Vladivostok and Beyond: SALT I and the Prospects for SALT II

Edwin Brown Firmage*
David J. Henry**

I. Introduction

The tortuously constricted boundaries within which the Vladivostok agreement can be considered as an advance toward the goal of arms reduction and stability remind us once again that technology unconstrained by law inexorably limits that arena within which we enjoy the capacity to control our own future.

Certainly the Vladivostok agreement contains some tangible advances—primarily the establishment of a ceiling upon the number of all strategic-weapon delivery vehicles (long-range missiles and bombers). In addition, the agreement offers some short-term advantages to the United States. For instance, our forward-based systems in Europe are omitted from the strategic ceiling even though they could be used to strike the Soviet heartland. The strategic forces of the United Kingdom and France are also omitted from the calculation. Unfortunately, however, restraints upon the qualitative arms race, including the development and deployment of MIRV systems, are almost non-existent. Both sides are permitted to increase their deliverable warhead capacity almost without limitation. More importantly, no provision is made for a planned and gradual diminution or elimination either of existing stockpiles or of obsolete and increasingly provocative systems.

The proposed agreement allows both the United States and the Soviet Union an upper limit of 2400 strategic delivery vehicles through 1985, of which 1320 may possess MIRV's of unlimited size, accuracy and number. An indirect qualitative limitation may be said to exist insofar as the entire category of any missile tested with multiple warheads will be counted against the ceiling (1320) of vehicles possessing multiple warheads. In addition, the Soviet

* Professor of Law, University of Utah College of Law; Fellow in Law and the Humanities, Harvard Law School; J.D., LL.M., J.S.D., University of Chicago.

** J.D., University of Utah College of Law; Max Planck Institute for Foreign and International Patent, Copyright and Competition Law, Munich.

Union may deploy no more than 300 of its giant SS-9 and SS-18 missiles. This limitation is merely a continuation of that provided in the 1972 accord. No prohibition was agreed upon with regard to land-mobile missiles or launchers. Any weapons developed within this latter category are included within the allowable number of strategic delivery vehicles; the United States has published its understanding that any deployment of such weapons systems must be done in the open (on railroad cars or trucks) to permit satellite observation.

Under the proposed agreement, the Soviet Union could by 1985 replace 1320 of their 1410 silo-based ICBM's (SS-9 and SS-11) with larger, more powerful weapons, which could be MIRVed without limitation. Instead of the 1410 warheads presently deployed in its land-based strategic missiles, permitted under SALT I, the Soviet Union could have 6,700 or more deliverable warheads, with accuracy and payload sufficient to present a credible first-strike threat to our land-based systems. In recognition of this strategic possibility, the Vladivostok agreement permits the United States to replace all of its first generation Minuteman III and Poseidon missiles with the larger, more accurate, Minuteman IV and Trident I missiles. Within the upper limit of 2400 strategic delivery vehicles and the sub-limit of 1320 which can be improved qualitatively without restriction, we reportedly plan to place an additional 288 huge Trident II missiles on 12 Trident submarines.

The immense advantage possessed by the Soviet Union in missile size and throw weight, when coupled with an agreement which provides a numerical ceiling upon delivery vehicles but no limitation upon qualitative improvements such as MIRV, presents the United States with the prospect of being placed in a position of decisive inferiority unless one of two objectives is met. First, the United States can, under the Vladivostok agreement, increase the size and the throw weight capacity of its own land-based delivery systems. This course would entail another huge jump in the arms race and an increase in the arms budget at a time when neither is desirable. Second, the Vladivostok accord could be modified to provide for a phased reduction and eventual elimination of land-based missile systems. This step would have to be accomplished before MIRV development by the Soviet Union eliminates the American superiority in the number of deliverable warheads, which superiority provides the counter-balance to Soviet throw weight. Before technology again outdistances diplomacy, the United States must quickly choose between these two courses. We propose that it adopt the latter.

One of the great tragedies of our time is the degree to which technology has consistently undermined diplomatic and political attempts to place the restraints of law upon the development of weapons systems. Whether motivated by "worst case" analysis in deployment of arms, by a somewhat related "action-reaction" cycle between opposing states, by inter-service rivalry within a state, by bureaucratic adherence to a Parkinsonian law of growth, or simply by a failure of political leadership, we have managed since World War II to insure the blessings of peace for outer space,[1] the ocean floor,[2] and Antarctica[3] while leaving the great powers relatively free from the constraints of law in the conduct of the arms race. We have expended our time and energies in negotiating agreements to prohibit the use of armaments that are not even feasible for serious use,[4] in proscribing the emplacement of weapons systems where we have scant evidence that anyone intended deployment,[5] and in concluding agreements which, while possessing limited value in themselves, are justified largely as being "first steps."[6] These steps somehow lead not to substantial constraints upon the principal actors but instead result in our prescribing the most significant prophylactic devices for those possessing greater continence than their physicians.[7]

In fairness, we did begin the attempt at nuclear arms control by focusing on the central problems. The Baruch Plan[8] must surely

---

1. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, January 27, 1967, [1967] 18 U.S.T. 2410, T.I.A.S. No. 6347.

2. Draft Treaty with the U.S.S.R. on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and in the Subsoil Thereof, April 23, 1970, 9 INT'L L. MAT. 534 (1970) [hereinafter Seabed Treaty].

3. Antarctic Treaty, December 1, 1959, [1961] 12 U.S.T. 794, T.I.A.S. No. 4780; 402 U.N.T.S. 71.

4. Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological and Toxin Weapons and their Destruction, April 10, 1972 *quoted in* UNITED STATES ARMS CONTROL AND DISARMAMENT AGENCY, U.S. ARMS CONTROL AND DISARMAMENT AGREEMENTS: 1959-1972, at 98 (1972).

5. Seabed Treaty, *supra* note 2.

6. Treaty Banning Nuclear Weapon Tests in the Atmosphere, In Outer Space and Under Water, August 5, 1963, [1963] 14 U.S.T. 1313, T.I.A.S. No. 5433.

7. Treaty on the Non-Proliferation of Nuclear Weapons, July 1, 1968, [1970] 21 U.S.T. 483, T.I.A.S. No. 6839. *See also* Firmage, *The Treaty on the Non-Proliferation of Nuclear Weapons*, 63 AM. J. INT'L L. 711 (1969).

8. See Firmage, *Anarchy or Order? The Nth Country Problem and the International Rule of Law*, 29 MO. L. REV. 138, 142-44 (1964).

represent one of the most creative efforts ever made to control weapons technology. That plan foundered for many reasons. One of the most immediate of these reasons, but not necessarily the most fundamental, was an insistence upon a level of intrusive inspection and enforcement unacceptable to any state.[9]

After technology, in the form of our successive loss of nuclear and then thermonuclear monopoly, had foreclosed any possible success of the Baruch Plan later attempts at "general and complete" disarmament foundered upon the issue of adversary or third party on-site inspection.[10] When President Eisenhower in his farewell address warned against the "military-industrial complex," he identified his inability to accomplish effective disarmament as the single most significant failure of his tenure in office.[11] He had exculpatory reasons which are not possessed by his successors, for technology, in addition to providing crushing problems in the form of new armaments, has also given heretofore nonexistent means for verifying compliance. The indictment of successor administrations must therefore include not only the lack of imaginative proposals for the control of nuclear weapons technology but also the failure to provide even the most cautious, conservative up-dating of an agreement to take note of increased technological capacity for verification by national means.[12]

Benjamin Franklin wrote Josiah Quincy that "there was never a good war or a bad peace."[13] It would be inappropriate to attempt to apply this aphorism to arms control agreements, for a badly conceived agreement could result in seriously increased instability or even war. However, we have erred overwhelmingly in the direction of caution. Abram Chayes has convincingly demonstrated that our preoccupation with technical factors, particularly our quest for foolproof systems of adversarial or third party on-site verification,

---

9. *Id.*

10. *Id. See also*, B. BECHHOEFER, POSTWAR NEGOTIATIONS FOR ARMS CONTROL (1961).

11. Eisenhower, *President Eisenhower's Farewell to the Nation*, 44 DEP'T STATE BULL. 181 (1961).

12. The Canadian effort to update the Non-Proliferation treaty by introducing a limitation on the number and power of nuclear tests has met with consistent opposition by both the United States and the Soviet Union. U.S. ARMS C'TL DISARMAMENT AGENCY, DOCUMENTS ON DISARMAMENT 1971, at 814, 852 (1970).

At the June 1974 summit, the Soviet Union proposed a complete test ban, but the United States turned it down on the grounds that it was unverifiable and contained objectionable escape clauses. Wash. Post, July 4, 1974, at 6, col. 6.

13. Letter from Benjamin Franklin to Josiah Quincy, September 11, 1773 *quoted in* C. VAN DOREN, BENJAMIN FRANKLIN, at 698 (1938).

has resulted in a catastrophic loss of security. Clearly the risks of competing arms technologies which threaten to become absolutely unmanageable in the foreseeable future outweigh the dangers implicit in an arms control agreement which possesses less than complete adversarial inspection provisions.[14]

As Chayes rightly noted, formidable internal political and bureaucratic barriers against cheating exist within a state, even without an agreement providing for adversarial third-party verification. We would emphasize in addition the substantial areas of possible agreement where national means of verification already exist.

Chayes asserts that substantial domestic political and bureaucratic impediments lie in the path of a preconceived plan for committing violations of an arms control treaty and that these factors, more than technical factors relating to verification, provide the seminal bulwark against treaty violation. But this is not to say that the technical factors are not of the highest importance. Indeed, in the absence of third party or adversarial on-site inspection, adequate national technical means of detection must be part of the (unstated) basis of the Chayes position, for the information supplied by such means must antedate the development of domestic forces in opposition to treaty violations. Without the existence of technical factors which enable national means of verification, much of the force of the Chayes position disappears.

The penchant for internal security and secrecy which constitutes a strategic asset and a basic tenet of political and social life in the Soviet bloc must be assessed with a view toward the relative openness of Western societies in calculating the potential balance achieved through "self-enforcing provisions" in arms control agreements. If agreements are to be accomplished which bind the super-powers and do not simply affect lesser states—and if those agreements are to affect the most potent strategic weapons systems in the arsenals of those great states and the technology to develop or improve such systems—then the consequences of treaty violation are obviously immense. Within this context, technical factors involving verification become vital. To avoid the repetition of past impasses over the issue of intrusive inspection, the United States should pursue agreements which fully exploit the present technical capacity for national means of verification.

SALT I and II are here analyzed within this context of seeking

---

14. Chayes, *An Inquiry Into the Workings of Arms Control Agreements*, 85 HARV. L. REV. 905 (1972).

arrangements (a) which bind the superpowers (b) in the development and deployment of their most powerful strategic weapons (c) in such a manner that verification can be accomplished by national means. In general our proposals seek to enhance nuclear stability while preserving options for nuclear response. The central proposal is developed following suggestions outlined earlier by Bernard Feld and others,[15] and is directed toward reducing the threat to stability posed by MIRV and other qualitative developments. The proposals dealing with MIRV have two major objectives: first, to reduce MIRV's pace of development and, second, to diminish its long-term threat. The first objective would be accomplished by imposing a missile test limitation on tests of all types while simultaneously introducing a planned freeze on launch vehicle size increases. The second objective is achieved by a phased reduction and the eventual elimination of land-based ICBM's while increasing allowable numbers of SLBM submarines. Full development of the United States B-1 bomber and Trident submarine programs is also advocated.

An additional category of proposals is directed toward preserving SLBM submarine invulnerability. It is proposed that no limitation be established on submarine or SLBM range in order to increase for both sides the effective "on station" area in the ocean for both sides. Other means are proposed to prevent or retard the development of antisubmarine warfare activity of the type which could potentially threaten SLBM submarines. Collateral discussion is directed toward a post-launch missile destruct mechanism and toward the control of tactical nuclear weapons.

II. The SALT I Agreements

Because of the enormity of the disparity between technological capability and the political capacity to regulate that capability,[16] it is

---

15. See notes 117, 121, 126 *infra*.

16. Rhinelander, *An Overview of Salt I*, 67 Am. J. Int'l L., No. 5, Proceedings of the 67th Ann. Meeting, at 29 (1973). John B. Rhinelander has asserted that in the U.S. decision-making process SALT I constituted 60% technology and 40% politics; *c.f.*, Chayes, *supra* note 14.

Technically oriented literature of significance to the issues at SALT includes: W. Biddle, Weapons Technology and Arms Control (1972); R. Kuenne, The Polaris Missile Strike (1966); J. Neilands, et al., Harvest of Death (1972); Feld, *ASW—The ABM of the 1970's?* 7 Stanford Journal of International Studies 87 (1972); Garwin, *Antisubmarine Warfare and National Security*, Scientific American, July 1972, 14; Greenwood, *Reconnaissance, Surveillance and Arms Control*, Adelphi Papers, No. 88 (1972); Greenwood, *Reconnaissance and Arms*

remarkable that an agreement was reached at SALT I. The accords are, to be sure, seriously deficient; but analysis of those deficiencies serves to illuminate both the goals yet to be reached and the obstacles to be overcome.

There are four major agreements comprising SALT I: the Treaty on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty),[17] the Interim Agreement on Limitation of Strategic Offensive Arms (Interim Agreement),[18] the Agreement on Nuclear Accidents Measures (Accidents Agreement),[19] and the Agreement on Direct Communications Link (Hot Line Agreement).[20] The Accident Measures Agreement and the Hot Line Agreement were executed on September 30, 1971, in Washington. The apparent

---

Control, SCIENTIFIC AMERICAN, February 1972, at 14; Imai, *Nuclear Safeguards*, ADELPHI PAPERS, No. 86 (1972); Luttwak, *The Strategic Balance 1972*, THE WASHINGTON PAPERS, No. 3 (1972); Myers, *Extending the Nuclear Test Ban*, SCIENTIFIC AMERICAN, January 1972, at 13; Scoville, et al., *Issues in Arms Limitations—4 Views*, 8 SCIENCE AND PUBLIC AFFAIRS: BULLETIN OF THE ATOMIC SCIENTISTS, 9 (March 1972); Smart, *Advanced Strategic Missiles: A Short Guide*, ADELPHI PAPERS, No. 63 (1969); York, *Controlling the Qualitative Arms Race*, 29 SCIENCE AND PUBLIC AFFAIRS: BULLETIN OF THE ATOMIC SCIENTISTS, 4 (March, 1973).

Major literature directed toward SALT includes: M. KAPLAN, SALT: PROBLEMS AND PROSPECTS (1973); W. KITNER, ET AL., (eds.) SALT: IMPLICATIONS FOR ARMS CONTROL IN THE 1970's (1971); J. NEWHOUSE, COLD DAWN, THE STORY OF SALT (1973); H. SCOVILLE, TOWARD A STRATEGIC ARMS LIMITATION AGREEMENT (1970); Caldwell, *Soviet Attitudes to SALT*, ADELPHI PAPERS, No. 75 (1971); Calogero, *A Scenario for Effective SALT Negotiations*, 29 SCIENCE AND PUBLIC AFFAIRS: BULLETIN OF THE ATOMIC SCIENTISTS, 16 (June 1973); Coffey, *The Savor of SALT*, 29 SCIENCE AND PUBLIC AFFAIRS: BULLETIN OF THE ATOMIC SCIENTISTS, 9; (May 1973); Greenwood and Nacht, *The New Nuclear Debate: Sense or Nonsense*, 52 FOREIGN AFFAIRS 761 (1974); International Institute for Strategic Studies, STRATEGIC SURVEY 1973; (1974).

Political ramifications of arms control are discussed in Gelber, *Nuclear Weapons and Chinese Policy*, ADELPHI PAPERS, No. 99 (1973); Heisenberg, *The Alliance and Europe, Crisis Stability in Europe and Theatre Nuclear Weapons*, ADELPHI PAPERS, No. 96 (1973); W. Mallison, *The Laws of War and the Judicial Control of Weapons of Mass Destruction*, 36 GEO. WASH. L. REV. 308 (1967); Slocombe, *The Political Implications of Strategic Parity*, ADELPHI PAPERS, No. 77 (1971).

17. Treaty with the U.S.S.R. on the Limitation of Anti-ballistic Missile Systems, May 26, 1972, [1972] 23 U.S.T. 3435, T.I.A.S. No. 7503.

18. Interim Agreement with the U.S.S.R. on Certain Measures with Respect to the Limitation of Strategic Offensive Arms, May 26, 1972, [1972] 23 U.S.T. 3462, T.I.A.S. No. 7504.

19. Agreement on Measures to Reduce the Risk of Nuclear War Outbreak, September 30, 1971, [1971] 22 U.S.T. 1590, T.I.A.S. No. 7186.

20. Agreement With the U.S.S.R. on Measures to Improve the USA-USSR Direct Communications Link. *Id.* at 1598; T.I.A.S. No. 7187.

purpose in executing the two agreements prior to the time of serious negotiations on ABM or offensive systems was to provide a core of agreed values and to avoid the possibility that SALT might prove fruitless.[21] The remarks of Secretary Rogers and Foreign Minister Gromyko[22] at the signing ceremony indicated that a relatively high political value was placed on these two less significant agreements. Substantively, the Accidents Agreement and the Hot Line Agreement do establish obligations which should at least marginally reduce the risk of nuclear war.[23]

The Accidents Agreement enunciates four major obligations: (1) a pledge to take steps to guard against accidental or unauthorized use of nuclear weapons;[24] (2) a pledge to notify the other party immediately in the event of an accidental, unauthorized, or unexplained incident involving a possible detonation of a nuclear weapon where such detonation could create a risk of nuclear war;[25] (3) a pledge to notify the other party upon detection of unidentified objects by missile detection systems or of signs of interference with the operation of such systems;[26] and (4) a pledge to notify the other party of planned missile launches which extend beyond the national territory.[27]

The Hot Line Agreement expanded upon the Memorandum of Understanding of June 20, 1963,[28] which originally established the Washington-Moscow "hot line." The agreement provides two additional satellite links and a system of dispersed ground terminals.[29] The annexed technical memorandum[30] indicates that the two alternate systems will employ the Intelsat and Molniya II satellites in the transmission links. The Washington-Moscow hot line

---

21. *U.S. and U.S.S.R. Sign Agreements to Reduce Risk of Nuclear War* 65 DEP'T STATE BULL. 399, (1971), note particularly remarks by Secretary Rogers and Foreign Minister Gromyko.

22. *Id.*

23. The two agreements executed at Washington on September 30, 1971 were negotiated and signed as a set under the label "Agreements to Reduce the Risk of Nuclear War" (*supra*, notes 19 and 20).

24. Agreement on Nuclear Accidents Measures, Article 1, *supra*, note 19 at 1591.

25. *Id.* Article 2.

26. *Id.* Article 3.

27. *Id.* Article 4.

28. Memorandum of Understanding With the U.S.S.R. Regarding the Establishment of a Direct Communications Link, June 20, 1963, [1963] 14 U.S.T. 825, T.I.A.S. No. 5362.

29. Agreement on Direct Communications Link, Article 1, *supra* note 20.

30. Annexed Technical Memorandum, *supra* note 20 at 1601.

has proven to be a tool of some value and the Hot Line Agreement will serve to protect the technical quality and integrity of the link.

The end of SALT I was marked on May 26, 1972, by the signing in Moscow of the Treaty on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty)[31] and the Interim Agreement on Limitation of Strategic Offensive Arms.[32] The ABM Treaty is the most significant of the four agreements concluded during SALT I.[33] It is generally believed that the long-term significance of the ABM Treaty lies in its potential for breaking the action-reaction cycle in the world of strategic arms by reducing the incentive to increase offensive arsenals.[34] In the ABM Treaty both nuclear powers have officially recognized and in effect agreed to maintain mutual deterrence.[35]

The ABM Treaty allows two protectable geographic regions within the national territory of each party.[36] One region comprises an area within 150 kilometers (94 miles) of the national capital, the second encompasses territory within 150 kilometers of ICBM silo launchers.[37] A problem was encountered during the course of negotiations with respect to the permissible relative location of the two ABM sites. The United States viewed as non-negotiable the premise that the Soviet Union would not be allowed to locate both of its ABM sites in Western Russia near the SS-11 fields and Moscow, where the sites would overlap to provide substantial area defense.[38] Ultimately an Agreed Interpretation[39] was reached re-

---

31. *Supra*, note 17.

32. *Supra*, note 18.

33. See Statement by the Honorable William P. Rogers to the Senate Foreign Relations Committee, Paragraph VI. Dep't State News Release, at 3 (June 20, 1972).

34. *Id.* at 4, *see also* 67 AM. J. INT'L L., *supra* note 16 at 31.

35. Rogers statement, *supra* note 33.

36. At the Moscow summit of June 1974, President Nixon and Soviet Communist Party Chairman Brezhnev signed a protocol limiting each party to one ABM site rather than the two sites provided in the treaty. Additionally, at the Moscow summit, agreement was reached prohibiting underground nuclear tests exceeding 50 kilotons. The agreement excludes peaceful engineering applications. The parties also agreed "in principle" to permit on-site inspection for the conduct of the peaceful explosions.

Two unpublished protocols specify certain procedures and alterations in the dismantling and replacement of missiles under the 1972 Interim Agreement. Secretary Kissinger has stated that the two secret protocols "break no new ground." (*See* N.Y. Times, July 4, 1974, at 1, col. 8)

37. ABM Treaty, Article III, *supra* note 17 at 3440.

38. J. NEWHOUSE, COLD DAWN: THE STORY OF SALT 233 (1973).

39. Agreed Interpretations (C), *supra* note 17 at 3456.

quiring the two sites to be separated by at least 1300 kilometers (800 miles). The 1300 kilometer limit operates to position the U.S.S.R. ICBM-protective site east of the Ural Mountains near the lesser populated regions of SS-9 deployment.[40]

Additionally, the treaty restricts the technical parameters at each ABM deployment location. Each site may employ no more than 100 ABM launchers with no more than 100 ABM interceptor missiles at launch sites. Nor more than six ABM radar complexes, each having a circular diametral dimension of no more than three kilometers, may be deployed at the "national capital" site, while two large phased-array ABM radars, in addition to eighteen standard ABM radars of limited power, may be utilized at the ICBM-protective site.[41]

The ABM Treaty also contains a provision in article IV which allows the continued use of test areas, provided that no more than fifteen launchers are employed. On April 26, 1972, the United States Delegation issued a statement of common understanding locating the United States ABM test ranges at White Sands, New Mexico and Kwajalein Atoll and the U.S.S.R. range near Sary Shagan in Kazakhstan. On May 5, 1972, the Soviet Union concurred in the United States' statement.[42]

Several provisions in the ABM Treaty reflect attempts to limit the further development of ABM technology. The parties pledged to refrain from developing, testing, or deploying ABM systems or components which are sea-based, air-based, space-based, or mobile land-based.[43] In addition, agreement was reached preventing the development, testing, or deployment of multiple ABM missile launchers or rapid re-load ABM launchers.[44] Other provisions designed to maintain the commitment to deterrence include a ban on developing ABM capabilities in present defensive and strategic force components; a ban on testing such force components in an ABM mode, lest SAM missile installations be upgraded to an ABM level;[45] a prohibition against future deployment of radar for early warning of strategic ballistic missile attack except at locations along the periphery of the national borders and oriented outward;[46] and

40. *Supra*, note 38 at 248.
41. *Supra*, note 37.
42. Common Understanding (B), *supra* note 17 at 3458.
43. ABM Treaty, Article V, *supra* note 17 at 3441.
44. *Id.*
45. ABM Treaty, Article VI, *supra* note 17 at 3442.
46. *Id.*

a pledge to refrain from transferring ABM systems or components to other states and to forbear deployment beyond the national territory.[47] Modernization and replacement of ABM systems is permitted within the scope of the technical restrictions on all ABM systems.[48]

Both parties recognized the political-diplomatic thicket surrounding verification in arms control agreements. Accordingly, the ABM Treaty adopts a fall-back position by relying upon "national technical means"[49] rather than high-level over-flight or on-site inspection mechanisms. The conjunction of the high level of confidence in "national means" with the nature of the terms serves to make the ABM Treaty generally verifiable. The verification article, article XII, provides other requirements for enhancing the reliability of "national technical means." One such requirement is non-interference with properly recognized verification procedures; another is the prohibition against deliberate concealment resulting in the impairment of the verification process.[50]

Control of the types of radar systems that could be used as components in an ABM system presented a time-consuming and vexing issue in the course of the ABM negotiations.[51] One of the substantial problems inherent in reliance upon "national technical means" of verification is the possible clandestine development of such a system, followed by denunciation of the treaty and rapid deployment. Since existing radar systems of the phased-array configuration are very large[52] and would be practically impossible to hide, and since the radar system would require a greater lead time in deployment than other ABM components,[53] radar has been selected as the pressure point control of clandestine ABM deployment.

The treaty also prohibits employment of non-ABM, long-range radar systems at geographic locations where—by effectively reducing the lead time for the deployment of secretly developed

47. ABM Treaty, Article IX, *supra* note 17 at 3443.

48. ABM Treaty, Article VII, *supra* note 17 at 3442.

49. ABM Treaty, Article XII, *supra* note 17 at 3443.

50. *Id.*

51. U.S. ARMS CONTROL AND DISARMAMENT AGENCY, 12TH ANNUAL REPORT TO THE CONGRESS, at 3 (1972).

52. The presently deployed phased-array, perimeter acquisition radar located near Grand Forks, North Dakota, is housed in a structure about 200 feet square and 130 feet tall. *Supra*, note 38 at 153.

53. *Supra*, note 51.

ABM systems—such radar systems may be used, functionally, as ABM components.[54] As an additional impediment to technological upgrading of radar capabilities employed in the ABM systems, the Agreed Interpretations prescribe limits on radar potential.[55]

During the course of negotiation and determination of administration policy, "exotic" ABM systems became a growing concern. "Exotics" were considered to be presently unknown antiballistic missile systems which did not employ a strike missile: For example, mechanisms such as lasers, charged particles, or electromagnetic waves.[56] On July 2, 1971, a complete ban on "exotics" was proposed in U.S. National Security Decision Memorandum Number 117 which specified that everything not allowed in a SALT agreement was forbidden.[57] The United States proposal was not well-received. Ultimately the two parties at SALT issued Agreed Interpretation (E),[58] which delays consideration of "exotics" until they are actually potential substitutes for existing systems and then refers the matter to the Standing Consultative Commission established under article XIII of the treaty.

Beyond the recognition of the importance and validity of mutual deterrence as a strategic policy, the ABM Treaty has codified deterrence by barring measures which could give either side the capacity to protect its industry and its population against nuclear attack, or which could arouse concern that either party was attempting to develop such a capacity.[59]

The Interim Agreement executed at Moscow on May 26, 1972, has proven to be the most controversial of the SALT I accords. Unlike the ABM Treaty, the Interim Agreement is limited in duration and scope and does not provide a long-term comprehensive limitation on strategic offensive weapons systems. It is a "holding" device to prevent the number of ICBM and SLBM launchers from increasing while negotiation to limit offensive systems continues.

---

54. *Supra*, note 45.

55. Radar potential is defined as the product of the mean emitted power in watts and the antenna area in square meters. Agreed Interpretation (B) limits the 18 smaller ABM radars at the ICBM site to a potential less than 3 million watt-meters squared. Agreed Interpretation (B), *supra* note 17 at 3456.

56. *Supra*, note 23, *also*, 34 ELECTRONICS 81 (1961), where a laser destruct system is examined.

57. *Supra*, note 38, at 230.

58. Agreed Interpretation (E), *supra* note 17.

59. J. Coffey, *The Savor of SALT*, SCIENCE AND PUBLIC AFFAIRS: BULLETIN OF THE ATOMIC SCIENTISTS, 9 (May, 1973).

Although it constrains a number of Soviet programs, it, in fact, has no such effect upon United States programs.[60]

The Interim Agreement prohibits construction of additional fixed, land-based ICBM launchers after July 1, 1972,[61] thereby limiting the United States to a maximum of 1054 such launchers and the U.S.S.R. to a maximum of 1618.[62] The quantitative limit of Article I is further complemented by a qualitative restriction in Article II, which prohibits the conversion of "light" ICBM launchers, or launchers deployed prior to 1964, into "heavy" ICBM launchers.[63] After several months of negotiation, the United States could not persuade the U.S.S.R. to accept a common definition for "light" and "heavy" ICBM's. The Soviets argued that the agreement was only a short-term freeze and that both sides could distinguish "light" and "heavy" rather easily.[64] Both sides appeared to have reached an understanding that Soviet SS-11 and SS-13 systems are "light", while SS-8's, SS-7's, and SS-9's are "heavy." Likewise, American Titans are "heavy" while Minuteman systems are "light."[65]

On April 7, 1972, after being frustrated in attempts to achieve a specific definition of "heavy missiles," the United States issued Unilateral Statement (D) which defined a "heavy ICBM" to be any missile having a volume significantly greater than the largest "light" ICBM" then operational on either side. It has been revealed that the United States notified the Soviet Union that it considered a "heavy" missile to be one exceeding a volume of seventy cubic meters, the SS-11 measuring sixty-nine cubic meters.[66]

---

60. Testimony of Gerard Smith, Director of the U.S. Arms Control and Disarmament Agency before the Senate Armed Services Committee on June 28, 1972, *Current Foreign Policy*, DEP'T STATE PUBLICATION 8668, GENERAL FOREIGN POLICY SERIES 266, at 4 (1972).

61. Interim Agreement, Article I, *supra* note 18 at 3464.

62. Congressional Briefing by Dr. Henry A. Kissinger, 118 CONG. REC. at 21309 (1972).

63. Interim Agreement, Article 2, *supra* note 18 at 3464.

64. *Supra*, note 60.

65. *Id.*

66. Unilateral Statement (D), *supra* note 18. In August 1975 a great deal of official United States comment centered upon the substitution by the Soviet Union of a new SS-19 missile for some older SS-11 models. Based upon intelligence reports, it appears that the new SS-19 is approximately 50% larger than the SS-11 and can lift off approximately 7,500 pounds as opposed to 2,500 pounds for the SS-11, thereby accomodating a substantially larger nuclear payload. The new development raised serious questions regarding the utility and advisability of the use

The Interim Agreement also limits submarine launched ballistic missiles and launchers to the number operational or under construction on May 26, 1972 (the date of signature).[67] However, the right to modernize and replace older submarines and SLBM missiles with newer types is retained. A protocol to the interim agreement specifically sets the maximum numbers of SLBM's and submarines at 710 and 44, respectively, for the United States and 950 and 62, respectively, for the Soviet Union.[68] At the time of agreement, however, the United States had 656 SLBM launchers on operational submarines or submarines under construction and the Soviet Union had 740. Accordingly, under the protocol each party may substitute SLBM's for land-based ICBM's which were deployed prior to 1964, up to the prescribed maximums of 710 and 950 SLBM's, and reduce the quotas established for ICBM's.[69]

The ICBM substitution clause of the protocol would allow the United States to substitute modern SLBM's for its 54 Titan II ICBM's and a number of its pre-1964 Minuteman I missiles, in order to reach a maximum of 710 SLBM launchers. Likewise, the Soviet Union could choose to substitute modern SLBM launchers for the 66 launchers now employed in diesel-powered submarines and pre-1964 SS-7 and SS-8 launchers, in order to achieve a maximum of 950 modern SLBM launchers.[70]

---

of "unilateral statements" in SALT negotiations. In addition, the SS-19 deployment invited some charges of breach of the SALT I accord in the Congress. Int'l Herald Trib. (Paris), Aug. 7, 1975, at 3, col. 6.

On January 14, 1975, at a news conference, Secretary of Defense Schlesinger stated that evidence existed of the beginning of deployment of MIRV by the Soviet Union with the largest new missile, the SS-18. Wash. Post, January 15, 1975, at 1, col. 1.

67. Interim Agreement, Article III, *supra* note 18 at 3464.

68. Protocol to the Interim Agreement, *supra* note 18 at 3469.

69. *Id.*

70. THE INTERNATIONAL INSTITUTE FOR STRATEGIC STUDIES, THE MILITARY BALANCE, 1972-73 at 84 (1972).

Just prior to the Moscow summit of June 1974, concern arose over two allegedly secret agreements which were not presented to the Congress. It was asserted that Secretary Kissinger had agreed to forego the option of transition from land-based Titan II missiles to modern SLBM launchers. Additionally, Senator Jackson claimed that the Secretary had agreed that transition missiles would not be included in the total number of allowable SLBM launchers, thereby increasing the total allowable Soviet SLBM launchers to 1020 instead of 950. (See N.Y. Times, June 22, 1974, at 1, col.1). Secretary Kissinger, however, denied that the agreements were made and stated that both issues were discussed subsequent to con-

An Agreed Interpretation was reached which does not allow significant increases in silo dimensions in the event the silo is "modernized."[71] On May 26, 1972, the parties issued a Common Understanding defining "significantly increased" to mean no greater than 10-15 percent notably without reference to the identity of the dimensions (*i.e.*, depth, diameter, etc.).[72]

Other articles regarding verification and the Standing Consultative Commission closely parallel those of the ABM Treaty.[73] Article VII indicates the intent of the parties to continue negotiations and states that the Interim Agreement is not to be interpreted to limit the scope or terms of any subsequent offensive weapons agreement.[74] Article VIII provides a durational limit of five years for the agreement and also includes an "extraordinary events" withdrawal clause now relatively common in arms control agreements.[75]

III. Political Aspects of SALT II

The signing of the ABM Treaty and the Interim Agreement on May 26, 1972, marked the beginning of a vociferous and multifaceted debate over whether the United States had "won" or "lost" at the bargaining table. The key words in the highly speculative debate surrounding SALT are "parity" and "sufficiency."

The major camps on both sides of the debate share the basic premise that the United States must maintain a level of military strength which will preserve its position as the preeminent political power of the Western world. However, beyond that foundation, there is little common ground. The meaning of "sufficiency" is complicated by a double definition in popular usage. In its narrow, military sense, sufficiency means the minimum level of military strength sufficient to deter an attack. In a broader, more

---

gressional approval of the interim agreement, but that no change was made in the allowable numbers of missiles. He termed a statement he had made regarding Titan II's as a "prediction" that the United States would not replace them with SLBM's. (See N.Y. Times, June 24, 1974, at 1, col. 3).

71. Agreed Interpretation (C), *supra* note 18, at 3478.

72. Common Understanding (A), *supra* note 18, at 3479.

73. Interim Agreement, Articles V and VI, *supra* note 18, at 3465, 3466.

74. Interim Agreement, Article VII, *supra* note 18, at 3466.

75. Interim Agreement, Article VIII, *supra* note 18, at 3467. See Firmage, *The Treaty on the Non-Proliferation of Nuclear Weapons,* 63 Am. J. Int'l L. 711, 739 (1969) regarding the withdrawal term.

political sense, sufficiency means the level of military strength necessary to prevent the United States from being coerced. This political definition may involve a higher standard than mere deterrence. Both definitions, however, encompass the retention of a sufficient, second-strike force after an initial cataclysmic attack. Neither definition permits the mere balancing of numeric criteria isolated from such offsetting factors as geography, hardening, civil defense, reconnaissance, and economics. The fact that SALT I, in the ABM Treaty, codified the concept of deterrence is a persuasive indication that the Nixon Administration believed that strategic "sufficiency" exists, at least in the military sense. Whether "sufficiency" exists in the political sense is open to speculation. Despite the conflicting results of detailed calculations, one may conclude, at the very least, that neither superpower can consider itself to have any significant advantage over the other in terms of ability to engage in nuclear war free from the threat of substantial retaliation.[76]

The "parity" camp first takes issue with the claim that minimum deterrent sufficiency exists in the SALT I formula, particularly when control is not maintained over modernization and MIRV deployment. In addition, the "parity" philosophy emphasizes the political importance of visible equality independent of amorphous technical explanations to prove sufficiency or technical equality.[77] In advancing the case for parity, a hypothetical situation is often established wherein the Soviet Union gains qualitative and quantitative superiority and launches a preemptive attack upon the United States, destroying all land-based missiles and most Polaris submarines. At that point, it is argued, the Soviet Union would be in a position to blackmail the United States into submission.[78]

Although most of the "parity" supporters concede that the reasonable decision-maker would not risk the kind of action set forth in the preceding hypothetical, the argument seems always to shift to one centered upon the value of the appearance of power through numerical equality. One writer has alluded to the Cuban missile crisis of 1962 and inferred that the result would have been different had the United States possessed fewer nuclear ICBM

76. *Supra*, note 70, at 86.

77. Rhinelander *supra* note 16, at 39; Perle, "Mutually Assured Destruction as a Strategic Policy."

78. *Id.*

delivery vehicles than the Soviet Union.[79] However, an equally convincing case can be made for the assertion that the Soviets felt compelled to take the precarious step of emplacing MRBM's and IRBM's in Cuba, even though this action broke their long-standing tradition of locating no such weapons outside the Soviet Union, precisely because of the rapid American build-up of ICBM's following the "missile gap" scare of the 1960 Presidential elections. It may also be argued that the Cuban missile crisis ended as it did because the United States possessed an overwhelming superiority in locally deployed conventional forces.[80] Perhaps the most convincing element in the "parity" position is the assertion that through numeric equality the United States may simply and clearly demonstrate to a world populace not sophisticated in deterrence strategy that the United States is at least as powerful as any other nation.

To assess adequately the overall balance set forth in the five-year Interim Agreement, it is necessary to attribute some weight to forces not included in the agreement, such as American bomber forces and European forward-based systems. The qualitative factors of MIRV and accuracy must also be considered. The United States still maintains a two-to-one lead in deliverable war heads and a major lead in accuracy.[81] Additionally, deployment requirements must be considered. As a result of geography and other factors existing during the period of the Interim Agreement, the Soviet Union must deploy three submarines for every two deployed by the United States in order to have the same number on station.[82] Because of the greater distance from Soviet bases to patrol stations and the shorter range of Soviet SLBM's only about 40 percent of Soviet SLBM's can be in firing position at any time compared with 60 percent of the American SLBM's. It should also be recognized

---

79. W. Kitner, "Arms Control for a Five-Power World," *SALT Implications for Arms Control in the 1970's*, (1973) at 176.

80. E. Able, *The Missile Crisis* (1966); R. Kennedy, *Thirteen Days* (1969); *cf.* G. Allison, *Essence of Decision: Explaining the Cuban Missile Crisis* (1971).

81. Kissinger, *supra* note 62, at 21310. At the June 1974 Moscow Summit, no agreement could be reached on limiting both quantity and quality of missile deployment because there was no mutually agreeable parameter for exercising the control. The Soviet Union would prefer to control the number of warheads while the United States wishes strictly to limit the number of launch vehicles. The proposed number of vehicles was wholly unacceptable to the Soviet Union. (N.Y. Times, July 5, 1974, at 1, col.8).

82. *Supra* note 62, at 21310.

that the Soviet MIRV program is still somewhat behind that of the United States. Even if the Soviet Union builds the maximum allowable SLBM force during the five-year life of the Interim Agreement, it will still be able to fire fewer warheads than the United States.[83] Of course, a radically different situation would exist once a full-scale MIRV deployment of the Soviet SLBM force were accomplished.

Deliverable megatonage is also a widely discussed, but misleading, statistic used in analyzing the "balance" under the Interim Agreement. It is generally agreed that the deliverable ICBM and SLBM megatonage of Soviet forces is about 11,400 MT whereas that of the United States is 2,400 MT. An even larger, though reverse, disparity is observed in the area of long-range bombers (U.S.S.R.: 3,600 MT, U.S.: 16,500 MT).[84] Mere deliverable megatonage is a deceiving factor unless accuracy is also taken into account. A widely recognized formula illustrating the important interrelationship between yield and accuracy is:

$$K \propto \frac{\Sigma \, (\text{yield})^{2/3}}{(\text{CEP})^2}$$

where K is a measure of first-strike destructive capability and CEP the circular error probability (accuracy), which represents the radius of a circle centered on the target so that a warhead aimed at the target would have equal chances of falling inside or outside of the circle.[85]

It is important to recognize that in determining the first-strike capability, a multiplication of yield by 2 will increase capability by a factor of 1.6, or 60 percent. However, an increase in accuracy by a factor of 2 (therefore a decrease in CEP of 1/2) will increase capability by a factor of 4, or 300 percent.[86] In the final analysis, it is important not to overreact to the impression created by a simple comparison of megatonnage. The Soviet lead in this area is much

83. *Supra* note 70, at 85. *See also*, *supra* note 59, at 9, where the assertion is made that it is conceivable that the Soviet Union could install enough MIRV's to surpass the United States in numbers of warheads by 1977 or sometime thereafter. At a news conference on January 14, 1975, Secretary of Defense Schlesinger stated that there is evidence that the Soviet Union has actually deployed MIRV, with the largest new missile, the SS-18. Washington Post, January 15, 1975, at 1, col. 1.

84. *Supra* note 70, at 85.

85. W. Biddle, *Weapons Technology and Arms Control* at 144 (1972).

86. *Id.*

less significant when it is analyzed in light of the substantial advantage possessed by the United States in terms of targeting, accuracy, and MIRV deployment.

Still another important factor in determining the most desirable balance is the nature of an anticipated conflict. Those who support "sufficiency" in the military sense are actually speaking of a minimum deterrent force capable of surviving a first strike and inflicting on the opposition something at least slightly more than marginally acceptable damage on the opposition.[87] With the recent development in United States strategic policy of "flexible response,"[88] more than just minimum deterrent sufficiency would be required to assure both the capacity for surgical, tactical use of weapons systems and the retention of the survivable, second strike force levels. In fact, the second, political meaning of "sufficiency" has been the meaning applied most often in describing a standard for flexible response. In addition, a buffer quantity above the minimum necessary level of military strength is desirable to insure that a surprise technological advance by the other side will not bring the balance below the point of "sufficiency" under either definition.

Even if the Interim Agreement did not provide answers to the questions surrounding the establishment of a "minimum stable deterrent,"[89] it did give both parties an opportunity to reflect upon the subject by allowing the possibility of a short respite from the quantitative arms race. Immediately prior to the Interim Agreement, the Soviet Union was producing SLBM launchers at the rate of about 128 per year and had demonstrated the capability of building ICBM's at a rate of 250 per year. At those rates, in five years the Soviets would have had 1200 SLBM launchers and nearly 2,800 ICBM's, many more than are now permitted. The United States has no active program to expand its numbers of launchers by 1978; and, in the aftermath of our involvement in Vietnam and the consequent attitude among the public and the Congress toward military spending, there seems to be little likelihood of a dramatic change in the near future. It can at least be argued that the Interim Agreement has temporarily reduced the potential 1978

87. *Id.* at 241-42.

88. Statement by Secretary of Defense James R. Schlesinger in the annual report of the Department of Defense for the fiscal year 1975, released in March 1974. The new "flexible response" doctrine is proposed in order to give the President "a wider set of much more selective targeting options."

89. *Supra*, note 85, at 242.

Soviet launcher totals until a more desirable, permanent solution is reached.[90]

Two important developments have occurred—one in technology, the other in strategic policy—which should be discussed prior to setting out proposals for SALT II. The first major development was the successful test firing of a Soviet SS-19 MIRV system on January 25 and 26, 1974[91] and deployment which began in early 1975.[92]

Second, on January 10, 1974, Defense Secretary Schlesinger announced that "there has been . . . a change in the strategies of the U.S. with regard to the hypothetical employment of central strategic forces."[93] He proposed that instead of following the long-adopted plan of massive, strategic response, the United States should respond to Soviet aggression by selectively attacking military targets. One writer has commented critically that "flexible response" has replaced "deterrence of nuclear war by assured destruction" as the cornerstone of our strategic policy.[94]

It has been asserted that the new "flexible response" posture is antithetical to the stable state of mutual deterrence formally recognized in the ABM Treaty. Herbert Scoville, Jr., former Assistant Director of ACDA for Science and Technology, has written: "the basic goal of our strategic policy for 20 years finally had a stable, more permanent foundation . . . but the ink was hardly dry on the [ABM] Treaty before the Administration raised questions about the desirability of a strategic policy based solely on deterrence."[95] He concludes: "making it easier to fight strategic nuclear war does not truly enhance deterrence and only increases the risk that fears of nuclear devastation will turn into reality."[96]

It is conceivable that the re-targeting proposal was made only for Soviet consumption in order to strengthen the hand of the United States at SALT II. However, if the Administration is serious about re-targeting missiles or reducing the "firebreak" between full-scale nuclear and conventional war, then the level of minimum stable deterrent must be increased substantially.

---

90. *Supra*, note 70.

91. "Soviet Fires MIRV Into Mid-Pacific," N.Y. Times, January 29, 1974, at 1, col. 5.

92. *Id.*

93. Scoville, "Flexible Madness," Spring 1974 *Foreign Policy*, Number 14, at 164.

94. *Id.*

95. *Id.* at 165.

96. *Id.* at 177.

Of course, it is possible that a decision has already been reached by the Administration to mollify domestic critics by achieving simple and permanent numeric parity of ICBM's and SLBM's on each side in SALT II without making any further efforts toward control or disarmament. In fact, parity may not be an undesirable long-term state if reached gradually and if accompanied by adequate control and force reductions; but to adopt parity regardless of cost, simply to lessen certain domestic pressures, would be wrong.

The Violations Debate

Substantial U.S. public attention has been directed toward alleged violations of the SALT I agreements by the Soviet Union. One author has isolated twelve distinct charges against the U.S.S.R.[97] It should come as little surprise to those familiar with the Soviet view of "strict construction" of international agreements to learn that their interpretation seems to ignore the "spirit" of the agreement as recognized and defined by the United States.

A major source of charges of violations are the seven American "Unilateral Statements." Of course the statements are "unilateral" because the Soviets would not agree to them. Unfortunately, however, Soviet acquiescence was carelessly presumed and many U.S. officials read the statements as if they were part of the agreement. At this point it is clear that the failure of the Soviets to agree to the subject matter of the unilateral statements was probably more important in determining the scope of SALT I than the fact of the issuance of the statements by the United States. It will be observed that the actions subsequent to SALT I illustrate as much a failure of U.S. arms control technique as they do direct violations by the Soviet Union.[98]

Five categories of violations appear to be most important. First, under the ABM treaty the U.S.S.R. has been charged with testing non-ABM elements "in an ABM mode." Although the term "in an ABM mode" was defined by the U.S. in Unilateral Statement (E),[99] no mutually agreeable definition was reached. Nevertheless, the Soviet tests of SA-2 and SA-5 missiles and radar at altitudes in excess of 100,000 feet make a very strong case for a charge of

97. Gray, *supra*, note 66, at 28; other writers have found five major issues to be involved in the violations discussion, see, "Is the Kremlin Cheating," *Newsweek* (Int'l Edition), Dec. 22, 1975, at 9.

98. Gray, *id.*, at 29.

99. Unilateral Statement (E), *supra*, note 18.

violation of the "in an ABM mode" limitation under almost any conceivable definition from a technological standpoint. If the facts are true as alleged, then reasonable ground appears to exist to support a charge of violation.[100] Another example of Soviet refusal to accept the "spirit" of SALT I is the testing of "transportable" radar units while maintaining that they are not operational as "mobile units" which are proscribed by the treaty.

The second major category of allegations concerns interference with "national means of verification."[101] The electronic equipment used by the United States to monitor ABM and SAM tests has allegedly been jammed on various occasions.[102] In addition reports have been made that the Soviets have tested a laser mechanism capable of temporarily blinding U.S. reconnaissance satellites. The Soviets maintain that the United States has no right to spy on innocent activities; however, a strong case could and should be made that only through open reconnaissance and verification can either side assure that activities are actually innocent.

The third major category of asserted violations, generally related to the verification problems outlined previously, is the use of large covers over several missile and submarine construction sites. Thus far the U.S. intelligence community has regarded the action more as a nuisance than a significant impediment to verification.[103] Recognizing that sheltering or covering of work areas is also practiced by the United States, it becomes clear that a definition of permissible covering is required in future arms control agreements.

A fourth category of charges concerns new deployment of launchers. Particularly important is the construction of 150 additional ICBM silos which the Soviets have claimed to be command and control centers.[104] The striking similarity to launch silos has been of great concern to the United States and may develop into a major barrier in SALT II.

An example of both the weakness of unilateral statements and the failure of the Soviets to recognize the "spirit" of SALT I is the testing of SS-X-16 land-mobile ICBM launchers. Unilat-

100. See Gray, *supra*, note 66, at 30. It should be noted that the testing was discontinued when the United States protested. It has been reported that the Soviets stopped only because they were caught, which should not excuse a violation, *Newsweek*, *supra*, note 97, at 9.

101. Art. XII(2), ABM Treaty, *supra*, note 17.

102. Gary, *supra*, note 66, at 30.

103. *Newsweek*, *supra*, note 97, at 9.

104. *Id.*; see also Gary, *supra*, note 66, at 31.

eral Statement (B) expresses the U.S. opinion that deployment of land-mobile ICBM launchers is "inconsistent with the objectives of [the Interim] Agreement."[105] In fact the U.S.S.R. agreed to nothing in SALT I regarding land-mobile ICBM launchers.

The fifth major category of allegations, which was readily foreseeable in SALT I, concerns the meaning of "heavy" and "light" missiles and the permissible expansion in size of existing missile silos.

In SALT I there was no agreement on the meaning of "light" or "heavy" missiles even though the United States, in Unilateral Statement (D)[106] and private notice to the U.S.S.R.,[107] attempted to implant a definition into the "spirit" of the agreement. One asserted violation is the substitution of SS-19 for SS-11 missiles. Through the combination of Agreed Interpretation (J) and Common Understanding (A),[108] agreement was reached on a fifteen percent maximum limitation on expansion of "present dimensions of land-based ICBM silo launchers." A fifteen percent increase in either depth or diameter represents nearly a thirty percent increase in volume of the silo structure, and a fifteen percent increase in both dimensions can produce a silo having a fifty percent larger volume.[109] Accordingly, the substitution of the large SS-19 for the SS-11 appears only to offend the U.S. "spirit" of SALT and not the letter of the agreement. The U.S. negotiators are attributed with the belief that only one silo dimension could be changed; however, the language of their agreed terms is to the contrary.

Fortunately the Interim Agreement has provided a five-year laboratory model in the intricacies of SALT negotiation, interpretation, and enforcement. Three lessons should have been learned by the United States: 1) unilateral statements are dangerously soothing to U.S. domestic assessment of an agreement, and more importantly, of no value in Soviet interpretation; 2) language must be definite and precise or no agreement should be reached at all; and 3) clearly defined provisions for securing the integrity of vital verification means must be achieved, since the entire agreement may be rendered useless and even dangerous by

105. Unilateral Statement (B), *supra*, note 18.

106. Unilateral Statement (D), *supra*, note 18.

107. See text associated with note 66, *supra*.

108. Agreed Interpretation (J) and Common Understanding (A), *supra*, note 18.

109. Gary, *supra*, note 66, at 33; see also the statement by Melvin Laird that the SS-19 is 50 percent larger than the SS-11, Int'l Herald Trib. (Paris), *supra*, note 66.

a failure in verification capability. With this reality in mind we will attempt to set out certain limited proposals which we feel would be useful in developing a responsible United States position on SALT II.

IV. Technological Aspects of SALT II

Our proposals for SALT II are both verifiable and politically feasible. We believe that restraint, control, and eventual diminution of MIRV should be the overriding goal of SALT II. Our major proposals encompass three areas: first, a reduction in the pace of MIRV development, accomplished through a test limitation on all missile systems, coupled with an eventual freeze on delivery vehicle size; second, a phased transition toward zero land-based ICBM's and 1500 sea-based SLBM's through the use of adjusted percent factors on a yearly basis; and third, an effort to protect submarine integrity through unlimited SLBM range and certain limitations relating to anti-submarine warfare.

Along with advocating the development of the B-1 bomber and the Trident submarine, we will discuss, without at this time proposing its unverifiable deployment, the feasibility of a missile self-destruct mechanism. The problem of the rapidly expanding deployment of tactical (or theatre) nuclear weapons will also be addressed.

The essential nature of an arms control agreement is political, but the subjects of the agreement and the means of its verification are predominantly technical in nature. There are three particular categories of technical definition, termed the technological "triptych" of disarmament and control: first, the zone which is subject to control; second, the types of arms, equipment, and installations subject to control; and third, the system of verification, inspection, and control.[110] The problem of verification is basic to all agreements regardless of the choices made in the remaining definitional categories.

There are three major verification alternatives open to the arms controller. First is the affirmative choice of no verification at all. Although in certain limited areas control might be in the self-interest of each party to such an extent that verification would be unnecessary—e.g., the agreement banning the development or use of biological weapons,[111]—this alternative is generally viewed as a

110. *Supra*, note 85, at 18; *cf.*, Chayes, *supra*, note 14.

111. *Supra*, note 4; see also J. Neilands et al., *supra* note 16.

politically impotent one, at least when serious weapons systems are the subject of control. And although the "no verification" alternative is the simplest and the least expensive, it will not provide the degree of mutual assurance required of a SALT II agreement.

On-site inspection and other territorially intrusive modalities comprise the second verification alternative. Such verification could be either adversary or third-party. A chief asset of direct verification is its reliability. The nature of intrusion may vary from an unmanned "black box" which transmits radio frequency data carrying information based upon several selective parameters, to direct on-site inspection of warheads, missiles, and production facilities. Over the course of many attempts by the United States and the Soviet Union to reach arms control agreements, on-site inspection has been an insurmountable barrier almost always preventing agreement. This was a major factor in the failure of the Baruch Plan.[112] During the period between 1958 and 1960 several versions of the Irish anti-proliferation proposal in the United Nations were opposed by the United States because of the omission of verification, but the U.S.S.R. would have opposed any draft which included the only reliable type of verification available in 1960, on-site inspection.[113] Herbert Scoville, speaking to the requirement of on-site inspection in control of MIRV, noted that "such inspection would almost certainly not be acceptable to the U.S.S.R. [but] if the Soviets required similar inspection . . . it is doubtful that the U.S. could accept it."[114]

At SALT I the Soviets strenuously opposed on-site inspection——partly because of an aversion to exposing their level of technology, partly because they wished to avoid disclosure of targeting information, and partly because of the fear that such a departure from past policy might undermine the effectiveness of their opposition as a matter of principle to intrusive intervention affecting sovereignty.[115] As mentioned above, less intrusive but still direct verification could be accomplished by unmanned "black boxes" located on the territory of the inspected party. Problems of servicing, tampering, reliability, and the limited scope of monitorable parameters have combined to defeat the use of such means.

---

112. E. Firmage, *supra* note 75, at 713.

113. Quester, *The Politics of Nuclear Proliferation* at 35 (1973).

114. Scoville, testimony before the Subcommittee on Arms Control, International Law, and Organization of the Senate Foreign Relations Committee, 116 *Cong. Rec.* 12357 (April 20, 1970).

115. J. Newhouse, *supra*, note 38, at 180.

High-level overflight at altitudes of about 70,000 feet would also provide a means of direct verification, but this technique—somewhat irrationally distinguished from satellite reconaissance, perhaps initially because of the presence of a human pilot—has taken on the negative connotation of a threat to sovereignty. The Eisenhower Administration proposed the "open-skies agreement" in 1955, without success. Although overflight has been used, for example, in the Gary Powers incident of 1960 and over Cuba in 1962, it remains a highly unsettling and dangerous means of observation. Thus, although verification by direct means remains the most assuring and most reliable, the likelihood of a major SALT term relying upon it is extremely remote.

The third verification alternative has been called "national technical means," and comprises monitoring systems which do not require formal[116] on-site inspection. One highly advantageous form of such verfication is the orbital earth satellite. Other systems include land-based radar and ship-based tracking sensors. Of course, national technical means also includes intelligence gleaned from newspaper accounts, radio broadcasts, economic factors, public displays, and countless other sources. However, radar and satellites clearly represent the major technological advances that made national technical means sufficiently reliable to form the foundation for verification in SALT I.

Although precise technical data is not available on the resolution that may be obtained with existing reconnaissance satellites, certain upper limit parameters are known; and these permit a rough estimate of capabilities. For example, it is known that because of electromagnetic properties in the atmosphere, satellite sensors are limited to the three spectral regions which will allow penetration of the atmosphere. The three regions are visible light wavelengths, a broad infrared band, and particular radar-frequency wavelengths.[117] The most meaningful measure of satellite performance is "ground resolution" G, as represented by the equation $G=A/300\ FR$, where A is the altitude, F is the camera focal length in feet, and R is the combined resolution of the film and optics in lines per millimeter.[118] In general terms ground resolution indicates the dimensions of the smallest object which can

116. "National technical means" may be considered to include techniques of espionage which may encompass contact within the target territorial state.

117. T. Greenwood, "Reconnaissance and Arms Control," *Scientific American*, February 1973, at 14.

118. *Id.*

be seen on the ground with good contrast. The most difficult factor to ascertain, owing to security, is the optical component of the resolution factor R. The optical component is a function of the wavelength of the light used and the aperture size of the camera. A camera aperture of five feet, however, is not unreasonable for use with visible light wavelengths and orbital pay-load capabilities. Given present film technology and a lens aperture of about five feet, a conservative resolution factor would be 180 lines per millimeter. A common satellite perigee (nearest point) is about 100 miles and the United States Air Force has disclosed the practicability of a focal length of 20 feet. Accordingly, a conservative estimate of ideal ground resolution would be 0.7 feet. In other words, an object with dimensions greater than 0.7 feet could be seen with adequate contrast.

Of course, many sporadic weather and electromagnetic factors may cause the ground resolution to deteriorate at times to something lower than the ideal 0.7 feet. On the other hand, some extended objects such as rail lines can be identified even though they are dimensionally too small to yield good contrast.[119]

At present, the highest resolution systems require actual retrieval of the exposed film through the use of a recoverable reentry capsule. Electronic transmission by television or facsimile is only useful for lower quality photo reconnaissance systems. Developmental trends indicate, however, that all-electronic surveillance systems are possible in the future.

United States satellites are typically launched in near-polar 90-minute orbits with a perigee of 100 miles. A parking orbit of 22,300 miles, where the satellite can remain in synchronous movement with the earth, would be more desirable; but the ground resolution, G, suffers substantially when A is increased from 100 to 22,300. For long-term area survelliance, however, the parking orbit may be desirable if coupled with lower level periodic satellites that could provide a "closer look" when necessary.

Recent charges of Soviet "blinding" of U.S. satellites through use of a laser system constitute a source of major concern; however, technological experts have indicated that a redesign of the optical systems in the satellites will transcend the problem for the time being. In view of the pace of technological development in the highly important area of satellite reconnaissance, and the alternative consequences of several years of weapons development

119. *Id.* at 15.

without restraints, it would seem reasonable to agree to an arms limitation term which may be only marginally observable today in reliance upon an increasing ability to observe future activity. The high level of reliance upon satellite verification produces a correspondingly high level duty on each side to preserve the integrity of verification by restraining technology which degrades verification. When either side has the power substantially to deny verification by the other side, the core of any agreement is sacrificed.

A second important component of "national technical means" is land and sea-based radar. Over-the-horizon (OTH) radar represents an additional technological advance, together with satellite observation systems. Unlike conventional line-of-sight radar, OTH radar is not restricted in its range by the curvature of the earth. By reflection from the ionosphere, OTH radar can detect objects at great distances, making possible the detection of missiles soon after they are launched.[120] A set of unique distinguishing ionospheric disturbance characteristics have been developed using OTH radar enabling the United States to identify each type of Soviet missile upon launch by its "signature." Accordingly, it is possible to discern precisely which element of the Soviet arsenal is being tested or otherwise launched and also to detect the use of a modified or previously unknown device.

As a result of large electromagnetic and other physical fluctuations in the ionosphere, OTH radar is necessarily imprecise in determining trajectories and ballistic information. However, once it has succeeded in alerting a nation of a launching and identifying, by "signature," the type of vehicle being employed, highly accurate, line-of-sight radar may then be poised to track the vehicle as soon as it breaks the horizon.

Shipboard radar has also proven a valuable tool in tracking the terminal stage of missile or warhead trajectories. United States ships have monitored the terminal phases of Soviet missile tests in the Pacific since 1961. The Pacific observations have given the intelligence community a clear picture of Soviet qualitative capability. Airborne radar and photography have also proven to be a valuable concomitant of Pacific Ocean reconnaissance operations.[121]

One additional and essential element in any of the verification systems discussed is the large scale digital computer. Myriad facts,

120. *Id.* at 22.
121. *Id.* at 23.

statistics, and electronic data signals must be quickly and accurately resolved into a humanly perceptible and technically meaningful form. The computer plays an ever increasing role in identifying, at real-time, the nature of a supposed threatened attack. Even though the threat posed by an accidental launch is immense, the immediately available information offered by a real-time system is available to corroborate any "hot-line" notice and to aid in the formulation of a suitable political or military response.

The heart of the ABM systems presently developed is a massive digital computer. The kind of tracking, calculation, and guidance response required for a mid-air intercept with high probability of destruction is super-human and presses state-of-the-art limitations in digital systems. Also, by making destruction of a submarine a rising probability function upon reverse-trajectory calculation after a single missile launch, the real-time computer system coupled with radar or passive sonar arrays constitutes one of the few known potential threats to the efficiency of the SLBM fleet.[122] (Of course a submarine still remains virtually invulnerable prior to that first firing.)

It is important to remain aware of the more pedestrian aspects of verification, such as radio broadcasts and economic data. These societal factors, when coupled with reconnaissance by satellite, radar, or sonar and when resolved to useful information by a large scale computer system, bring the state of verifiable activity to a rather high level. Verification is no longer as substantial a hurdle in arms control agreements as it once was. National verification means were endorsed in SALT I, and will probably prove to be sufficiently reliable to support a SALT II agreement.

A second element of the "triptych" of disarmament and control following verification is the determination of the types of weapon systems to be controlled. The "qualitative" system that is most visibly and probably most immediately destabilizing is MIRV. MIRV was often related to SALT I in the literature but was only indirectly discussed in the formal negotiations. The most significant decision on MIRV to emerge from SALT I was the decision to reach no agreement at all.

For a single warhead ICBM, the impact location is a predetermined function of the ballistic path followed by the missile. MIRV, however, employs a post-boost control system (PBCS) which

122. See Kuenne, *The Polaris Missile Strike*, 114-16 (1966). The author examines the probability of detection after successive launches and determines it to be a rising function.

is capable of re-orienting the final warhead-carrying stage, called a "bus," in order to alter substantially the ballistic path of the "bus" and associated warheads. The MIRV system accomplishes independent targeting for separate warheads by selectively and gently releasing successive warheads from the "bus" and then, between warhead releases, redirecting the ballistic pathway of the entire "bus." Upon release from the "bus," the warhead proceeds along the same ballistic path as that followed by the entire "bus" at the moment of release. Accordingly, by changing the direction or speed of travel of the "bus" between each successive warhead release, each warhead will be directed toward a different target area or, alternatively, will arrive at the same target area but, because of the use of differing trajectories, at a different time.[123] It is believed that individual warheads may be targeted for impact at points separated by distances of as much as a few hundred miles or a given percent of the distance covered by the trajectory of the entire missile-bus assembly.[124]

The increased number of independently targetable warheads does not come without a cost in terms of deliverable payload. The post-boost control system and other parts of the bus structure obviously occupy volume and weight which is not productive in terms of explosive yield. Some design trade-off factors are the desired target separation (determinative of the amount of fuel required for mid-course bus reorientation), the number of warheads carried, overall range of the system, ABM penetration aids, and yield of the individual warheads.

The generally accepted ratio of yields in single warhead systems compared with a MIRV system is about 3 or 2 to 1. For example, the single warhead versions of Minuteman had yields estimated at one to two megatons; but Minuteman III is believed to employ three MIRV warheads of only 200 kilotons each.[125]

As outlined above, the more meaningful comparison of MIRV with single warhead systems is in the area of "first strike destructive capability". The area of destruction at a given yield increases with increasing yield by approximately the two-thirds power.[126] Therefore, an increase in yield does not result in an equivalent increase in area of destruction. Thus, doubling the yield would increase the

123. A general interest, technically oriented analysis of MIRV may be found in H. York, "Multiple Warhead Missiles," *Scientific American*, November 1973 at 18.

124. *Id.* at 19.

125. *Id.*

126. W. Biddle, *supra* note 85.

area of damage by only 60 percent. Of course, the two-thirds power factor is only a rough approximation since the susceptibility of the area to blast effects and the height of the detonation above the ground must also be considered in estimating the area of destruction. Clearly, however, a mere increase in yield will not automatically result in an equal increase in destructive potential.

Recognizing that damage is not so much a factor of yield as of targeting accuracy, one may conclude that the yield to yield tradeoff between MIRV and non-MIRV warheads may operate to increase the area of destruction even though a MIRV system would be of a lower total yield. It has been found that three 190 kiloton MIRV warheads (570 kilotons total) may destroy the same area as a single one-megaton warhead; thus the non-MIRV warhead requires nearly twice the yield. In like manner, twenty-four 100 KT MIRV warheads (2.4 MT total) will destroy the same area as a single 25 MT warhead.[127]

V. Proposals for SALT II

Four areas of concern will demand the attention of the parties to SALT II: MIRV, SLBM, accidental or unreasoned attack, and control of manned bomber aircraft. The purpose of the foregoing discussion of the increased destructive capability offered by unlimited MIRV deployment was to form a foundation for the assertion that some type of control of MIRV or diminution of its threat is mandated under any meaningful approach to ending or significantly lessening the arms race. The United States had successfully tested the MIRV system in 1970 and, during SALT I, was in the process of deploying it in Polaris and Minuteman missiles.

While the United States favored a freeze on further development, it was unwilling to eliminate the system, even if elimination were possible and even if it could have been verified by acceptable means (both of which possibilities were highly unlikely), since the Soviet Union by then possessed massive throw weight and quantitative advantages.

As a result of a counterbalance having been set up between the Soviet lead in numbers and throw weight in land-based ICBM's and the American advantage in MIRV technology and deployment, an inextricable connection has arisen between the two types of superiorities, such that the elimination of one must be accomplished in tandem with the diminution of the other. We propose a two-step approach to limiting the technological arms race resulting

127. *Id.* at 195.

from MIRV development. Additionally, we propose a means by which the "counterforce" character of MIRV in the opposing arsenal can be substantially eliminated. These proposals are interdependent, and we do not advocate any single element independent of the other major elements.

At the outset we should point out that we have ruled out any direct numerical limitation upon deployed MIRV warheads. This presumption is based on the belief that neither side would accept such an agreement because of the present difficulties in verifying compliance.[128] As the first step in our approach to limiting the perils of further MIRV development, we believe that a partial ban on the testing of all missile systems should be imposed.

A total ban on flight testing of MIRV systems is widely advocated, but a major problem in achieving meaningful agreement on any total ban in the arms control area is presented when one side has fully developed the subject system and the other side has not. In the present context, it would seem highly improbable that any of the proposed total testing bans would be agreeable to either side and particularly to the Soviets with respect to MIRV.[129] Another substantial factor weighing against a total ban directed only toward MIRV testing is the possibility for clandestine testing by using one warhead at a time on a MIRV system; because of this procedure the ban would be essentially unverifiable.

The type of limited testing ban which we propose is addressed to all tests of missile systems. There would be allowed each year a specified number of tests of any system which the testing party wished to select, including MIRV and launchings necessary to maintain confidence in systems already deployed.[130] An annual limitation of 20 launches would be most effective in reducing substantially the pace of development of all missile systems, including MIRV, without encouraging clandestine activity.[131] Particularly

---

128. It seems clear that an agreement limiting the number of MIRV warheads could only be verified, under present technology, by on-site inspection either of inventories or of deployed missiles. (It should be noted, however, that the Soviet Union has agreed "in principle" to on-site inspection of peaceful nuclear tests, a far less demanding intrusion than on-site inspections of weapons systems; see *supra* note 36.)

129. Secretary Kissinger's congressional briefing on SALT I indicated an exchange of proposals on MIRV, wherein the Soviet Union ruled out any total testing ban on MIRV. *Supra*, note 62.

130. See B. Feld, "Current Developments and Dangers of Atomic Armaments," *Science and Public Affairs: Bulletin of the Atomic Scientists*, March 1972, at 17. The author proposes, in general terms, a limit similar to the instant proposal.

131. H. York, "Controlling the Qualitative Arms Race," *Science and Public Af-*

when coupled with the other proposals made here, the action to reduce the pace of development would be desirable and would support the effectiveness of those proposals.

The second proposal directed primarily toward MIRV is an eventual freeze on the physical size of delivery vehicles or silo structures. A more precise definition of "heavy" and "light" missiles should be made and dimensional characteristics of each type should be frozen after the agreement has been in effect a number of years, *e.g.*, eight to ten years. Until that time dimensional limits should be established which would allow the United States the option of increasing missile sizes to match those deployed by the Soviet Union. Any increase in size by the USSR should be prohibited or limited to a small percentage. The direct result of this proposal would be to allow each side to deploy MIRV, but presumably only to the level of optimum effectiveness for present Soviet payload capacity and missile sizes. The trade-off, with respect to destructive capacity, between yield and number of warheads, coupled with target "hardness" factors, places an upper optimum limit on the number of independent warheads for a given delivery vehicle size.[132] Of course, technological advancement in fuels, cold launch techniques, and post boost control systems would alter the optimum number of warheads; nevertheless such advancement would probably occur rather slowly and would therefore be compatible with the instant MIRV proposals aimed at slowing the pace of development while maintaining the goal of general parity during the course of the agreement.

The Soviet Union's present superiority in payload capability would make the freeze disadvantageous to the United States if it chose not to enlarge missile sizes during the pre-freeze period, but the operation of the testing limitation should tend to offset any temporary Soviet advantage in payload capability by aiding the preservation of America's superior technological position. We

---

fairs: Bulletin of the Atomic Scientists, March 1973, at 5. York proposes a limit of 20 or 30 test firings each year when a ban is directed toward all systems.

132. Several factors combine to determine the optimum number of MIRV warheads per launch vehicle. The most significant factor is the lower limit of yield imposed upon each warhead to overcome the "hardness" of a target. Also, the more warheads used, the greater the non-productive weight of the PBCS bus (in terms of yield). Accordingly, it is not conceivable that either side will use an unlimited number of warheads of very small yield in the face of larger and larger losses in payload efficiency owing to the bus fuel and structure. See I. Bellany, "MIRV's and the Strategic Balance" 226 *Nature*, 412, (May 2, 1970), for a discussion of optimum numbers of warheads prior to the freeze on the number of delivery vehicles.

again note that this second proposal is inextricably connected with the accomplishment of agreements in the other areas covered by these proposals, particularly the shift in reliance from land-based systems, to be discussed below, since that defense element is most threatened by mere increases in number of deliverable warheads.

To summarize, our plan for the verifiable reduction in the pace of development of MIRV as opposed to an unverifiable ban on MIRV, will ultimately result in the full, though slower, deployment of MIRV systems on both sides. The testing limitation is readily verifiable through the use of OTH radar and shipboard radar, and both the testing limitations and the freeze on the physical size of delivery vehicles and silo structure are also verifiable through satellite reconnaissance owing to the nature of ground activity which would be observable if there were serious violations.

Our third related proposal directed toward the elimination of the counter-force threat posed by MIRV is a plan for the gradual phaseout of land-based ICBM systems, in conjunction with an overall gradual reduction in the total number of nuclear armaments. Statistical analysis of warhead numbers, yields, and accuracies, shows that under present trends of technological development, land-based ICBM sytems are becoming increasingly vulnerable and more destabilizing because of the convincing "launch on warning" rationale attached to their effective use.[133] (The cancellation of the United States proposed Hardrock silo hardening program illustrates a recognition of the limits of passive protection in the face of MIRV accuracy.) On the other hand, any

---

133. See E. Luttwak, "The Strategic Balance 1972", *The Washington Papers* No. 3, The Center for Strategic and International Studies, Washington, D.C. See also, M. Kaplan, *SALT: Problems and Prospectives* 81-82 (1973).

R. Beavers in "SALT I," *U.S. Naval Institute Proceedings, Naval Review 1974*, at 214, concludes that "the number of 'large modern' missiles which the Soviet Union can deploy was frozen, but at a level which is probably too high to save Minuteman if the Soviets MIRV their huge SS-9 ICBM's."

The Department of Defense has discussed a possibility of "fratricidal" interference between exploding and incoming warheads when individual silos are targeted, which interference would somewhat reduce the one-on-one analysis of the counterforce capability of MIRV. However, Secretary Schlesinger has conceded that MIRV could destroy many Minuteman missiles in their silos. N.Y. Times, June 20, 1974, at 1, col. 3.

On Dec. 3, 1974, Secretary of State Kissinger stated that with or without SALT, "I would think that the land-based missiles on both sides are going to become increasingly vulnerable." Int'l Herald Trib. (Paris), April 29, 1975, at 3, col. 7.

sudden movement to eliminate all land-based ICBM's would be unacceptable to both parties and destabilizing.

A movement toward submarine-launched missiles would tend to increase stability because of their present and foreseeable invulnerability. Additionally, the transition period from ICBM's to SLBM's would present a prime opportunity to reduce total numbers of launchers on both sides while actually increasing the level of second-strike survivability.

The phased reduction and transition toward SLBM's should be accomplished by applying a yearly percentage calculated annually on the basis of then existing levels, SLBM's being related to a total absolute number on the order of 1500.[134] For example, based upon maximums originally established in SALT I, if the chosen percentage used were 10%, in the first year the United States would be obligated to reduce ICBM systems by 106 (1054 × 10%) and permitted to increase SLBM's by 79 ((1500 − 710) × 10%). The Soviet Union would be required to reduce ICBM's by 162 (1618 × 10%) and would be permitted to increase SLBM's by 55 ((1500 − 950) × 10%). Given a constant percentage, each year the reduction of ICBM's and increase in SLBM's would become smaller in absolute numbers. For example, during the second year the United States would lose 95 ICBM's ((1054 − 106) × 10%) and gain 71 SLBM's ((1500 − 710 − 79) × 10%). The Soviet Union would lose 146 ICBM's ((1618 − 162) × 10%) and gain 50 SLBM's ((1500 − 950 − 55) × 10%).

Eventually—over several years—the force levels of the two parties would reach zero ICBM's and 1500 SLBM's. No long-term allowance has been made for the differing geographical factors in submarine deployment by the United States and Soviet Union, which factors would presently justify some disparity in favor of the Soviet Union. It is believed the disadvantages will eventually be overcome by the Soviet Union through longer range missiles, which will substantially increase the "on station" area of the ocean and thereby increase the percentage of "on station" forces. Any temporary disparities in deployment patterns or other differences between the parties could be balanced equitably by applying differing reduction and transition percentages, while maintaining long-term numeric equality——for example, by applying a flat 10% factor to the United States and mixed 8% ICBM, 12% SLBM factors

134. See B. Feld, supra, note 130, at 19, where this proposal is graphed and explained in detail. See also, proposal by the Federation of American Scientists, N.Y. Times, January 27, 1974, Sect. 3, at 2, col. 3.

to the Soviet Union. Regardless of the factors used, in time both parties would reach the same number of SLBM systems.

The long-term limit of 1500 SLBM's was chosen rather arbitrarily in order to reach an overall reduction from present day combined forces and still allow both parties substantial increases in SLBM launchers. The overall reduction should be acceptable to most domestic and foreign interests since significant increases in first-strike survivability will be achieved through the transition from land to sea.

Specific implementing provisions regarding verification of abandoned sites will need to be reached. One acceptable method would be to require complete demolition of abandoned silos, necessitating a substantial amount of observable earth-moving activity to reactive the site.

It should be recognized that these three interrelated "MIRV" proposals are completely and presently verifiable and contain significant elements of self-interest on both sides. Although the proposals do not eliminate MIRV, they decelerate its development and make MIRV less advantageous as a counterforce system, thereby reducing its long-term destabilizing effect. Additionally, while satisfying the "parity camps" on both sides, the agreement would still maintain present "sufficiency" by mechanistically accommodating short-term disadvantages through the proper selection of percentage factors.[135]

Another newly-developed re-entry system is MARV (terminally guided Maneuverable Re-entry Vehicle).[136] Although the ABM penetratability of MARV is not as appealing in view of the ABM Treaty, its development has continued. It is our belief that our proposals with respect to MIRV are equally applicable to MARV.

Over time both parties to SALT have been placing an increasing reliance upon SLBM invulnerability as they assess their nuclear postures. The time will come when the stability of the nuclear

---

135. Nations have generally been reluctant to forego even highly obsolete and useless systems. In this case the land-based ICBM phase-out will unfortunately disturb the balance of interservice rivalries. Although it is a severe indictment to assume that such factors are relevant, they are real political considerations for the executive branch. The same problems are observable in the hierarchy of the Soviet Union. See B. Feld, "ASW—the ABM of the 1970's?," 7 STAN. J. INT'L STUDIES 89 (1972). See also statement by Henry A. Kissinger, N.Y. Times, July 4, 1974, at 1, col. 8, expressing the need for restraint by the military establishment.

136. A brief discussion of the operation of MARV is found in B. Carter, "Nuclear Strategy and Nuclear Weapons," *Scientific American*, May 1974, at 20.

balance will be at the mercy of continued SLBM invulnerability. The proposals set out in this paper will operate to increase reliance upon the SLBM and its relatively invulnerable nature. Accordingly, we propose a two-part accord to protect further the integrity of submarine forces. The first part of the proposal is to permit unlimited increases in the range of SLBM delivery vehicles. Each increase in SLBM range opens substantially more "on station" area in the oceans of the earth. The direct result of opening more "on station" area is to enhance invulnerability because the probability of detection decreases. It has been estimated that the increase in range obtained by the replacement of the Polaris with Trident system, having a range of 2880 miles, will increase the "on station" area of the ocean by more than a factor of ten. Similar results will occur on the Soviet side with the deployment of the SS-N-8, a 3000-mile range SLBM.[137] Accordingly, continued development and deployment of the long-range Trident Submarine System along with the Polaris/Poseidon upgrade plan should be pursued.

The second part of our SLBM proposal is directed toward anti-submarine warfare (ASW) activity. It is generally conceded that state-of-the-art ASW capability represents an extremely remote threat to SLBM submarines. Anti-submarine warfare activities comprise five major categories: intelligence, detection, localization, tracking, and destruction. Each category presents peculiar technological problems, and extensive research is being conducted by both the United States and the Soviet Union in all areas.[138] Any agreement which can retard or halt the pace of the development of ASW would operate to extend and enhance materially the continued invulnerability of the SLBM Submarine. Accordingly, it would seem to be an excellent time to reach an agreement regarding limitations on ASW development and, particularly, deployment.

An agreement on ASW should, at a minimum, prevent the installation or use of any active or passive underwater detection array for purposes other than protection of the immediate area surrounding sea-going vessels in established shipping lanes. In ad-

---

137. *Supra*, note 70, at 65.

138. *Supra*, note 131, at 6; *see also*, R. Garvin, "Antisubmarine Warfare and National Security," *Scientific American*, July 1972, at 14; R. Beavers, *supra* note 133, at 216, points out that even knowledgeable critics of SLBM's do not foresee any prospect of nullification for the next two decades. Beavers asserts that the ABM Treaty substantially enhanced SLBM effectiveness by removing the nullification prospects for incoming missiles.

dition, the agreement should designate a large zone of the ocean as a sanctuary in which no form of underwater detection equipment could be used except for immediate area navigation. In the alternative, two large areas could be designated—one to each party—in which the non-designated party could not employ any type of military equipment, including surface vessels or hunter-killer submarines.[139] Although verification of under-surface activity would be difficult, the "total ban" provision would make a single detected unauthorized event a violation of the terms of the agreement and would thereby strengthen verification reliability.

It should also be recognized that many claims of ASW technology are based upon "laboratory models" and that in actual operation the claimed system capabilities have been shown to be greatly over-rated. The opacity, vastness, and noise levels of the ocean still represent significant strengths for the strategic submarine. At the present and in the forseeable future, SLBM submarines are not in any danger of detection in more than very limited numbers;[140] but the potential threat to security posed by a sudden advancement in ASW is still a matter which deserves careful attention.

Thus, the combined objectives of our proposals on MIRV and SLBM are five-fold: to increase deterrent stability, to achieve politically desirable parity, to phase out obsolete and increasingly provocative land-based systems, to enhance the invulnerability of submarine systems, and to reduce overall force levels.

A third area demanding the attention of both parties to SALT II is the problem of accidental or unreasoned attack by any country having control of nuclear weapons. Even the most limited probability of an accident may seem exceedingly real when the scenario could find an American President notifying the Kremlin that an unrecallable warhead is on a trajectory toward Kiev, with its 10,509,000 inhabitants. The second widely noted scenario is a threatened or actual attack by an Nth country with perhaps only a few delivery vehicles, but capable of reaching New York, Los

139. See B. Feld, *supra* note 135, at 94 where the second alternative is set out more fully. See also H. York, *supra* note 131, at 8.

140. R. Garvin, "Antisubmarine Warfare and National Security," *Scientific American*, July 1972, at 14. An example of detection problems is the difficulty encountered by the United States in obtaining information on Soviet Delta class submarines deployed in the Barents Sea, thereby escaping the U.S. monitoring gap between Britain and Iceland. This instance is also an example of more invulnerability owing to extended range SLBM missiles (4,800 miles for D-Class SLBMs). Int'l Herald Trib. (Paris), April 29, 1975, *supra*, note 133.

Angeles, or Kiev. Even such limited capacity would serve to hold the world hostage to almost any demand. The test of a nuclear explosive by India on May 25, 1974, points out the urgency of some means of assurance and international control over the development and use of nuclear power. The "Nth" country scenario presents substantial international economic and political repercussions.[141]

Although the probability of the occurrence of these events is low, the consequences would be so dire that far more serious thought must be given to their prevention. However, since the ABM debate was settled in SALT I and since the technological deficiencies of both "thick" and "thin" ABM systems have been disclosed, we are reluctant to propose the construction of a "thin" system to meet the accidental launching or Nth country problems. Although a "thin" ABM may technologically solve those problems,[142] political reasons would probably prevent agreement on such a system from being reached at SALT II.

Nonetheless, serious debate might have to begin again over the desirability of allowing both superpowers a thin missile defense system. Such a system may be the only modality, short of nuclear disarmament, that can accomplish a meaningful hedge against war by mistake or miscalculation or against war initiated by a secondary nuclear state and catalytically affecting the superpowers. If the system were sufficiently thin, it would not generate an offense-defense arms race nor render a first strike more plausible. At this particular time, we can no more afford the sacred cows of the left (*e.g.*, opposition to ABM regardless of the nature of the particular system) than we can endure the icons of the right (*e.g.*, eternal attachment to the defense triad—bombers, ICBM's, and SLBM's —without regard to its paternity or necessity).

A limited measure of protection against accidents, though not against Nth country launching, could be provided by agreement to develop and apply complex coded communication systems within each warhead or delivery vehicle, which systems could either destroy or deactivate the warhead after launch. Such a mechanism would, of course, meet serious resistance from the military on the ground that we would face possible nullification of our defense systems to possible impotence upon discovery if another party discovered the nature of the electronic medium employed. Opposition to a deactivation system should be tempered, however, by

141. E. Firmage, *supra* note 75.

142. See Kahn, "The Case for a Thin System," *Why ABM* at 73 (1969).

statistical-technological considerations of the parameters of the problem. With the availability of thousands of discreet radio frequencies and modulation schemes in multiple combinations and with the additional availability of an infinite number of pulse code configurations, coupled with the added security protection of last-second coding of the warhead "safety lock" prior to launching, it would seem extremely difficult, if not impossible, for any target nation to successfully base its defense system upon electronic deactivation. An explosive destruct mechanism has been used successfully by NASA and has averted potential disasters. The NASA system does not seem to have been a source of technical failure or unusual risk. The "coded lock" of a strategic system would add complexity, but only of a minimal nature when compared with present guidance, control, and launch electronics.

We do not embody the coded destruct system in a formal proposal because it falls beyond the limits of national means of verification, the criterion we established to test all of our concrete proposals, and because it would require on-site inspection.[143] Although such a "fail-safe" system could be, in many respects, as advantageous to the party whose missile was accidentally launched as to the target nation, in order to insure greatest security for both parties, mutual deployment of a destruct mechanism should be a provision in an arms control agreement. Although the presently deployed Minuteman firing program contains several interlocking controls in the firing and inhibition systems, that alone should not preclude us from considering the establishment of a further tier of safety controls over that most critical period immediately subsequent to launch.

A final topic of concern in SALT II is the control of manned bomber aircraft and cruise missiles. Some American officials have claimed that the disparity in allowable force levels under the Interim Agreement was in deference to United States superiority in the manned bomber component,[144] but a more convincing rationale is that agreement on bombers simply was not reached. A most important technical obstacle to control of manned aircraft is the ready convertibility of virtually any high-performance transport

143. The fact that at the Moscow Summit the Soviets agreed in principle to on-site inspection may make it possible eventually to reach such an agreement. See *supra* note 36.

144. The United States now has 455 long-range B-52 bombers while the Soviet Union has 140 long-range TU-95 "Bear" and MYA-4 "Bison" bombers. *Supra*, note 70, at 66.

or heavy fighter to strategic nuclear roles. While the generally larger radar cross-section of jet transports would render them more vulnerable to air defenses than well-designed bombers, the difference could be small.[145]

Long-range bombers were lumped with long-range missiles in that provision of the Vladivostok agreement which placed a ceiling (2400) upon strategic-weapon delivery vehicles possessed by the United States and the Soviet Union. It should be noted, however, that bombers are suited for many roles, conventional and nuclear; they are relatively slow in reaching a target, and are nearly impossible to control or verify because of the conversion problem outlined above. Most importantly, bombers are flexible and recallable under state of the art command and control mechanisms. Given the present early warning technology, the bomber force is also relatively invulnerable to sudden attack.[146] We therefore advocate the adoption and further development of the B-1 bomber program in the United States in order to enhance strategic options in the safe and effective area of manned bombers. The manned strategic bomber may constitute a significant element in the "flexible response" policy first outlined during the Nixon Administration.[147]

Control of the cruise missile,[148] like the manned bomber, is nearly impossible to verify owing to a dual tactical and strategic role and ready convertibility of conventional to nuclear capability. The major counter-force threat posed by the cruise missile is its accuracy, although the radar penetration features are not insignificant. The development of the cruise missile only accelerates the obsolescence of land-based systems as an element of the strategic arsenal. Except for a general arms control interest in reducing the absolute number of all types of nuclear systems, strategic and tactical, the

---

145. E. Luttwak, *supra* note 133, at 65.

146. J. Newhouse, *supra*, note 38, at 201.

147. See H. Scoville, *supra* note 94.

148. The cruise missile is a slow, low-flying, unmanned aircraft powered by an efficient fan-jet engine and guided the entire distance to the target. The guidance mechanism provides two alternatives, either the missile can utilize a terrain-matching computer together with real-time radar images or it may be guided remotely by external commands which are relayed by space satellite. The missile is capable of flight at 300 feet while navigating around buildings or irregular terrain features, thereby totally escaping detection by known radar systems. The estimated range is 2,000 miles and the missile may be launched by aircraft (twenty missiles per B-52), from almost any ship, or from submarines (through standard twenty-one inch torpedo tubes), "Two Stoppers in SALT," *Newsweek* (Int'l. Edition), Nov. 24, 1975, at 10.

cruise missile represents approximately the same destablizing influence as MIRV and MARV, furthermore its development strongly supports our proposed shift in reliance from land-based systems.

Both cruise missiles and manned bombers have been used in SALT II negotiations as negotiable elements;[149] however, final agreement on their control would be unverifiable and probably unacceptable politically.

Land-mobile systems were not included in SALT I in any meaningful manner. The practical conflict between concealment of the systems to enhance invulnerability and the exercise of non-concealment requirements for verification is a major and potentially insurmountable barrier to any agreement short of total forbearance. The land-mobile system is only slightly less vulnerable than fixed systems, and should be considered a land-based system with reference to our proposals.

SALT II—Collateral Issues

Completing this analysis of SALT II, we turn our attention to the final element of the "triptych" of disarmament and control, the zone subject to control. Dictated somewhat by circumstance, SALT I was not concerned with arms control in Europe or any other "forward" location. SALT II should, however, encompass the European theatre to the extent of strengthening the Mutual Force Reductions talks (MFR) and the Non-Proliferation Treaty review.[150]

An issue which is separate from bomber control, but still related, is Forward-Based Systems (FBS). FBS is concerned principally with the stationing by the United States of manned bomber forces in continental Europe, on carriers in the Mediterranean, and in the northeast Pacific. There are about 600 FBS aircraft in

149. *Id.*; see also, Int'l Herald Trib. (Paris), June 17, 1975, at 1, col. 3.

150. The Non-Proliferation Treaty was subject to review on March 5, 1975, under the terms of Article VIII, Section 3, which requires a review at the end of five years after the treaty enters into force. The treaty entered into force on March 5, 1970. See, 7 *International Legal Materials* 815, July 1968; E. Firmage, The Treaty on the Non-Proliferation of Nuclear Weapons, 63 AM. J. INT'L L. 711 (1969). The final report of the review was adopted on May 30, 1975, "Final Document of the Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons," NPT/CONF/35/I, Annex I, at 1; 14 *Int'l. Legal Materials* 1061 (1975). The next review conference will probably be in 1980 (see review report under Art. VIII).

Europe alone.[151] Yet, the Vladivostok agreement did not include within the weapons constituting the ceiling upon strategic-weapon delivery vehicles NATO's foreward-based weapons capable of striking the Soviet heartland. Because the integrity and unity of NATO are directly involved in any discussion of European FBS aircraft, the United States should agree to submit European-related FBS to the MFR negotiations between the Warsaw Pact and NATO countries. It is believed that an agreement to submit FBS to the Mutual Force Reductions Conference would be viewed by the Soviet Union as a desirable concession and would thus aid in achieving other more important points sought by the United States, particularly the testing limitation as it relates to MIRV and the eventual elimination of land-based ICBM's. As French and British forces grow to a level sufficient for European security, the United States should find it justifiable and politically acceptable to recall part of our FBS components in Europe and the European area.[152]

In recent years a quiet trend has emerged toward expanded deployment and further dissemination of low-yield nuclear devices, euphemistically called tactical (or theatre) nuclear weapons (TNW). One writer has referred to the invisible undefined growth as "arms without doctrine."[153] Presently, the major area of our deployment of TNW is in Europe under NATO. Approximately 7,000 TNW warheads are deployed in the European theatre.[154] The weapons range in yield from less than one kiloton to twenty KT. The deployment comprises several categories of weaponry, from artillery shells with a range of ten miles to surface-to-surface missiles with a range of 25 to 460 miles ("Honest John" and "Sergeant"). In addition, small yield nuclear weapons carried by tactical aircraft and ships are considered to be TNW.[155] The TNW potential of the Warsaw Pact is believed to be of approximately the same level as that of NATO, with perhaps fewer warheads of greater average yield.

In testimony before the Joint Atomic Energy Subcommittee, General Andrew J. Goodpaster, then Supreme Allied Commander

---

151. J. Newhouse, *supra* note 38, at 175.

152. For an analysis of French and British capability, see W. Joshua and W. Hahn, "Nuclear Politics: America, France and Britain", *The Washington Papers*, Center for Strategic and International Studies at 22-26 (1973).

153. W. Heisenberg, "Crisis Stability in Europe and Theatre Nuclear Weapons," *The Adelphi Papers*, No. 96, IISS London (1973) at 1.

154. *Id.* at 15.

155. *Id.*

in Europe, sought significant expansion in the development of TNW in Europe under NATO.[156] The proposed expansion would be in the area of very small yield weapons, less than one KT, of a newer "clean" technology. In the course of his testimony, General Goodpaster conceded the substantial danger of collateral damage and fallout that exists in using the presently deployed generation of more "unclean" TNW artillery shells.

The proposed expansion—if not intended solely as a "bargaining chip" for Soviet consumption—seems to constitute a hazardous course of deployment. Again, we might point out that TNW is coupled closely with NATO security and should be a subject for consideration in the Mutual Force Reductions talks.

American bombing in Vietnam demonstrated the highly developed state of technology in television guidance and other "smart" conventional weapons. These weapons would seem to be as effective as TNW for many unhardened targets, such as bridges and dams. In addition, the use of small nuclear devices for civil engineering has not proven as advantageous as once envisioned under the "plowshare" program.[157] The TNW issue, however, is not a simple one. Some targets, for example tanks and submarines, are sufficiently hardened that a TNW artillery shell or torpedo finds little substitute in the conventional sphere. A point of real opposition to TNW is that it unnecessarily reduces the emotional "firebreak" between conventional and nuclear war. A small number of writers, however, argue the reverse by asserting that TNW may actually be a stronger deterrent than large missiles since their use is more conceivable and therefore more feared.[158] Nevertheless, technological development of conventional armaments diminishes the force of this argument.

The Mutual Force Reductions Conference offers an opportunity for the West to discuss TNW and FBS under more favorable conditions than those at SALT. But if a measure of intention and comparison could be reached at SALT, chances for mutual reduction of NATO and Warsaw nuclear weapons would be enhanced.[159]

Finally, an agreement between the United States and the

156. N.Y. Times, January 27, 1974, Sect. 3, at 2, col. 3.

157. See B. Spinrad, "Where Are We? On War and Peace and NPT and Safeguards," *Science and Public Affairs: Bulletin of the Atomic Scientists*, January 1974, at 35.

158. *Id.* at 36.

159. W. Heisenberg, *supra*, note 153 at 33.

Soviet Union regarding nuclear arms necessarily concerns the entire globe and, to become effective, must take on global dimensions. It is becoming increasingly clear that China intends to become a superpower.[160] Thus China must be brought into the arms control dialogue as soon as possible, perhaps, first, at the Conference of the Committee on Disarmament at Geneva and, later, if necessary, in bilateral and multilateral negotiations with the nuclear states. Chinese nuclear strategy will most surely become an increasingly important factor in Soviet decisions at SALT II and, to a lesser extent, will influence United States policy as well.

VI. Conclusion

The Vladivostok agreement accomplishes for the first time a quantitative ceiling upon the deployment of strategic-weapon delivery vehicles. The further limitation upon the numbers of these vehicles that may be equipped with qualitative improvements in size, throw weight, and multiple warheads places a mild and indirect qualitative restraint upon the arm race as well. Both the quantitative and qualitative prohibitions, however, could be strengthened substantially by the reduction and eventual elimination of land-based ICBM's and the retardation of MIRV as a counter-force, first-strike weapon.

We have suggested three major, interdependent areas of arms control endeavor. First, we propose two steps to reduce the pace of development of MIRV: a test limitation on all missile systems and an eventual freeze on delivery vehicle size. Second, the threat of MIRV and other qualitative developments as counter-force weapons may be eliminated by adopting a long-term phased transition toward zero land-based ICBM's and 1500 sea-based SLBM's through the medium of adjusted annual percentage factors. The third set of primary proposals is directed toward the maintenance of SLBM integrity through missile range increases and certain restrictions on anti-submarine warfare activities. We advocate the continuation of programs to increase SLBM range, and thereby to enlarge potential "on station" ocean areas, and we also suggest two possible means for retarding the growth of destabilizing anti-submarine capability.

It is proposed that strategic stability and versatility are furthered by the continuation of the B-1 and Trident programs in the

160. See H. Gelber, "Nuclear Weapons and Chinese Policy," *Adelphi Papers*, No. 99, IISS, London (1973).

United States. The applicability of a missile self-destruct mechanism to our present and future defense systems has also been examined although not embodied specifically in a proposal.

A major change in United States policy has apparently occurred since the conclusion of SALT I. The shift began quietly with a rhetorical question in the President's foreign policy statement of February 18, 1970: "should a President, in the event of a nuclear attack, be left with the single option of ordering the mass destruction of enemy civilians, in the face of the certainty that it would be followed by the mass slaughter of Americans?"[161] The central issue is the desirability of a return to the strategic doctrine of "flexible response." It is our belief that the President should have the option of striking a single military installation through the use of manned bomber forces or selective SLBM's. In line with our proposals for SALT II and the mutual force reduction talks, we suggest that the United States and the Soviet Union be denied the option of using tactical nuclear weapons at the battlefield level where advanced conventional weapons are nearly as effective. The President should, however, have the flexibility under the Single Integrated Operating Plan (SIOP) to retarget certain missiles for an optional set of military or industrial centers. Of course, in view of our hypothesis regarding the increasing instability and obsolescence of ICBM's, the new operating plan would apply only to SLBM's and manned bombers.

It is recognized that long-time proponents of a triad in U.S. forces—bombers, ICBM's, and SLBM's—will react negatively to these proposals. However, we believe that to pay homage to the triad doctrine when one of its major components is increasingly destabilizing is to invite disaster.

The likelihood of a massive Soviet nuclear strike upon the United States is now widely perceived as being exceedingly small. However, the possibility of a limited "surgical" attack in reprisal for some other political or military act, as unthinkable as that may be, is as likely as any other hostile and intentional use of a nuclear weapon. In view of our proposal for phased reduction of increasingly obsolete land-based ICBM's, the cost in terms of stability for the military/industrial targeting option is reduced. It is not herein proposed that the "firebreak" between nuclear and conventional war be reduced, but the President's question with respect to nuclear options demands serious consideration. Clearly, if military

161. President's Foreign Policy Statement, 116 *Cong. Rec.* at 3838 (February 18, 1970).

response is mandated, the policy of the United States should be to respond first with conventional weapons, when at all possible; but if, as a last resort, the "firebreak" is to be breached, that breach should occur at a level necessitating less than the complete destruction of two continents.

For too long, the world's major powers, particularly the United States and the Soviet Union, have, it would seem, erred in arms control negotiations on the side of overcaution in their attempts to restrain and direct technology with law. In actuality, such a course has been neither cautious nor conservative, for the values sought to be protected have been placed in a position of remarkable vulnerability. Yet the obvious has been overlooked: some risk is involved in reaching arms control agreements that attempt to restrain a technology whose end can never be perceived; but the result of a technological race unrestrained by legal agreements, even imperfect ones, is foreseeable and presents a far worse spectre.