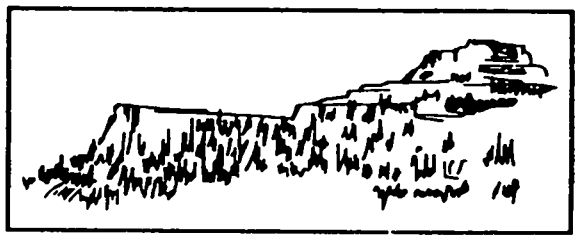
Report No. 15
July 1992

The Strategic Arms Reduction Treaty and Its Verification

David B. Thomson



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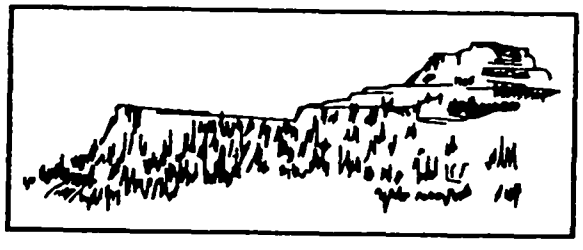

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DAVID B. THOMSON retired after thirty-seven years as a physicist with the Los Alamos National Laboratory. His technical background includes nuclear and plasma physics, nuclear weapons testing, high-explosive-driven systems, and magnetic fusion. He has assisted in the program offices of magnetic fusion (Department of Energy), weapons research and development (National Security Programs, Los Alamos), and the Reversed Field Pinch Program at Los Alamos. He has a Ph.D. in physics. He is presently a Laboratory Associate in the Center for National Security Studies.

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EXECUTIVE SUMMARY

The Strategic Arms Reduction Treaty (START), signed between the United States and the former Soviet Union in Moscow, July 31, 1991, if ratified and implemented, will lead to major reductions in the deployments of strategic nuclear arms of the two largest nuclear powers. Equally important, it will put in place a comprehensive system of notifications, data exchanges, cooperative measures, and on-site inspections that, combined with national technical means (NTM), are expected to add to the confidence that the parties will have in their abilities to verify the reduced deployments called for in the treaty.

The treaty limits the number of strategic nuclear delivery vehicles—intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and heavy bombers—of each party to 1,600 after a seven-year balanced reduction period. The total number of accountable, deployed nuclear warheads is limited to 6,000 for each party. The total number of warheads on ballistic missiles is limited to 4,900 for each side. A reduction of deployed, heavy ICBMs (namely, Soviet SS-18s) from 308, with 3,080 warheads, to 154, with 1,540 warheads, together with other prohibitions, sublimits, and counting rules, was designed to reduce the number of most threatening deployments capable of a first strike. The aggregate missile throw-weight is limited to 3,600 metric tons, and mobile-missile deployments are limited to restricted areas, further limiting surprise attack.

The treaty and its related protocols, annexes, and other agreements are accompanied by a detailed exchange of data in a memorandum of understanding, and upon entry into force of the treaty there will be periodic and detailed data updates to the memorandum.

The treaty establishes eighty-two types of notifications concerning deployments, data updates, movements, dispersals, and missile tests. The treaty also establishes cooperative measures, including notifications calling for specified open displays of mobile (road and rail) launchers and heavy bombers, and prohibitions of interference with national technical means.

The treaty and its protocols establish twelve types of on-site inspections (OSIs): baseline data, data updates, number of reentry vehicles per missile, new facilities, suspect sites (three for each side), post-exercise dispersals, eliminations and conversions, facility close outs, formerly declared facilities, exhibitions of missile technical characteristics,

air-launched cruise missile (ALCM) and non-ALCM heavy bomber exhibitions, and nuclear armed/nonnuclear heavy bomber baseline exhibitions. There may be up to fifteen data update OSIs per year for each party, and up to ten reentry vehicle inspections for each side annually. The treaty and protocols also provide for portal perimeter continuous monitoring of declared mobile-missile production facilities to help confirm the number of mobile ICBMs produced.

The treaty and its protocols and annexes spell out in much detail the procedures for the OSIs, including the number of inspectors, notifications, transit and inspection times, equipment that may be used by the inspectors, logistics, actions required by the host, and other details. For example, a typical OSI such as a data-update inspection at a particular site is conducted by a team of ten persons within twenty-four hours with provision for an eight-hour extension. Treaty-limited items such as mobile missiles are identified by their general appearance and specific characteristics such as dimensions and size, and are counted at the site and reported.

The treaty establishes procedures for the observed elimination or conversion (to non-treaty-limited uses) of certain treaty-limited items and facilities. These include ICBM silos, mobile ICBM launchers and facilities, SLBM launchers, and heavy bomber forces. Verification procedures are provided involving notifications, NTM, and/or on-site inspections of these eliminations/conversions.

The treaty establishes a Joint Compliance and Inspection Commission (JCIC) to promote its objectives, implementation, and effectiveness. The JCIC may resolve differences and agree on additional measures to improve the effectiveness of the treaty.

The verification procedures of the treaty are sufficiently generic to enable it to verify additional or speeded up reductions in force deployment inventories, such as those announced or proposed separately by Presidents George Bush and Boris Yeltsin in January 1992 and the large reductions agreed jointly at the June 1992 Washington Summit. Such agreements further reducing each side's strategic nuclear deployment, by making use of the START verification procedures, reduce the complications of these negotiations.

Full implementation of the treaty depends on appropriate agreements among Russia and the other three members of the former USSR, Ukraine, Byelarus, and Kazakhstan, on whose territory START-limited deployments are located, and upon ratification by the parties.

Since this report was written, two major agreements affecting the START treaty have occurred.

Lisbon Protocol

On May 23, 1992, at a foreign ministers conference in Lisbon, Portugal, the United States, the Republic of Byelarus, the Republic of Kazakhstan, Ukraine, and the Russian Federation signed a protocol that reaffirmed the support of all five nations for the Treaty between the United States and the Union of Soviet Socialist Republics of July 31, 1991, on the Reduction and Limitation of Strategic Offensive Arms.

The protocol pledges these four nations of the former USSR to assume the obligations of the USSR under the treaty. These nations agreed to "make such arrangements among themselves as are required to implement the Treaty's limits and restrictions and to allow functioning of the verification provisions." The protocol provides for inspections and continuous monitoring activities on the territory of these four nations and for their participation in the Joint Compliance and Inspection Commission with the United States. The protocol states that "Each party shall ratify the Treaty--with this protocol--in accordance with its constitutional procedures," and that the treaty "shall enter-into-force on the date of final exchange of instruments of ratification." The protocol also states that Byelarus, Kazakhstan, and Ukraine will adhere to the Nonproliferation Treaty of July 1, 1968, as nonnuclear weapons states, and begin actions to this end.

Just prior to the signing of the protocol, the presidents of Byelarus, Kazakhstan, and Ukraine submitted signed letters to President George Bush obligating them to eliminate all nuclear weapons and all strategic offensive arms from their territories within the seven-year period provided by the treaty.

With these documents, U.S. Secretary of State James Baker stated at Lisbon that the basis is created for prompt ratification of the treaty by all parties.

(Excerpted from a release by the Office of Public Affairs, U.S. Arms Control and Disarmament Agency, May 29, 1992.)

Washington Summit Agreement

Presidents George Bush and Boris Yeltsin, in a Summit Meeting in Washington, D.C., June 16-17, 1992, signed a new agreement which calls for major reductions in deployed strategic warheads to limits much below the START treaty values. In this new "Joint Understanding on Reductions in Strategic Offensive Arms," the sides agreed to reduce their strategic forces to no more than

- *an overall total of warheads of 4,250 (or less) for each party*
- *1,200 multiple independently targetable reentry vehicle (MIRVed), ICBM warheads*

- *650 heavy ICBM warheads*
- *2,160 SLBM warheads.*

These reductions are to take place within the seven-year period following entry into force of the START treaty. By the year 2003 (or by 2000 if the United States can help finance elimination of strategic arms in Russia), the sides will

- *reduce the overall total of warheads to no more than 3,500*
- *eliminate all MIRVed ICBMs*
- *reduce SLBM warheads to no more than 1,750.*

For calculating these overall warhead totals in this agreement,

- *the number of warheads counted for each heavy bomber shall be the number of nuclear weapons they are actually equipped to carry*
- *up to 100 non-ALCM nuclear bombers that are reoriented to strictly nonnuclear roles will not count against the overall warhead totals*
- *nonnuclear-equipped heavy bombers will be based separately from nuclear bombers and from nuclear weapons.*

The joint understanding further states that

- *START treaty verification procedures will be used to help confirm that the nonnuclear bombers are as declared*
- *reductions required by this agreement will be carried out by eliminating missile launchers and heavy bombers using START treaty procedures, and by reducing warheads on existing missiles (other than SS-18s).*

The two presidents further directed that this agreement be promptly recorded in a brief treaty document which they will sign and submit for ratification in their respective countries. Because this new agreement is separate from, but builds upon, the START treaty, they continue to urge ratification and implementation of the START treaty as soon as possible.

(Excerpted from release by the Office of the Press Secretary, The White House, June 17, 1992.)

In a separate letter submitted by Secretary of State James Baker and also signed by Russian Foreign Minister Andrei Kozyrev, it was agreed that the downloading limits (1,250 warheads etc.) established in the START treaty may be exceeded as needed to reach the aggregate warhead limits of the joint understanding. Reentry vehicle platform destruction required by START treaty downloading provisions will be relaxed for downloading under the joint understanding. The letter states that these provisions will be incorporated into the new treaty proposed by the joint understanding.

(Excerpted from the release by the U.S. Department of State, June 18, 1992.)

ACRONYMS

ALCM	Air-Launched Cruise Missile
EIF	Entry into Force
GPR	Global Position Receiver (also known as Satellite System Receiver, SSR)
ICBM	Intercontinental Ballistic Missile
INF	Intermediate-Range Nuclear Forces
IOI	Item of Inspection
JCIC	Joint Compliance and Inspection Commission
MIRV	Multiple Independently Targetable Reentry Vehicle
MOU	Memorandum of Understanding
NRRC	Nuclear Risk Reduction Center
NTM	National Technical Means
OSI	On-Site Inspection
OSIA	On-Site Inspection Agency
POE	Point of Entry
PPCM	Portal Perimeter Continuous Monitoring
RV	Reentry Vehicle
SALT	Strategic Arms Limitation Talks
SLBM	Submarine-Launched Ballistic Missile
SLCM	Sea-Launched Cruise Missile
SNDV	Strategic Nuclear Delivery Vehicle
SRAM	Short-Range Attack Missile
SSBN	Submarine, Ballistic, Nuclear
SSI	Suspect Site Inspection
START	Strategic Arms Reduction Treaty
SVC	Special Verification Commission
TLI	Treaty-Limited Item
WH	Warhead

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The Strategic Arms Reduction Treaty and Its Verification

David B. Thomson

I. INTRODUCTION

The strategic arms reductions talks between the United States and the USSR began in 1982 and resulted in the Strategic Arms Reduction Treaty (START) signed by Presidents George Bush and Mikhail Gorbachev in Moscow on July 31, 1991.[1] This report is a summary of the treaty and its complex verification provisions, including protocols, annexes, and agreed statements (the Appendix of this report presents the expanded table of contents of the treaty document). In addition to the summary of the treaty, the report also examines in detail the verification provisions in the treaty and some of their implications for arms control.

The START negotiations, originally proposed by President Ronald Reagan in 1982, gained impetus when President Gorbachev and President Reagan agreed at the Geneva Summit of November 1985 to the general guideline of a 50 percent reduction in strategic offensive nuclear arms. This was followed by their agreement at the 1986 Summit in Reykjavik that the numerical deployment limits would be 1,600 strategic nuclear delivery vehicles (SNDVs) and a total of 6,000 accountable warheads (WHs). At the Washington Summit in 1987, Gorbachev and Reagan agreed to several sublimits: no more than 4,900 warheads on intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles (SLBMs) combined; and no more than 1,540 warheads on 154 heavy ICBMs (SS-18s). The history and issues leading to these summit agreements were reviewed by Patrick J. Garrity in a CNSS publication in 1988.[2]

Subsequent negotiations were carried on by the Reagan and Bush administrations, leading to additional agreements involving sublimits on mobile missiles, air-launched cruise-missile (ALCM) sublimits and counting rules, and principles for verification. A separate agreement was reached for sea-launched cruise missiles (SLCMs). The status of the proposed treaty as of the Bush-Gorbachev Summit of June 1990 was reviewed by the author in a CNSS publication in 1990.[3]

The treaty as signed by the parties July 31, 1991, and submitted by President Bush in November 1991 to the U.S. Senate for ratification, includes the main treaty text of nineteen articles; the Annex on Agreed Statements; the Annex on Terms and Their Definitions; the Protocols on Procedures Governing Conversion or Elimination, Inspections and Continuous Monitoring Activities, Notifications, ICBM and SLBM Throw-weights, Telemetric Information, and Joint Compliance and Inspection Commission; and the Memorandum of Understanding (MOU) on the Establishment of the Data Base.

The treaty articles and their subjects are

Article I: general obligations of the parties.

Articles II, III, and IV: central limits, sublimits, counting rules, limits on nondeployed weapons, and other restrictions.

several documents that are not integral parts of the treaty but are considered important to the Senate in its consideration of the treaty. These include:

- Related agreements, such as the agreement on early exhibitions and the agreements on the exchange of coordinates and site diagrams.
- Letters signed by the U.S. and Soviet representatives, such as the phased reductions of heavy ICBMs and letters relating to specific systems or activities.
- Certain correspondence related to the treaty, such as third-country basing and relocation of heavy ICBM silos.

mental ballistic missiles; submarine-launched ballistic missiles; and heavy bombers with gravity bombs, short-range attack missiles (SRAMs), and air-launched cruise missiles. The two sides agreed to limit sea-launched cruise missiles through unilateral declarations separate from the treaty limits. As part of the treaty, the sides have agreed to extensive and detailed on-site inspection procedures and cooperative measures which, combined with national technical means, provide a verification regime unprecedented for deployed strategic nuclear weapons.

The START force limitations were negotiated with the U.S. goal of reducing the deploy-

ments of the most threatening first-strike weapons (such as the SS-18) and reducing the total throw-weight. The limitations encourage the deployment of bomber-carried weapons which are believed appropriate to deterrent retaliation but not for a surprise first strike. The rationale for many of the various negotiated sublimits is discussed elsewhere.[2,3,5-7]

A number of issues, unresolved as of the June 1990 Summit, were accommodated or agreed in the final treaty. These include:

Throw-weight. A major U.S. aim was to limit the overall throw-weight of Soviet missiles. The sides ultimately agreed to a limit of 3,600 metric tons, which is 54 percent of the USSR declared value at treaty signing and marginally higher than the original U.S. proposal.

ICBM warhead sublimit. The United States wished to reduce the fraction of ICBMs in the total Soviet nuclear force structure as a stabilizing measure. However, the United States dropped its demand for an ICBM warhead sublimit of 3,000-3,300 WHs in return for the Soviets dropping their demand for an SLBM warhead sublimit.

Modernization. The sides agreed on language to define "new-type" ICBMs. New-type heavy ICBMs and missiles with more than ten reentry vehicles are banned. Otherwise, modernization or replacement of existing systems is allowed.

Baseline inspections. Allowances, not included in the Joint Summit Statement of June 1990, were provided in the treaty as signed to enable extensive verification of the baseline data supplied by the two sides. In addition, the inventory data is to be updated every six months and detailed provisions are made for on-site inspections to verify each updated inventory.

Eliminations or conversions. Detailed verification provisions were agreed to confirm the eliminations and conversions of treaty-limited items (TLIs).

Suspect site inspections. Rights were agreed to allow inspections of suspect mobile-missile assembly facilities, but only at sites on an agreed list of relevant sites.

Verification for mobile ICBMs. Mobile missiles and their launchers are limited in number and their locations normally restricted to geographically limited deployment areas. Verification for mobiles has been provided in the treaty through movement notifications, cooperative measures, and specified on-site inspections, in addition to national technical means.

Distinguishability of nuclear-armed ALCMs and bombers. The sides agreed to provide detailed dimensional characteristics and to conduct "distinguishability exhibitions" as a basis for distinguishing nuclear from nonnuclear ALCMs and bombers. On-site inspections, including use of neutron detectors, will be used in verifying deployments of nuclear-armed ALCMs.

Downloading. The issue of downloading became important during the final weeks of the negotiations. Both sides had an interest in reducing the number of warheads deployed on existing types of missiles below those numbers flight tested and agreed upon in the memorandum of understanding. Such reductions are permissible, but no provision existed in the treaty to allow the number of warheads counted against the side under the treaty to be reduced accordingly. There was concern that steps taken to reduce the number of warheads carried on a missile could easily be reversed in a crisis by simply reloading warheads on to the attachment points that had been vacated. This could allow a "break out" from the treaty by a sudden increase in the number of deployed and deliverable warheads. The issue was resolved by limiting to 1,250 the number of reentry vehicle (RV) spaces that can be accountably downloaded, limiting the number of missile types upon which downloading is permitted, allowing only missiles with the same number of warheads to be deployed at a given base, and requiring the development and testing of new warhead "platforms" in some cases.

Telemetry. Details of the provisions for exchange of telemetry data were also finally resolved just before signing.

II. TREATY PROVISIONS FOR FORCE LIMITATIONS

The START treaty was signed on July 31, 1991, and provides for the following principal force limitations:

SNDVs:	1,600
Heavy ICBMs:	154
Accountable deployed nuclear warheads:	6,000
Ballistic-missile warheads (ICBMs and SLBMs):	4,900
Warheads on heavy ICBMs:	1,540
Warheads on mobile ICBMs:	1,100
Throw-weight in metric tons (aggregate, deployed ICBMs and SLBMs):	3,600

Principal definitions and counting rules are:

SNDV	ICBM and associated launcher; SLBM and associated launcher; heavy bomber (nuclear armed)
Accountable warhead	Any nuclear warhead[8] deployed on an ICBM, SLBM, mobile ICBM, or ALCM of range greater than 600 km; a heavy bomber armed only with gravity bombs or SRAMs counts as only one warhead.
Heavy ICBM (or SLBM)	Any ICBM with throw-weight greater than that of the Soviet SS-19 (4350 kilograms); this applies only to the Soviet SS-18 and to no U.S. missiles.
Bomber counting rules	The first 150 U.S. (180 for the USSR) bombers armed with ALCMs will count as having only ten ALCMs for the U.S., or eight ALCMs for the USSR, regardless of the number on board. Above the 150/180 bomber limits, each bomber will be counted as having the actual number of ALCMs for which it is equipped.
Major prohibitions include:	No new-type heavy ICBMs No heavy SLBMs or launchers No mobile heavy ICBMs or launchers No rapid reload of ICBM launchers No long-range ALCMs with multiple warheads No new-type ballistic missiles with more than ten RVs
Additional sublimits include:	
For deployed nuclear systems	No more than twenty ALCMs for any U.S. bomber; no more than sixteen ALCMs for any USSR bomber; no more than ten RVs per ICBM or SLBM
For nondeployed missiles	No more than 250 ICBMs of a type flight tested from mobile launchers (125 or fewer of these may be for rail

launchers); no more than four nondeployed ICBMs at any one silo base

For nonnuclear heavy bombers — Up to seventy-five heavy bombers may be removed from the SNDV and WH counts if converted to carry nonnuclear weapons only. Up to twenty test heavy bombers may also be excluded from the SNDV and warhead counts.

Other features of the treaty include:

Nondeployed warheads — There is, in general, no limit on the total number of nondeployed warheads. There is no overall limit on nondeployed silo-based ICBMs or on nondeployed SLBMs.

Declaratory limits (SLCMs) — Sea-launched, nuclear-armed cruise missiles do not count in the total SNDV/WH counts (1,600/6,000), but are limited by separate declarations by each side to 880. The number actually deployed is to be declared annually; the declaration is not subject to inspection. SLCMs are counted if their range is greater than 600 km.

Downloading — Up to 1,250 RV warheads may be removed from existing types of missiles (the Minuteman III plus two other types for the U.S.; the SS-N-18 plus two other types for the USSR), thereby reducing the START reentry vehicle count on missiles with specified multiple independently targeted reentry vehicle (MIRV) capabilities. A downloaded Minuteman III, or any missile reduced more than two RVs, must have a new RV platform. Heavy ICBMs may not be downloaded.

Modernization — Modernization of strategic nuclear forces may be undertaken by each side except as specifically prohibited.

Heavy ICBM reductions — The Soviets will eliminate twenty-two SS-18 heavy ICBMs each year for the first seven years of the treaty to reduce to the 154 limit (separate letters, p. 250, Ref. 1).

Duration and timing — The sides will reduce their deployments in three phases over seven years (to agreed levels at the end of each phase) to reach the final START deployment limits. The parties may individually or collectively reduce at a more rapid rate to lower deployment levels if they choose. The treaty will remain in force for fifteen years unless superseded. It may be renewed thereafter at five-year intervals.

Reductions

Reductions of silos, mobile ICBMs, mobile launchers, SLBM launchers, and heavy bombers will be achieved by eliminations and/or conversions, for which procedures are specified.

Restricted areas (road-mobile missiles)

Deployed road-mobile launchers and missiles shall be based only in restricted areas of 5 sq km or less, which may contain up to ten mobile ICBMs and only one type of ICBM for each area.

Each restricted area must be in a specified deployment area of up to 125,000 sq km. The deployment area may contain only one road-mobile ICBM base, one associated maintenance facility, and one or more restricted areas.

Deployed road-mobile missiles may leave a restricted area only for operational or for exercise dispersals with specified notifications.

No more than 15 percent of the road-mobile missiles may be outside the restricted areas at one time, except during an operational dispersal.

Restricted rail garrisons (rail-mobile missiles)

Deployed rail-mobile launchers and missiles shall be based only in rail garrisons. A rail garrison is an area in which one or more parking areas for rail-mobile launcher trains may be located, and for which one associated maintenance facility may be located. No point on a portion of track located in a rail garrison shall be more than 20 km, measured along the track, from any exit/entrance for that rail garrison. No two rail garrisons may overlap. Each party shall have no more than seven rail garrisons.

No more than 20 percent of the designated rail-mobile missiles may be outside the garrisons at one time except during an operational dispersal. All deployed trains of rail-mobile missiles of one type shall be of one standard configuration, except for routine movements, relocations, or dispersals, as notified.

Dispersals

Exercise dispersals

The treaty provides for conditions for movements of mobile missiles outside of their restricted areas, including (but not limited to) such purposes as routine movements for training, maintenance, or testing. Ex-

ercise dispersals must be completed within thirty days of initiation, may be conducted no more than twice every two years, and may not begin until after the six-month period allotted to baseline data inspections. Detailed notification provisions are specified for exercise dispersals. Some dispersals may be limited to specific bases. Data update and reentry vehicle inspections are suspended from the base or bases involved in an exercise dispersal but may be conducted in full upon completion.

Strategic exercises

The treaty also provides for major strategic exercises involving heavy bombers. These may be conducted only once annually with the suspension of inspections, but with appropriate notifications and post-exercise inspections. If more than one strategic bomber exercise is to be conducted in any one year, inspections and cooperative measures will not be suspended.

Operational dispersals

The parties reserved the right to conduct operational dispersals involving all of their mobile missiles, heavy bombers, and other strategic arms. These dispersals may be conducted if either party considers the survivability of its strategic forces at risk. The other party must be notified within eighteen hours of the initiation of the dispersal, and both parties may suspend inspections, cooperative measures, and most notifications. Operational dispersals are to be used only rarely and in a crisis. Upon completion, all inspections and cooperative measures are to be allowed that could have otherwise occurred, plus two additional cooperative measure displays.

These force limitations, along with the sublimits, lists of prohibitions, counting rules, and general provisions of the treaty (such as time duration) are listed in detail in Table 1. Table 2 lists the deployments of U.S. and former USSR strategic nuclear forces as presented in the memorandum of understanding at the time the treaty was signed. Figure 1 presents currently deployed and START limits on SNDVs, and Fig. 2 shows currently deployed START accountable warheads and treaty limits. Figure 3 shows some of the key sublimits.

III. VERIFICATION AND INSPECTIONS

To verify compliance with the treaty, each side may monitor and observe the deployment of forces and the conduct of activities of the other, using an extensive suite of rights, processes, and equipment provided for by the terms of the treaty. Each party must then analyze and interpret the information it collects and determine the degree to which the other side has complied with the treaty. Each side

may raise and seek resolution of questions or suspected violations by the other in the Joint Compliance and Inspection Commission established by the treaty. As a last resort, a party may withdraw from the treaty upon six-months notice if its national security interests have been jeopardized by extraordinary events.

Verification of compliance with the treaty is an enormous and challenging task. Full verification will require determining on a timely basis the inventories, by category, of deployed SNDVs and warheads, launchers and support equipment, and other treaty-limited items covered by the treaty, and comparing these data with the ones supplied by the other side and with the treaty's limits sublimits, and other prohibitions. That is, the sides will need to confirm information such as the numbers of deployed SLBMs and ICBM silos, numbers and locations of mobile ICBMs and their launchers and mobile-missile reloads, nuclear-armed heavy bombers, long-range ALCM-equipped bombers (both nuclear-armed and nonnuclear-armed), numbers of RVs deployed on each type of ICBM and SLBM, number of ALCMs for which each type of bomber is equipped, and information regarding related facilities. They will need to watch for development of prohibited new types of ICBMs, SLBMs, cruise missiles, and more exotic weapon systems. For the United States it will be particularly important to confirm the reductions in the Soviet inventory of deployed heavy SS-18 ICBMs and the numbers and locations of deployed and nondeployed mobile ICBMs. The sides will count the aggregate missile throw-weight by determining the throw-weight per missile along with missile inventories.

To accomplish this daunting task, the Bush administration notes[9] that the treaty establishes a far-reaching inspection regime, including on-site inspections, special access visits, continuous on-site monitoring of certain facilities, and technical exhibitions. This regime is designed to complement national technical means, the primary source for monitoring compliance with the provisions of the treaty. Cooperative measures, such as the display of road-mobile and rail-mobile launchers of ICBMs, are also required and are designed to further enhance the effectiveness of our national technical means.

Generally, the START treaty makes provisions for verification of its limits in Article VIII, which obligates the parties to provide detailed data bases and notifications regarding their strategic nuclear forces, facilities, and activities; in Article IX, dealing with the use of national technical means of verification and nonconcealment of treaty activities from NTM; in Article X, dealing with the broadcasting and nonencryption of telemetric information during flight testing of missiles; in Article XI, which enumerates rights for on-site inspections, exhibitions of equipment, and continuous monitoring activities; and in Article XII, which describes the cooperative measures that may be requested to strengthen the capabilities of NTM and on-site inspections. These basic rights and obligations are elaborated in protocols to the treaty on inspections and continuous monitoring activities; notifications; telemetric information; and the establishment of the data base.

The remainder of this section describes the treaty's verification rights and procedures in greater detail. Table 3 is an overview of the verification provisions.

A. Use of National Technical Means and Cooperative Measures

In Article IX the treaty states that "for the purposes of ensuring verification of compliance with this treaty, each party shall use national technical means of verification at its disposal in a manner consistent with generally recognized principles of international law." NTM includes[10] use of satellites for photographic reconnaissance and detection of particles and radiations in space, aircraft-based systems (e.g., radars, optical systems, and fallout detection), sea- and ground-based systems (e.g., radars and antennas for collecting telemetry, and optical systems for observing nuclear tests) and other observations from outside the territory of the country being observed. National technical means was the primary method

for monitoring and verifying the early arms-control treaties with the Soviets, such as the Limited Test Ban Treaty of 1963, the Strategic Arms Reduction Talks (SALT) I Treaty (1972), and the SALT II Treaty of 1979 (unratified and expired).

Article IX states that each party shall not interfere with the NTM of the other party and shall not use measures that result in concealment of ICBMs, SLBMs, or mobile missile launchers at test sites.

Article X of the treaty and the telemetry protocol provide for enhancement of NTM during missile flight tests by broadcasting telemetric technical information concerning the flights and restricts the denial of access (by the other party) to such information by use of encryption, jamming, narrow-beam broadcasting, or ejectable and recoverable capsules or reentry vehicles. After each ICBM or SLBM flight test, the testing party must provide recorded tapes of the telemetric information. Each party may use encapsulation or encryption pertaining only to the RV or front-section phases of the flights, and on no more than eleven flight tests per year.

Article XII of the treaty provides for cooperative measures that include open displays of (1) road-mobile launchers located within the restricted areas specified by the requesting party; (2) rail-mobile launchers located at specified parking sites; and (3) all heavy bombers and former heavy bombers within one air base specified by the requesting party. Such open displays must be conducted without concealment measures and must provide for the opening of the roof covering the road-mobile missiles, and moving the rail-mobile missile trains to an open area, during the display time period. Bombers must be located outside their hangers. Each party may request up to seven such displays per year.

B. Data Exchange and Notifications

The START treaty provides for extensive specified exchanges of data involving all the treaty-limited items. The treaty also provides for extensive and detailed notifications of the deployments, movements, tests, reductions, and other activities involving the strategic offensive arms and facilities subject to limitations by the treaty.

Article VIII of the treaty stipulates that the memorandum of understanding sets forth the detailed data base pertaining to the obligations under the treaty. The data in the memorandum of understanding was provided by the parties at the time of signing and was included as part of the overall treaty package. The MOU lists all the types of ICBMs, SLBMs, and heavy bombers (with and without ALCMs), related facilities, base locations, and total numbers of TLIs of each type at each location. Strategic nuclear deployments as stated in the memorandum of understanding are presented in Table 2.

An update of all the data listed in the MOU, including inventories at each location, is called for from each party within thirty days after the entry into force of the treaty following ratification by the parties. This exchange of data, followed by regular updates of these data every six months thereafter, together with detailed data on changes of status of individual treaty-limited items as they occur, is provided for in the protocol on notifications and establishes a continuous comprehensive baseline against which to measure and compare the results of all the observations and data obtained through application of the various verification mechanisms.

The protocol on notifications sets forth the requirements for notifications associated with the data-exchange updates noted above and for notification of various activities involving strategic offensive arms and their related facilities subject to the treaty.

The detailed protocol on notifications includes eighty-two specific types of notifications that the parties must provide. An additional twenty-two types of notifications are called for in the inspections protocol.

Nearly all of the notifications involve a time constraint, that is, the number of hours or days before or after an event during which the notification must be given. The Nuclear Risk Reduction Centers (NRRCs), one for each side,

established by executive agreement in 1987, are used to provide, receive, and confirm receipt of each of the notifications.

The notifications are grouped in the ten categories listed below.

1. Notifications concerning inventory data and change of inventory of treaty-limited items, such as ICBMs, SLBMs, and bombers, according to the categories given in the memorandum of understanding. These notifications are detailed and are designed to alert the verifying party to incremental or detailed changes in the inventory of deployed TLIs. An example is that within thirty days of the entry into force of the treaty, each party must provide current data for each category of data given in the MOU. Another notification provision requires that within thirty days of each six-month period after the EIF, each party must provide current data for each category of data given in the MOU. There are eighteen notifications in this category.

2. Notifications concerning movements of treaty-limited items. These involve general movements of ICBMs and heavy bombers among deployment locations, test sites, assembly facilities, and air bases. These notifications may contribute to an understanding of movements observed by national technical means and other verification procedures. A typical notification is that no later than forty-eight hours after completion, a party must notify the other of the completion of transit of nondeployed ballistic missiles, mobile launch canisters after tests, nondeployed mobile launchers, and/or mobile training launchers. The notification shall include the number of each type moved, the origins and destinations, mode of transport, and unique identifiers for mobile ICBMs. Other notifications involve the beginning and completion, of exercise dispersals of mobile ICBMs and strategic exercises of heavy bombers. There are seventeen such notifications involving movement of TLIs.

3. Notifications concerning throw-weight data for ICBM and SLBM flight tests. These assist a party in verifying the throw-weight values provided by the other party, particularly for new types of missiles under test. There are four such types of notifications concerning throw-weight determinations. One such notification is that each party must provide the other, no less than seven days in advance, with notification of the eighth test of each new-type ballistic-missile flight test. The notification must include the greatest throw-weight demonstrated in the first seven tests, data on the maximum calculated throw-weight, data on the residual propellant in each stage, and data on the descending flight path angle (at 100 km) used in the calculation.

4. Notifications concerning conversions or eliminations of treaty-limited items and elimination of facilities subject to the treaty. In reducing their inventories of SNDVs and deployed warheads to conform to treaty limits, the parties may choose, subject to the category sublimits, those specific TLIs which they wish to eliminate or convert to nontreaty limited status. The protocol on conversions or eliminations includes provisions for the elimination or conversion, at appropriate locations or facilities, of the chosen items. ICBMs for mobile launchers and the launchers themselves, SLBM launchers, heavy bombers, and former heavy bombers must be eliminated at elimination facilities. Fixed ICBM silo launchers and fixed structures for mobile launchers shall be eliminated in situ.

The party conducting eliminations or conversions must make seven types of notifications. These allow the verifying party to respond with appropriate monitoring processes, such as with NTM observations, requests for cooperative measures, or on-site inspections. A typical such notification is that each party must provide notification at least thirty days prior to the initiation of conversion or elimination procedures for mobile ICBMs and launchers, ICMB silos, SLBM launchers, bombers, and related TLIs. The locations, categories, dates, etc. must be provided.

5. Notifications relating to cooperative measures to enhance verification by national technical means. There are five types of such notifications. The verifying party may request a display of specific mobile missiles or heavy bombers at specified bases, and may request a

display of a special-purpose submarine. The receiving party may respond with notifications that the specific mobile ICBM or bomber cannot be displayed at the times requested. A party must notify the other, within twenty-four hours, of the exit of a submarine from a covered facility in which conversion of its SLBM launchers was carried out.

6. *Notifications concerning flight tests of ICBMs and SLBMs and concerning telemetric information.* Five kinds of notifications are specified by the testing party to enhance NTM for the verifying party or to explain certain details of the telemetering. A typical notification is that each party must provide notice of any flight test of an ICBM or SLBM. It must include the launch date, launch area, reentry vehicle impact area, telemetry broadcast frequencies, and information as to broadcast tapes and plans for encryption or encapsulation.

7. *Notifications concerning production, movement, flight tests, or deployment of new types or new kinds of strategic offensive arms.* There are sixteen types of notification concerning the development of new types of strategic offensive arms. Typical of these notifications is that each party must provide notification, no less than forty-eight hours in advance, of a planned exit from a production facility of the first prototype of a new type or new kind of ICBM or SLBM. The notification must include the length, diameter, weight, calculated throw-weight, and the name and location of the production facility that will produce the prototype.

8. *Notifications concerning change of notification data on movements and on conversions/eliminations.* There are two types of these notifications.

9. *Notifications concerning inspections and continuous monitoring listed in Section III of the inspections protocol.* There are twenty-two types of such notifications. These are involved with the on-site inspections and continuous monitoring procedures that are discussed in the next section of this report.

10. *Notifications concerning operational dispersals.* Each party may conduct operational dispersals of its strategic forces, including mobile ICBMs, SLBM forces, or heavy bombers. The party conducting the dispersal must notify the other party as provided by one or more of the seven types of notifications specified in this section. A typical notification is that each party must provide notification no later than eighteen hours after the start of an operational dispersal. Included shall be the date, time, and reason for the operational dispersal.

Additional notifications provide for the completion and other features of the operational dispersal.

Most or all of the notifications specified in the protocol serve as important triggers to the various monitoring and verification mechanisms. Movements or tests of strategic weapons or changes in inventories of treaty-limited items may be specifically observed by NTM satellites or detectors in response to the notification. The verifying party will frequently have the option to request open displays at specific missile or bomber bases in response to notifications. Finally, decisions to conduct specific on-site inspections may be made in response to certain notifications and in coordination with the flow of information coming in from national technical means and observations from the open displays. They may also be used to clarify questions about possible violations identified by other monitoring processes.

Taken together, the eighty-two specific notifications detailed in the notification protocol are meant to be a considerable addition to the effectiveness of the verification of the treaty. If false data are given in the notifications, or data are consistently withheld, NTM and the OSI provisions of the treaty should enable the other party to eventually detect it and to take appropriate action.

C. On-Site Inspections and Continuous Monitoring

On-site inspections of deployed nuclear weapons on Soviet territory first became a reality with the Intermediate-Range Nuclear Forces (INF) treaty, ratified and entered into force in

1988. The negotiations leading to that treaty, and discussions in the Special Verification Commission (SVC) established by the INF treaty to resolve verification issues and establish more detailed inspection procedures, led the START negotiators to spell out extensive OSI rights and mechanisms.

1. General Types of On-Site Inspections and Continuous Monitoring

Article XI of the START treaty and the protocol on inspections and continuous monitoring spell out the general categories of on-site inspections, continuous monitoring activities, and exhibitions that allow for inspections. The on-site inspection procedures are summarized in Table 4.

These general categories are described below.

Baseline Data Inspections. Inspections are allowed at facilities designated in the treaty memorandum of understanding. They are meant to validate the initial inventory data exchange and make baseline measurements of treaty-limited items. The facilities where baseline inspections may be made include ICBM and SLBM bases, loading facilities, and repair facilities. Also included are storage facilities for ICBMs, SLBMs, mobile launchers of ICBMs, and heavy bombers or former heavy bombers; training facilities for ICBMs, SLBMs, and heavy bombers; conversion or elimination facilities for SLBM launchers, mobile ICBMs and their launchers, and heavy bombers; test ranges; and specified air bases. These initial baseline inspections are conducted from 45 to 165 days after entry into force of the treaty. There may be any number of inspections, but the number will be limited by the logistics of time constraints of notifications and procedures, and there may be no more than ten such OSIs conducted at one time.

Data Update Inspections. On-site inspections may be conducted at facilities designated in the MOU and listed above or in subsequent notifications. The inspections are to confirm the accuracy of data provided in the regular exchanges of updated inventory data called for after each six-month period after the entry into force of the treaty. There may be as many as fifteen data-update inspections each year, starting 165 days after entry into force. Details of the procedures are given in the following two sections of this report.

New Facility Inspections. When new facilities are listed in notifications, they are subject to inspections to confirm the numbers and types of treaty-limited items specified.

Suspect Site Inspections (SSI). The inspecting party has the right to conduct OSIs to confirm that covert assembly of mobile ICBMs or first stages of mobile ICBMs is not occurring at a suspect site not specified by the other side as producing mobile ICBMs. These inspections may take place only at facilities designated for such inspections in the MOU. Three such sites were designated by each side. Each SSI counts against the quota of fifteen data update inspections per year.

Reentry Vehicle Inspections. On-site inspections of RVs are permitted to confirm that the number of reentry vehicles (warheads) deployed on ballistic missiles are as stated by the inspected party. This is accomplished by removing the shroud (RV cover) and making observations of the front end of the missile using procedures to prevent the inspectors from seeing the details of the warhead or bus. There may be up to ten RV inspections per year, starting 165 days after the entry into force.

Post-Exercise Dispersal Inspections. On-site inspections may be conducted after an allowed and notified dispersal exercise of mobile ICBMs to determine that the numbers of deployed mobile ICBMs and their launchers, attributed to that base, have returned to the base or are accounted for, and that this total does not exceed the number specified for that base in the MOU or subsequent notifications. The OSIs are conducted by procedures similar to data update inspections for mobile-missile bases.

Conversion or Elimination Inspections. Conversions or eliminations for mobile missiles and launchers, heavy bombers, or SLBM launchers are carried out at specified elimination/conversion facilities. Following advance

notification of a scheduled conversion or elimination, NTM or OSIs may be conducted by the other party to confirm the elimination or conversion to allowed uses as provided by the treaty. Elimination of ICBM silo launchers are to be conducted on-site, with advance notification given. These may be observed only by NTM.

Close-out Inspections. Inspections may be conducted to determine that treaty-limited activities have ceased at a site declared to be eliminated or converted to allowed uses. The OSI will confer the appropriate change of status.

Formerly Declared Facility Inspections. Facilities may be eliminated under treaty provisions that allow for a period of close-out inspections. After this period, the other party may conduct up to three formerly declared facility inspections per year.

Technical Characteristics Exhibitions for ICBMs and SLBMs. Each side must conduct an exhibition of the technical characteristics of one ICBM, one SLBM, and one mobile ICBM launcher of each type and variant limited by the treaty. The other party has the right to conduct OSIs during the exhibitions to confirm that the characteristics for each exhibited TLI are as stated in the MOU or subsequent declaration notifications. Characteristics that may be measured include the length, diameter, shape, weight, and other observable features as defined in the verification protocol and listed in the memorandum of understanding.

Distinguishability Exhibitions for Heavy Bombers and ALCMs. Each party must conduct exhibitions for heavy bombers, former heavy bombers, and long-range, nuclear-armed ALCMs. The other party has the right during the exhibitions to conduct on-site inspections that confirm the data given in the MOU and subsequent notifications as to the distinguishing features of heavy bombers equipped for long-range, nuclear-armed ALCMs, heavy bombers equipped only for nuclear armaments other than long-range, nuclear-armed ALCMs, and long-range, nuclear-armed ALCMs. These inspections also are to confirm the maximum number of ALCMs for which each type of heavy bomber is actually equipped.

Baseline Exhibitions for Nonnuclear Heavy Bombers. Each party must conduct baseline exhibitions of all heavy bombers equipped for nonnuclear armaments, training heavy bombers, and former heavy bombers specified in the initial data exchange (notifications protocol). The other party may conduct inspections of these bombers to confirm that such bombers satisfy the requirements for conversion to nonnuclear uses, as given in the conversion or elimination protocol.

Perimeter Portal Continuous Monitoring. Each party may conduct PPCM at mobile-missile production facilities to confirm the number of mobile ICBMs produced. Using TV cameras, infrared sensors, and other equipment, the inspectors establish continuous monitoring of the perimeter of the facility or site, and observe all candidate TLIs entering or leaving the facility. PPCM of production facilities may continue as long as the facility is active and the treaty is in effect.

The degree and depth with which each type of inspection is made will depend on the inspectors' observation rights as specified in the treaty, the efficiency with which the inspection is made, and the ability of the host to demonstrate to the inspection team that the number and characteristics of treaty limited items at any site being investigated are as stated by the host. For the United States these inspections will be conducted by the U.S. On-Site Inspection Agency (OSIA).

2. *Administrative and Logistical Procedures for On-Site Inspections*

The treaty provides for the establishment of inspection organizations for each party, including inspectors, monitors, and air crew members. Inspection and monitoring teams will be made up from lists (submitted and approved by each party) of 400 inspectors, 300 monitors, and unlimited air crew members.

Advance notice of up to sixteen hours of intent to conduct an OSI is required for inspec-

tions of baseline data, data updates, suspect sites, reentry vehicles, new facilities, post-exercise dispersals, and formerly declared facilities. Notifications are given through the nuclear risk reduction center for each country.

For a given inspection, the inspection team must file a flight plan for entry at the appropriate point of entry (POE). Each country will have established two or three previously approved permanent POEs. All equipment and supplies brought with the inspection team are subject to inspection by the host (in-country escort). Specific inspection and monitoring equipment that may be used by the inspectors is listed in Table 5. Equipment not related to the treaty inspection may be impounded. Equipment and supplies may be stored, under the inspector's lock and key, at the POE of the host country. The treaty provides that the host make provision for food, lodging, and transportation of the inspection team while in the host country.

The treaty and protocols provide detailed rules for the activities and conduct of the inspection team. Upon arrival at the point of entry, the team names the site to be inspected. The host must ensure that the inspectors arrive at the site within nine hours (for the inspections listed above) of the naming of the site. The equipment available for the inspectors during each type of inspection is specified. The host must provide a secure telephone line between the inspection site and the embassy of the inspection team.

The OSI team may consist of as many as twenty persons for conversion or elimination OSIs, as many as fifteen inspectors for exhibition inspections, and as many as ten persons for all other on-site inspections. Two inspectors must speak the host language. Instant development cameras may be used but operated for the inspectors only by the hosts. The time duration of an inspection shall be twenty-four hours or less (except for warhead exhibitions, conversions, or eliminations) and may be extended up to eight hours by mutual agreement.

Post-inspection procedures, including the completion of the on-site inspection report, must be completed within four hours after completion of the OSI. Any information (as to the host country's facilities or weapons systems) gained through the inspections requires permission of the host before it can be released to a third party or made public.

For setting up a perimeter portal continuous monitor at a specified facility, the inspection team may use up to thirty persons. Monitors may be replaced as needed and will use equipment specified in the treaty and protocols (see Table 6).

Baseline on-site inspections may start forty-five days after entry into force of the treaty, which will occur shortly after ratification by both sides and official deposit and exchange of documents. Data update inspections and other OSIs may start 165 days after entry into force.

Figure 4 illustrates the time sequence of inspection events for specific on-site inspections.

Table 7 lists the starting times for applicability for each of the types of inspections.

3. *Procedures for Conducting On-Site Inspections and Monitoring*

This section describes types of inspections (listed in sec. III.C.1. above) as they apply to each class of strategic weapon limited in the treaty (fixed ICBMS, mobile ICBMS, SLBMs, and heavy bombers). For each of the inspections or monitoring procedures described in this section, we note that the administrative procedures (notification, transportation, and other logistics) will have been carried out as described in the preceding section.

For baseline inspections, data update inspections, suspect site inspections, new facility inspections, and other inspections, the OSI team carries out the following six specific steps:

1. The OSI team arrives at the selected declared site and verifies its location (at ICBM silo sites) using global positioning receivers (GPR) based on orbiting satellites. The GPRs are provided by the host.

2. The host provides a site briefing (less than one hour) and provides a site drawing that lists

and shows the location of all declared treaty-limited items at the site. Team members are taken by the host to each TLI location as requested by the team leader. A team subgroup may patrol the perimeter of the site and monitor exiting vehicles during the inspection.

3. During the inspection the team compares the observed and the candidate TLIs with the declared inventories, and the declared TLI characteristics with those given in the MOU and/or declared by the host. Discrepancies are discussed with the host, who is asked to explain any ambiguities or disagreements in the data. A candidate treaty-limited item is any device, unopened box, or container large enough to be or contain a TLI of a type being counted and that has not been satisfactorily explained.

4. The team makes additional observations and measurements as provided by the treaty or agreed by the host in an effort to resolve any disagreements. The OSI must be completed within twenty-four to thirty-two hours (see Fig. 4).

5. Within four hours after completing the OSI, the team leader writes the inspection report, with a copy for the host, and leaves the site, returning to the point of entry. The team leader may request a sequential inspection at that time.

6. The team leader reports promptly to the embassy and to the OSIA (for the United States).

To assist with the subsequent inspections, each party must provide notification of and conduct an exhibition of each type of SNDV, and variant thereof, to demonstrate the technical characteristics listed in the memorandum of understanding. New types of SNDVs developed after July 1, 1991, are listed in the required notifications. Chart A presents specific on-site inspections that may be made by the other party during these exhibitions to help verify the determination of the technical characteristics to be used in the other types of inspections described in Charts B and C.

In making the inspections listed in Chart A, the OSI teams may use inspection equipment listed in Table 5.

A separate agreement[11] provides for conducting technical characteristics exhibitions and distinguishability exhibitions before the start of baseline inspections. These early exhibitions are to be completed within 240 days after the date (July 31, 1991) the treaty was signed. These early exhibitions and inspections are to be carried out in accordance with the inspections protocol except for modification of the provisions for lists of inspectors and air crew members. The inspection procedures indicated in Chart A apply. Any item or characteristic not exhibited prior to the entry

Chart A. On-Site Inspections during Exhibitions

Weapons System	Type of Inspection[a]	Characteristics Observed
ICBMs, silo launchers	Technical characteristics	Exhibited appearance (obtain photographs); specified distinguishing features; length and diameter of each stage; weight[b] of ICBM; type of dispensing mechanism; etc.
ICBM, mobile launchers (road and rail)	Technical characteristics	Exhibited appearance (obtain photographs); specified distinguishing features; length and diameter of each stage; weight[b] of ICBM; size of mobile launch canisters; type

		of dispensing mechanism; etc. Exhibit "new type" close to "existing type"
SLBMs	Technical characteristics	Exhibited appearance (obtain photographs); specified distinguishing features; length and diameter of each stage; number of launch tubes per submarine; inside diameter of launch tubes; weight[b] of SLBM; type of dispensing mechanism
Heavy bombers with nuclear armaments and long-range, nuclear-armed ALCMs	Distinguishability exhibitions	Exhibited appearance (obtain photographs); specified distinguishing features; linear distances between designated points on bomber or ALCM as designated by host as distinguishing; (may observe ALCM for absence of neutrons if declared nonnuclear)
Nonnuclear-armed heavy bombers	Baseline exhibitions to demonstrate nonnuclear	Exhibited appearance (obtain photographs); specified distinguishing features, linear distances between designated points on bomber or ALCM; (may observe declared nonnulcear ALCMs for absence of neutrons)

[a]As listed in sec. III. C. 1. of this report.
[b]Weight measured for determination of "new type."

into force of the treaty must be exhibited after the EIF.

A principal goal of each verifying party will be to determine that the inventories of deployed SNDVs and their warheads are as declared by the other party in the memorandum of understanding as modified in subsequent notifications. Chart B presents typical specific on-site inspections that the treaty provides to help verify the inventories of deployed delivery systems and warheads limited by START. In making each type of inspection shown in Chart B, the OSI teams may use inspection equipment listed in Table 5.

In verifying the declared inventories of TLIs listed in the MOU and subsequent notifications, the sides may also inspect for missile launchers and other support equipment listed in the inspection protocol as items of inspection.

Each side may conduct suspect site inspections to confirm that covert assembly of mobile ICBMs is not occurring at a site listed as eligible for suspect site inspections in the MOU. SSIs may also be conducted at a facility that starts production of an ICBM or SLBM as large or larger than a mobile ICBM of the inspected party at the time of entry into force and not

Chart B. On-Site Inspections of Deployments

Weapons Site	Type of Inspection[a]	OSI Observations/Techniques
ICBM silo base	Baseline data; data update; new facility; close-out	Observe ICBM locations at site; observe selected silos and ICBMs; measure dimensions as needed; observe inside containers as needed; obtain photographs[b]; compare data with reference data[c]
ICBM mobile-missile site (road-mobile, rail-mobile)	Baseline data; data update; new facility; close-out	Host has moved mobile missiles to be within restricted areas; for OSI, team posts perimeter monitor; team observes, reads tags, and counts declared ICBMs; observes selected missiles and launchers and measures dimensions as needed; observes inside containers as needed; obtains photographs[b]; compares data with reference data[c,d]
SLBM submarine base	Baseline data; data update; new facility; close-out	Host displays requested submarines by type; team counts submarines by type; host opens specific tubes on request; team measures SLBM dimensions; team obtains photographs[b] as needed; team compares data with references[c]
ICBM and SLBM bases; mobile-missile bases	RV inspections	Team selects ICBM/SLBM at site; missile moved for observation by host and front section prepared (as team observes); host opens shroud; team counts RVs
Heavy-bomber bases (includes weapon storage areas)	Baseline data; data update; new facility; close-out	Host exhibits bombers at base by type; team inspects one bomber of each type; team observes distinguishing features of bombers and ALCMs, compares with reference data;[c] photographs[b] taken; in weapon storage areas team may use neutron detector if nuclear ALCMs declared nonnuclear; team counts inventories of

		each type of nuclear-armed bomber and ALCM
Mobile-missile bases	Post-exercise dispersal	Team posts perimeter monitor around restricted area; team counts missiles and launchers within allowed areas, using procedures similar to data update inspections for mobile missiles, as above
Any of above bases after completion of close-out inspections	Formerly declared facilities	Team conducts OSIs for TLIs using procedures for data update OSI for the appropriate categories

[a]As listed in sec. III. C. 1. of this report.
[b]May request photographs if there are ambiguities.
[c]Reference data includes MOU and data given in subsequent notifications and declarations.
[d]Must include all deployed road missiles assigned to specified site. Rail-mobile missiles are restricted to rail garrisons and inspected in a similar way.

subject to portal perimeter continuous monitoring. Also included is any site for which continuous monitoring has ceased. Items of inspection for suspect site inspections are an ICBM for a mobile launcher, the first stage of a mobile ICBM, and a solid rocket motor for a mobile ICBM. The SSI procedures are:

> Within one hour of notification of the designated suspect site to be inspected, the host shall implement preinspection movement restrictions of all TLIs. All vehicles, containers, and launch canisters large enough to contain an item of inspection are not to be removed from the site. Team members are taken to site as requested. Perimeter observers are established. Procedures similar to data update inspections for mobile-missile sites are then followed to search for suspect items of inspection. The inspectors may use the inspection equipment indicated in Table 5 for SSIs.

Each suspect site inspection uses up one of the quota of fifteen data update inspections allowed each year. Only one SSI may be conducted at a time, and no more than two at the same facility.

4. Procedures for Portal Perimeter Continuous Monitoring

Each side may establish a portal perimeter continuous monitor around mobile ICBM production facilities of the other side. These facilities, as declared in the memorandum of understanding, are at Votkinsk (SS-25), Pavlograd (SS-24), and Promontory, Utah (MX). The procedures are summarized as follows:

- Host supplies maps of area; team deploys at facility and posts monitors at agreed points (allowed equipment is listed in Tables 5 and 6); team establishes secure telephone line to their embassy and installs backup radio link.
- Team occupies buildings supplied by host for monitoring activities; team installs fiber-optic perimeter fence monitor system; team checks out monitoring system; team reports to host as to maintenance, modifications, etc. needed for monitoring operations; the perimeter shall be secure and all vehicles and materials passing in and out shall be subject to monitoring by the inspection team.
- Team establishes agreed portal monitor stations (1 or 2) for entrance/exit through the perimeter fence.

— The team monitors all vehicles entering or exiting the portals; the team asks for and the host supplies information on the contents of all vehicles and containers exiting through the portals that might contain items of inspection (IOIs) or TLIs. Host may weigh vehicle to confirm no IOIs.
— If appropriate, the team inspects such vehicles or containers; if the host does not open containers for further inspection, the team measures lengths and diameters for comparison with MOU and other data; if necessary, the team requests more detailed inspection of contents of the vehicle or container, and/or requests need to make dimension measurements of items inside the vehicle or container; photographs may be requested for inspected items as needed. Unique identifiers (tags) are read.
— The team counts all IOIs and TLIs that exit the portals, compares with host-supplied information, and determines the number of ICBMs for mobile launchers that exit the facility each year; the team and host discuss any discrepancies.

The U.S. team reports regularly to the U.S. Embassy and the OSIA. Data from the PPCM monitoring stations are combined with the other inspection and NTM data by the verifying party to help determine the accuracy with which the other party has stayed within the inventories allowed by the treaty.

D. Verification of Eliminations and Conversions

In reducing their inventories of deployed SNDVs and warheads, the sides will have to carry out a process of elimination, or conversion, of certain treaty-limited items and facilities. These procedures will involve several types of ICBM silos; mobile ICBMs, launchers, and facilities; SLBM launchers; and heavy bomber forces.

The treaty provides for elimination and conversion processes and verification that enable or enhance confidence that these systems are indeed being eliminated or converted to nonnuclear uses. Such verification is intended to add to the effectiveness of each side's overall abilities to monitor strategic nuclear weapons inventories and capabilities.

Chart C is a summary of the elimination procedures and related verification procedures for each of the categories of weapons systems that may be eliminated or converted. In some cases, the verification involves NTM and cooperative measures only, and in others it also involves on-site inspections during the elimination or conversion

IV. JOINT COMPLIANCE AND INSPECTION COMMISSION

The START treaty establishes, in Article XV, a Joint Compliance and Inspection Commission "to promote the objectives and implementation of the provisions of the treaty." The treaty states that, if either party so requested, they would meet within the framework of the JCIC to

1. resolve questions relating to compliance

Chart C. Conversion, Elimination, and Verification Procedures

Weapons System	Conversions/Elimination Procedures	Verification
Silo-based ICBMs	Missiles and other equipment not to be eliminated are removed more than 1,000 m from silo; eliminate silo by excavation to 8 m or explosion to depth of 6 m	NTM and cooperative measures only; observe with satellite photos etc.; other side provides notifications of each step; silo area must be visible for entire process plus 90 days

SLBM launchers	Submarine moved to elimination facility; all SLBMs removed, in open; remove complete missile sections or all launch tubes and superstructure; all removed launch tubes cut in half; thereafter, submarine may be used only for uses other than SNDV carriers	NTM and cooperative measures only; observe with satellite photos etc; other side notifies; key process visible for start and for 10 days thereafter
Mobile ICBMs and launch canisters	Remove RVs, guidance and control systems; may remove propellent, penetration aids, etc. prior to OSI. launchers, canisters, stages, and motors destroyed by demolition or crushing; RV platform, rocket nozzles, etc. cut into pieces	OSI team arrives by standard procedures, confirms types of missiles to be eliminated; observes entire elimination process; team leader and host write report confirming elimination
Mobile launchers and related structures	Road erector launchers and rail-car launchers cut into two pieces; other hardware and structures similarly eliminated	OSI team arrives as above; observes entire elimination process; report written
Heavy bombers; former heavy bombers (elimination)	Prior to OSI, engines and equipment not part of airframe removed; elimination: tail severed, wings removed, fuselage cut in two pieces.	NTM, with notification, observes entire process; may make OSI by request; procedures similar to above
Heavy bombers (conversion)	Bombers with long-range nuclear ALCMs may be converted to nuclear non-ALCM bombers. Nuclear-armed bombers may be converted to nonnuclear. Details specified in elimination/conversion protocol (see Ref. 1).	Prior notifications specified; NTM used; may request OSI at a particular site; procedures similar to above

2. agree upon such additional measures as may be necessary to improve the viability and effectiveness of the treaty

3. resolve questions related to the development of a "new kind of strategic offensive arm" after the required notification of the first flight test of such a device.

The JCIC protocol spells out the make-up and procedures for meetings of the commission. Each party is to appoint a commissioner and deputy commissioner to represent it at JCIC meetings. Each party also has the right to be represented by alternates, members, advisers, and experts, as they so designate.

A regular or special session of the commission may be called at the request of either party. The agenda for a session may include questions submitted by the parties in advance, as well as questions that arise just before or during the session. The work of the commission is to be confidential, except as otherwise agreed. Communications pursuant to meetings of the JCIC are provided through the NRRCs.

The provisions for calling a special session are particularly significant. If either party has an urgent concern relating to compliance with the treaty, that party may request a special session of the JCIC to address that concern. The request states the type of strategic arm related to the concern and may propose a specific method for resolving the concern. Such methods may include a *visit with special right*

of access to the facility or location where the requesting party believes the activity of concern took place. The requested party must respond within seven days, either accepting the proposed method and/or site visit or proposing an alternative location and date for the special session and/or an alternative method for resolving the concern. The parties have the option to agree to a site visit with special right of access, conducted under provisions of the inspections protocol, and not convene the special session.

The JCIC protocol allows the parties to establish additional procedures for conduct of the commission. The protocol allows the JCIC to convene provisionally for up to twelve months under the rules of the protocol, starting with the date of treaty signature (July 31, 1991). It will convene under the treaty upon ratification (the JCIC has indeed been meeting provisionally in Geneva since October 1991). The JCIC provides a function similar to the special verification commission used with the INF treaty.

V. DISCUSSION

A. The Role of On-Site Inspections, National Technical Means, and Cooperative Measures

National technical means alone would not be sufficient to guarantee that START limitations were being adhered to by the nations of the former USSR. Cooperative measures, such as banning of data denial of telemetric information during missile test flights and displaying mobile missiles at specified times for satellite observation, enhance the value of NTM but still may not provide sufficient accuracy to the overall verification. The comprehensive on-site inspections add greatly to this accuracy since they enable a mechanism for spot checking the numbers of deployed SNDVs at specified sites, and for determining the number of warheads on particular SNDVs. This is particularly true for determining numbers of reentry vehicles per ICBM or SLBM, for determining the numbers of ALCMs per heavy bomber, and for checking on the distinguishability of nuclear-armed bombers compared to non-nuclear-armed bombers.

Of particular importance has been the downloading issue. By conducting on-site inspections to count the number of RVs per missile, there can be a measure of assurance that the declared downloading has some basis in fact. We cannot measure the number of RVs on each and every Soviet ICBM, but by using a reasonable number of short-notice RV inspections, we should gain some statistical confidence as to the actual downloading. The requirement for installing new platforms reduces the likelihood of rapid uploading.

If a significant number of critical violations by the other party are observed by the United States, in say twelve months time (without reasonable explanation), the other party would put the status of the treaty at risk—a treaty that their political leadership has viewed as very important to their overall national interests.

By systematically comparing the total inventories observed by NTM and continually spot checked by OSIs, the United States should have a fair measure of the degree to which the other party is staying within the overall treaty limits. In the case of the dangerous heavy SS-18s, we should have some confidence in our NTM observations alone because these missiles are in large, fixed sites whose characteristics have been observed for many years. Use of short-notice data update inspections (every six months) should add to the confidence that the SS-18s are being reduced at the agreed specified annual rate.

Suspect site inspections of suspect mobile-missile assembly facilities (not declared as such) may be made in response to any information gleaned from national technical means by satellite observations and/or by intelligence-gathering techniques. Careful coordination of short-notice SSIs with other verification should contribute to our knowledge of the other party's capabilities.

It seems clear that the effectiveness of the verification of the START treaty by the United States will be dependent on the effectiveness with which we are able to utilize national

technical means observations and our ability to coordinate NTM with the cooperative measures and with the on-site inspections. Continuous analysis of the input data from NTM and early OSIs will be conducted and will lead to decisions as to how best to use the follow-up OSIs. The efficiency with which we do this analysis and make these decisions will be important to the overall accuracy of our verification and knowledge of the numbers of deployed (and nondeployed) strategic nuclear weapons within the former Soviet Union.

B. Application of START Verification Procedures to Subsequent Arms Reductions

Since the START treaty was signed, the leaders of both parties have announced plans and proposals for additional strategic nuclear force reductions, both unilateral and bilateral. We list here those plans and proposals for which the notification, verification, and other provisions of the START treaty are most applicable.

On September 27, 1991, President Bush announced[12] that the United States would:

1. eliminate ICBMs at a faster rate than required by START (after ratification)
2. halt development of the MX rail garrison and mobile elements of Midgetman
3. cancel SRAM-II development
4. seek agreement with the USSR to ban all MIRVed ICBMs, under START provisions.

On October 5, 1991, former President Gorbachev announced[13] that the USSR would:

1. halt buildup of rail-mobile ICBM forces
2. discontinue development of a small mobile ICBM and of a Soviet SRAM
3. reduce to 5,000 START-accountable warheads (below the 6,000 limit)
4. after START ratification seek to begin talks on reducing forces a further 50 percent.

He noted that the USSR had already removed three SSBNs with forty-four launchers and was removing three more with forty-eight launchers.

More recently, President Bush in his State of the Union Address[14] to Congress in January 1992 announced additional unilateral START-related force reductions. These included that the United States will:

1. stop B-2 production after a total of twenty planes and cancel the Midgetman program
2. stop production of SLBM warheads, new production of the MX, and purchase of advanced ALCMs.

In addition, on condition of an agreement with the Commonwealth of Independent States, President Bush offered to

1. eliminate all MX ICBMs
2. reduce all Minutemen to one warhead each
3. reduce SLBM warheads by one-third
4. convert a substantial number of nuclear-armed heavy bombers to primarily conventional use.

These four reductions would be conditioned on Russian and commonwealth agreement to reduce all land-based ICBMs (former Soviet) to one warhead each.

On January 29, 1992, Russian President Boris Yeltsin, in a comprehensive statement[15] on disarmament, announced the following START-related unilateral force reductions (confirming or going beyond those listed by Gorbachev on October 5, 1991):

1. 600 ballistic missiles, along with 1,250 warheads, have been removed from operational readiness
2. 130 ICBM silos have been destroyed or are being prepared for destruction
3. deployed strategic weapons located in Ukraine will be dismantled sooner than planned
4. production of TU-160 and TU-95MS heavy bombers and of long-range ALCMs is being stopped
5. Russia will reduce the number of strategic weapons on operational readiness to the agreed number in three years instead of the seven years provided in START.

President Yeltsin proposed that the strategic weapons retained by the United States and Russia after the reductions not be targeted at each other. Yeltsin also stated that proposals

have been prepared (by Russia) to cut strategic force levels to 2,000-2,500 warheads on each side. He added that "In doing so, we hope that China, Britain, and France will join the real disarmament process."

Present and future strategic nuclear force reductions that go beyond those given in the START treaty as signed, such as many of those discussed above by Presidents Bush and Yeltsin, and former President Gorbachev, will involve reductions in the inventories of the parties, and thus will be covered by the appropriate baseline data notifications once START is ratified, and by subsequent data update notifications specified by the treaty. Thus the verification provisions (NTM, cooperative measures, and on-site inspections) provided by the treaty will automatically become applicable for monitoring each side's inventories as additional force reductions take place. We also note that President Bush's initiative called for utilizing the elimination procedures in the START agreement if the sides agree to eliminate MIRVs.

Putting in place an effective verification regime as provided for in START has the potential for ensuring the verification of future arms reductions going beyond those agreed to in the treaty, whether they be unilateral or by future mutual agreement.

As this is written, the ratification and implementation of the treaty are still in process. President Bush submitted the START treaty to the U.S. Senate for ratification on November 25, 1991, and the Foreign Relations Committee has conducted some hearings on the treaty during the early months of 1992. However, the situation in the states comprising the former USSR has been uncertain. Early on, the four former Soviet Republics where strategic weapons are deployed [Russia, Ukraine, Byelarus, and Kazakhstan] expressed support for START and pledged to fulfill its obligations. And though the Commonwealth of Independent States, comprising most of the former Soviet Republics, created a single unified military command for maintaining control of their strategic nuclear weapons, by the end of March 1992 the four nuclear republics had not achieved written agreements among themselves as to exactly how their nuclear weapons were indeed to be administered. U.S. officials have been encouraging such agreements in the hope of expediting the ratification and implementation process.

(On May 23, 1992, in Lisbon, Portugal, the foreign ministers of Russia, Byelarus, Ukraine, and Kazakhstan and the U.S. Secretary of State signed a protocol that bound these parties to the START treaty and which Secretary of State Baker stated created the basis for prompt ratification of the START treaty by the parties. At the just concluded Washington Summit of June 16-17, 1992, Presidents Bush and Yeltsin signed a joint understanding which called for reducing the number of strategic nuclear warheads to limits much below those provided for in the START treaty, and for utilizing the treaty for verification of these added reductions. The Washington Summit agreement and the Lisbon protocol are reported in more detail in the Executive Summary of this report.)

C. Verification Research

The START treaty was negotiated on the basis of existing verification technologies, and for a variety of reasons did not incorporate much "high-technology" equipment for use by the on-site inspectors. In many cases, size criteria, weight and dimensions, and obvious appearance represent the key observational techniques. In Tables 5 and 6 we list the types of equipment allowed by the treaty for use by the inspection teams. We note such items as satellite system receiver (for accurate global position), neutron detectors, programmable calculators and portable computers, infrared sensor systems, surveillance systems, PCs with hard disks, etc. as examples of some of the more sophisticated types of equipment that may be used. The treaty, its protocols, and annexes lay out the specific instruments and equipment that the parties have a "right" to use for each type of inspection. Additional verification instrumentation may be agreed to in the Joint Compliance and Inspection Commission if mutually beneficial.

Continued research and improvements in verification technologies, improvements in the types and use of instruments such as those listed above, development of new instruments that might be agreed for use by the JCIC, development of computer-based analysis techniques that could aid the overall verification coordination, etc., could make it possible to further enhance the verification accuracy of this treaty and future agreements.

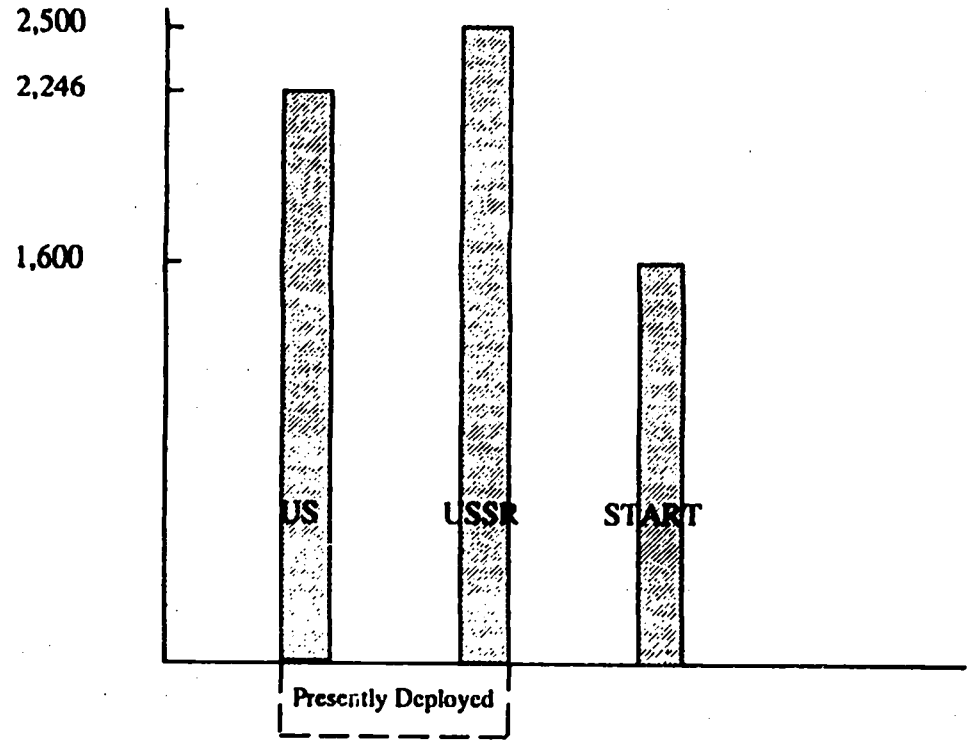
NOTES AND REFERENCES

1. "Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Reductions and Limtations of Strategic Offensive Arms," signed in Moscow, July 31, 1991. Complete START Treaty Document including text of Treaty, Protocols, Annexes, Memorandum of Understanding, and related Agreements, Letters, Supporting Documents, and Declarations (280 pp.), U.S. Arms Control and Disarmament Agency, Washington, D.C., 1991.
2. Patrick J. Garrity, "The U.S.-Soviet START Negotiations: Status and Implications," CNSS Paper no. 7, LA-11280-MS, April 1988.
3. David B. Thomson, "START: A Status Report, September 1990," CNSS Briefing, vol. 1, no. 6, September 28, 1990.
4. The related agreements included in the START Treaty Documents as signed in Moscow, July 31, 1991, are included in Ref 1.
5. U.S. Arms Control and Disarmament Agency, "Annual Report to Congress, 1988," March 14, 1989.
6. U.S. Arms Control and Disarmament Agency, "Annual Report to Congress, 1989," March 13, 1990.
7. U.S. Arms Control and Disarmament Agency, "Annual Report to the Congress, 1990," March 20, 1991.
8. For current types of ICBMs and SLBMs, the numbers of warheads per missile are as declared in the MOU and confirmed by inspection. For new types of ICBMs and SLBMs, the number of warheads is the larger of (1) the maximum number flight-tested or (2) the number determined by the "40 percent" rule. The number is subject to inspection. There was concern that a new-type missile might not be tested with as many warheads as it was capable of carrying. At a minimum, a new type will be attributed with the number of warheads determined by dividing 40 percent of the missile's throw-weight by the weight of the lightest RV flight tested.
9. "Message from the President of the United States transmitting The START Treaty signed at Moscow on July 31, 1991, including Annexes on Agreed Statements and Definitions, Protocols on Conversion or Elimination, Inspections, Notifications, Throw-weight, Telemetry, and the Joint Compliance and Inspection Commission; Memorandum of Understanding; all integral parts of the START Treaty." 102d Congress. 1st Session, U.S. Senate, Treaty Doc. 102-20. Nov. 25, 1991. U.S. Govt. Printing Office, Washington, D.C., 1991. This document includes: Transmittal Letter from President Bush to the U.S. Senate, Nov. 25, 1991; Submittal Letter from Secretary of State Baker to the President, Nov. 20, 1991; the complete text of the treaty, protocols, and other documents listed in the message; and an article-by-article analysis (by the administration) of the treaty, protocols, and other START documents.
10. William C. Potter, *Verification and Arms Control* (Lexington, Massachusetts: D.C. Heath, 1985).
11. Agreement on Early Exhibitions of Strategic Offensive Arms, pp. 246-47, Ref. 1.
12. President George Bush, nationwide televised address, September 27, 1991, *The Arms Control Reporter* (611.B695,6), IDDS 10-91; 675 Massachusetts Ave., Cambridge, MA 02139.
13. President Mikhail Gorbachev, national televised address, October 5, 1991, *The Arms Control Reporter* (611.B699,700), IDDS

10-91; 675 Massachusetts Ave., Cambridge, MA 02139.

14. President George Bush, State of the Union Address, January 28, 1992 (foreign policy excerpts), U.S. Department of State Dispatch, vol. 3, no. 5, February 3, 1992.

15. President Boris Yeltsin, Russian television address, January 29, 1992 (English version by TASS, Moscow), JPRS-TAC-92-006, February 14, 1992, pp. 11-13.



SNDV: ICBM, SLBM, or heavy bomber equipped for nuclear warheads (bombs, SRAMs, or ALCMs).

Fig. 1. START Limits: Deployed Strategic Nuclear Delivery Vehicles (SNDVs).

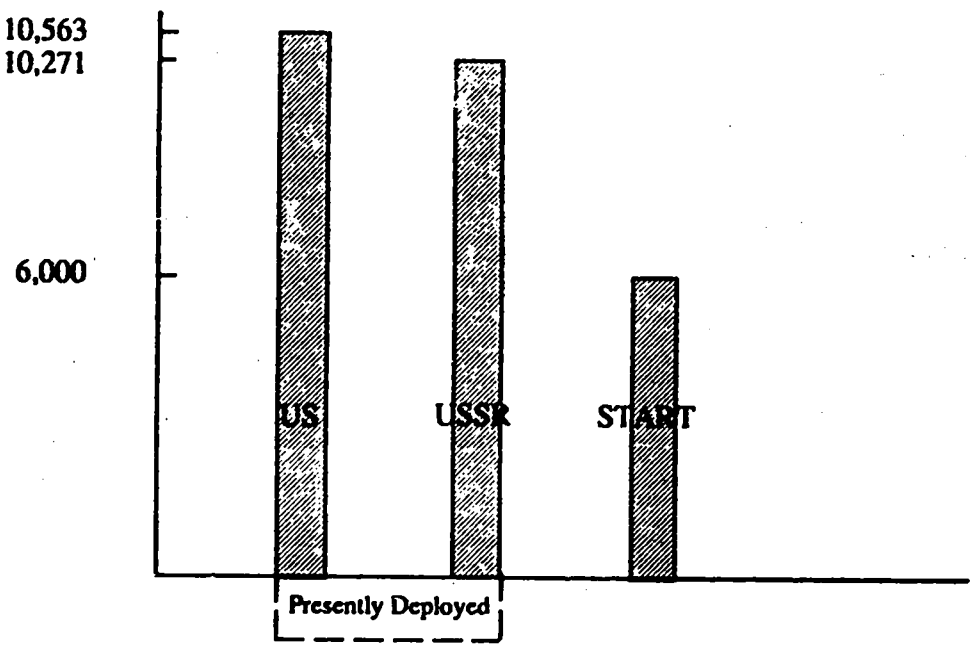


Fig. 2. Deployed Warheads (START Accountable).

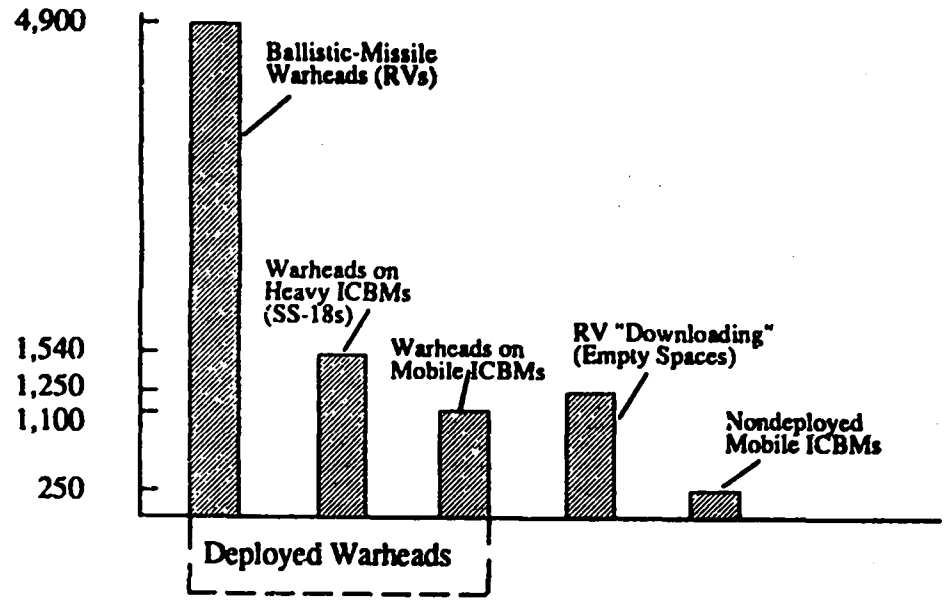
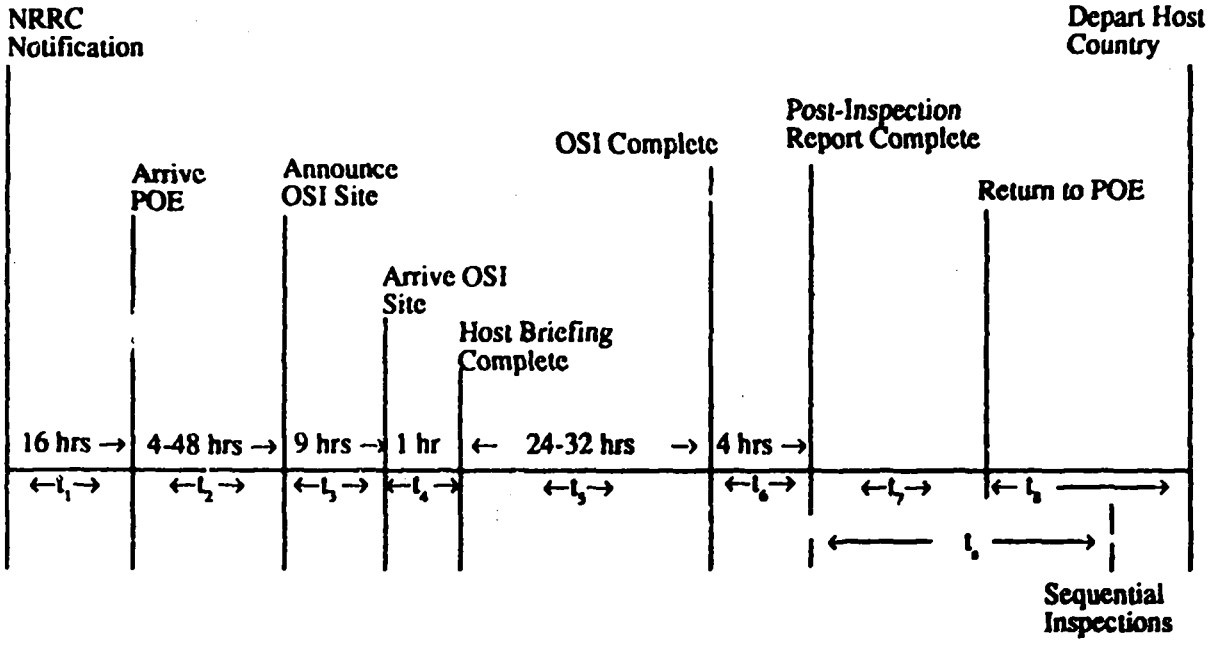


Fig. 3. Ballistic-Missile Warhead Sublimits.



OSI Travel Activities

- t_1 Inspection team flies (overseas) from home to host POE (includes time from notification).
- t_2 Time for team to rest, prepare for inspection; host inspects equipment etc.; team designates site; t_2 = 4-24 hrs for data update, suspect site, and RV OSIs.
- t_3 Host flies team to specified site (expeditiously).
- t_4 Host briefs OSI team upon arrival at inspection site.
- t_5 Actual specified OSI takes place (team may request extension).
- t_6 Team leader writes, completes report of OSI findings.
- t_7 Team returns to POE; announces sequential inspection by this time.
- t_8 Team prepares to leave, leaves POE for home, or conducts sequential inspection.
- t_9 Team conducts sequential inspection.

Fig. 4. On-Site Inspection Time Durations (does not include PPCM; time durations shown are for baseline, data update, and other "short-notice" inspections).

Inspection Times (t) in Hours for Fig. 4

Type OSI	t_1	t_2	t_3[a]	t_4	t_5	t_6	t_7	t_8
Baseline Data	≥16	4-48	≤9	1	24[b]	≤4	t_7[c]	24
New Facility	≥16	4-48	≤9	1	24[b]	≤4	t_7[c]	24
Data Update	≥16	4-24	≤9	1	24+8[d]	≤4	t_7[c]	24
RV Count	≥16	4-24	≤9	1	t_5(RV)	≤4	t_7[c]	24
Suspect Site	≥16	4-24	≤9	1	24+8[d]	≤4	t_7[c]	24
Conversion or Elimination	≥72	#	#	1	t_5(C,E)	≤4	#	24
Post-Exercise Dispersal	≥16	48	≤9	1	24+8[d]	≤4	t_7[c]	24
Close-Out	≥72	#	≤48	1	24+8[d]	≤4	#	24
Formerly Declared Facility	≥16	4-24	≤9	1	24+8[d]	≤4	t_7[c]	24
Exhibitions: RV Technical Characteristics	≥72	#	#	1	24[b]	≤4	#	24
Exhibitions: HB, ALCM; distinguishability	≥72	#	#	1	24[b]	≤4	#	24
Exhibitions: nonnuclear HB; baseline	≥72	#	#	1	24[b]	≤4	#	24

[a]See exceptions for mobile-missile sites etc. (Ref. 1).
[b]May be extended by mutual agreement as needed to complete inspection.
[c]These times are dependent on sequential inspections (see inspections protocol, Ref. 1).
[d]8-hour extension by agreement.
t_5 (RV) Upon completion of procedures in annex 3 of inspections protocol, Ref. 1.
t_5 (C,E) dependent on conversion/elimination activities.
These time durations for the "scheduled" inspections will be dependent on the host exhibition activities for these cases.

Table 1. Summary of START Force Limitations

CATEGORY	PROVISIONS AND NUMERICAL LIMITATIONS
General Provisions	U.S. and USSR will reduce their accountable deployed strategic nuclear arms by about 30% to equal accountable levels.
	Reductions will be achieved by eliminations or conversions.
	Eliminations or conversions will be carried out in three phases over seven years to agreed levels at the end of each phase. These levels are: 3 yrs: SNDVs ≤2,100; WHs ≤9,150. 5 yrs: SNDVs ≤1,900; WHs ≤7,950. 7 yrs: Limits are as described below.
	Modernization and replacement may be carried out except as specifically prohibited.
	The treaty's duration will be fifteen years unless superseded. The treaty may be renewed at five-year intervals.
	No transfer of strategic nuclear arms to third countries, but existing patterns of cooperation (i.e., U.S./UK) may continue.
Overall Limits	
SNDVs	No more than 1,600 deployed ICBMs and their associated launchers, SLBMs and their associated launchers, and heavy bombers will be allowed either side after a sever-year reduction period.
Nuclear Warheads	No more than 6,000 accountable warheads may be deployed on ICBMs, SLBMs, and heavy bombers after the seven-year reduction period. A bomber with only gravity bombs and SRAMs will count as one toward the 6,000 limit.
Throw-weight (total)	No more than 3,600 metric tons
Overseas Basing	Not permanently permitted. Temporary overseas basing of bombers permitted with applicable notifications. Port calls for SSBNs permitted.
Sublimits and Restrictions	
Ballistic-Missile Warheads	No more than 4,900 nuclear warheads on ICBMs and SLBMs. No more than 10 RVs per ballistic missile.

Table 1. (continued)

Downloading	No more than 1,250 "empty spaces" reducing the START count of RVs on ballistic missiles with demonstrated MIRV capabilities. Heavy ICBMs (SS-18s) may not be downloaded. Downloading restrictions for SS-N-18, MMIII, etc. (see treaty Art. III, Par. 5).
Heavy ICBMs	No more than 154 heavy ICBMs (applies only to SS-18). No new-type heavy ICBMs. No more than 154 silos for heavy ICBMs. Soviets will eliminate 22 SS-18 launchers per year for seven years to reduce to 154 limit.
Heavy ICBM Warheads	No more than 1,540 warheads on heavy ICBMs.
Heavy SLBMs	No heavy SLBMs and no heavy SLBM launchers.
Mobile ICBMs	No more than 1,100 warheads on mobile ICBMs. No mobile launchers of heavy ICBMs. SS-24, SS-25, and MX treated as mobiles.
Heavy Bombers	Each nuclear-armed heavy bomber counts as one SNDV. Each bomber may carry more than one bomb (and/or SRAM) and will still count as one against the warhead limit. U.S. agrees not to count Backfire (Tupolev 22-m). Soviets will, by declaration, limit Backfires to ≤300 air force and ≤200 naval, and not give them intercontinental capability.
Heavy Bombers with ALCMs	Nuclear-armed ALCM bombers must be distinguishable from nonnuclear bombers. Each ALCM-equipped bomber counts as 10 ALCMs for U.S. and 8 ALCMs for USSR. The U.S. may count no more than 150 bombers as carrying 10 ALCMs, and the (former) USSR no more than 180 bombers as carrying 8 ALCMs. If these values are exceeded, each bomber in excess will be counted as carrying the actual number of ALCMs for which it is equipped. For the U.S., an ALCM heavy bomber may actually be equipped for no more than 20 nuclear-armed ALCMs per bomber. For the USSR, an ALCM heavy bomber may actually be equipped for no more than 16 such ALCMs per bomber. Bombers may be removed from SNDV and warhead counts if converted to carry nonnuclear weapons only.

Table 1. (continued)

Nonnuclear Heavy Bombers	≤75 (excluded from SNDV and WH counts).
Test Heavy Bombers	≤20 (excluded from SNDV and WH counts).
ALCMs	Each nuclear-armed ALCM counts as one warhead under the counting rules for bombers listed above. Nuclear ALCMs are counted (long-range) if their range is greater than 600 km. Nonnuclear-armed, long-range ALCMs are not counted if they are distinguishable from nuclear-armed ALCMs.
SLCMs	SLCMs are not directly constrained in the treaty, but each year each side must declare its policy for planned deployments of nuclear SLCMs (of range greater than 600 km) for the next five years, and these declarations are binding. These planned deployments must provide for no more than 880 SLCMs for each side. There will be no nuclear multiple warhead SLCMs. Nuclear-armed SLCM, 300 ≤ range ≤600 km, subject to confidential annual data exchanges. The declarations containing these agreements were included with the July 31, 1991, treaty documents.
Specific Prohibitions	These prohibitions apply to both the U.S. and the USSR: - No heavy SLBMs or launchers - No mobile launchers of heavy ICBMs - No rapid reload of ICBM launchers - No long-range nuclear ALCMs with multiple warheads - No new-type heavy ICBMs - No new-type ballistic missiles with more than 10 RVs (New type defined as any missile whose throw-weight was increased by ≥21% or whose stage-length changed by ≥5%.). - No increase in number of ICBM or SLBM warheads from those listed in MOU - No more than two new-type ICBMs or SLBMs with front section of fundamentally new design - No increase in launch-weight or throw-weight of existing heavy ICBMs or SLBMs - ICBMs may be deployed only in silos or road/rail mobile launchers - No underground facility accessible to SSBNs - No conversion of SLBM to land-mobile ICBM - No ballistic missiles with a range over 600 km for waterborne vehicles, except submarines - No ballistic-missile launchers on seabed - No systems for placing nuclear weapons in orbit

Table 1. (continued)

	• No air-to-surface ballistic missiles • No basing of TLIs outside the national territories of the parties • No nuclear weapons on an aircraft with a range greater than 8,000 km that is not an airplane • No nuclear armed ALCMs on airplanes other than bombers. The U.S. unilaterally states that it does not plan to place nuclear-armed ALCMs on the B-2 bomber unless flight tested and exhibited.
Nondeployed Weapons	
Mobile ICBMs	There may be no more than 250 nondeployed ICBMs of types previously flight tested from mobile launchers, ≤125 of these may be for rail-mobiles. Nondeployed mobile launchers of ICBMs will be limited to 110. No more than 18 of these may be rail-mobile launchers. At a maintenance facility, nondeployed ICBMs shall be stored separately from nondeployed mobile launchers. There may be no more than two nondeployed ICBMs of each type specified at a maintenance facility for mobile launchers. Additional restrictions given in treaty Art. IV.
ICBMs and SLBMs	Nondeployed silo ICBMs and SLBMs are not subject to aggregate numerical limits but are subject to requirements for data exchange (specific types in MOU) and notification. Example: transit of nondeployed ICBMs and SLBMs must be stated in a notification.
Test Ranges	ICBMs and SLBMs located at test ranges are limited to ≤35 at one time; ≤25 after 7 yrs.
Other Restrictions (ICBMs and SLBMs)	There are further detailed restrictions as to locations of specific nondeployed ICBMs and SLBMs (see treaty Art. IV).
Bombers/ALCMs	The treaty provides no number limit on nondeployed bombers and ALCMs.
Warheads	The treaty provides no limit on the total number of nondeployed nuclear warheads.
Bomber Exercises	The U.S. and USSR have agreed to allow each side one bomber exercise per year, with agreed notification procedures.

Table 1. (continued)

Conversion of TLI	Provisions specified. (see conversion/elimination protocol)
Elimination of TLI	Provisions specified. (see conversion/elimination protocol)
ICBM Facility Locations (production, repair, storage, loading, and conversion)	Each such facility must be located >100 km from any ICBM base for that type (silo, mobile, test range). See treaty Art. IV.

Table 2. U.S. and USSR Strategic Nuclear Deployments (START counting rules used for warheads per SNDV)

Type	Launchers[a]	Warheads/Launcher[a]	Total Warheads[a]
United States			
ICBM			
Minuteman II	450	1	450
Minuteman III	500	3	1,500
MX	50	10	500
Subtotal (ICBM)	1,000		2,450
SLBM			
Poseidon	192	10	1,920
Trident I	384	8	3,072
Trident II	96	8	768
Subtotal (SLBM)	672		5,760
Bombers			
B-1B	95	1[b]	95
B-52(non-ALCM)	290	1[b]	290
B-52(ALCM)	189	10 (39 @ 12)[b]	1968[b]
Subtotal (Bombers)	574		2,353
Total SNDVs	2,246	Total Warheads	10,563
USSR			
ICBM			
SS-11	326	1	326
SS-13	40	1	40
SS-17	47	4	188
SS-18	308	10	3,080
SS-19	300	6	1,800
SS-24	89	10	890
SS-25	288	1	288
Subtotal (ICBM)	1,398		6,612

Table 2. (continued)

SLBM			
SS-N-6	192	1	192
SS-N-8	280	1	280
SS-N-17	12	1	12
SS-N-18	224	3	672
SS-N-20	120	10	1,200
SS-N-23	112	4	448
Subtotal (SLBM)	940		2,804
Bombers			
Blackjack (ALCM)	15	8[b]	120
Bear (ALCM)	84	8[b]	672
Bear (non-ALCM)	63	1[b]	63
Blackjack (non-ALCM)	0	1[b]	0
Subtotal (Bombers)	162		855
Total (SNDV)	2,500	Total Warheads	10,271

[a]Values given in MOU, signed July 31, 1991.

[b]Attributed by START Bomber/ALCM counting rules.

Table 3. Summary of Provisions for Verification of Compliance

CATEGORY	PROVISIONS
Data Exchange	Both sides provided inventory data (MOU) at signing of the treaty. The data will be updated every six months during the life of the treaty. These data include the number of TELs, site locations, and characteristics.
National Technical Means	Each side will use NTM. The sides agreed not to interfere with NTM. Encryption of telemetric data is banned during flight tests. The treaty provides for cooperative measures, including notified open displays of deployed mobile ICBMs and bombers.
On-Site Inspections	Each side will conduct twelve kinds of OSIs.
On-Site Inspection Regimes	Inspections may be conducted of baseline data, data updates, new facilities, reentry vehicles per missile, post-exercise dispersals, facility close-outs, and formerly declared facilities. Exhibitions of technical characteristics [for ICBMs, SLBMs, bombers, and ALCMs (nuclear vs. nonnuclear)] will be inspected by the other party using OSI procedures.
Trial Exhibitions of Counting Rules and RV Demonstration	There have been trial inspections of selected SNDV systems to demonstrate counting rules.[a]
Verify Elimination and Conversion of TLI	Notifications of eliminations or conversions are issued by each party. The other party observes by NTM and cooperative measures, or observes by OSI.
Suspect Sites	Short-notice inspections may be conducted of suspect mobile-missile assembly at sites listed in the MOU (for USSR: Zlatoust, Bershet, and Petropavlovsk; for U.S.: Ogden, Sacramento, and Magna.)
Inspection Quotas	Fifteen OSIs (data update + SSI) per year. Ten RV OSIs per year. Other OSIs are in response to specific notifications.
PCM	There will be a portal perimeter continuous monitor (PPCM) of the declared mobile ICBM assembly facilities (Votkinsk, SS-25; Pavlograd, SS-24; Promontory, Utah, MX).

Table 3. (continued)

Specific Systems	
Mobile Ballistic Missiles	Mobile-missile deployments are restricted to specific areas to assist verification, movement notifications and procedures for NTM, cooperative measures, and OSIs are spelled out.
Heavy Bombers/ALCMs	Both sides have completed trial exhibits of heavy bombers with ALCMs to distinguish them from non-ALCM bombers.[b] Procedures were specified for additional exhibitions (see sec. III.C. of this report).
SLCMs	Separate declaratory SLCM limits will be verified by NTM only.
Nondeployed Weapons	
Nondeployed SNDVs	Nondeployed mobile-missile location restrictions may be verified during data update OSIs of ICBM bases.
Nondeployed warheads	No verification regimes proposed.

[a]Demonstration of procedures for on-site inspection of RVs for

U.S. Peacekeeper (MX)	April 25-26, 1990
Soviet SS-18	May 11, 1990
U.S. SLBM	May 29-30, 1990
Soviet SLBM	June 12, 1990

[b]An exhibition of heavy bombers with ALCMs to observe the demonstration of procedures for distinguishing from non-ALCM-equipped bombers, by each side. Exhibition of

Soviet Tupolev heavy bomber	April 18, 1990
U.S. B-1 heavy bomber	May 11, 1990

Table 4. Highlights of On-Site Inspection Procedures

GENERAL OSI RULES	
Inspection Organization	Inspectors, monitors, and aircrew provided in verification protocol. Allows 400 names on inspectors list, 300 monitors, and unlimited aircrew.
Notifications	Inspecting party must notify host, ≥16 hrs prior to arrival of OSI team at POE, of intent to conduct baseline data, data update or any other type OSI except those for exhibitions, conversion/elimination, or close-out. They require >72 hrs advance notice. See Fig. 4 for subsequent OSI time durations. Appropriate notifications must be given at each stage of the OSI.
Air Transportation	U.S./USSR each have 2 points of entry. Must file flight plan within listed time constraints.
OSI Team Logistics	Must enter thru POE closest to site to be visited. All equipment and supplies subject to host inspection. Equipment not related to treaty may be impounded. Equipment and supplies may be stored at POE under inspector's lock and key. Access to equipment requires presence of both parties. Provision made by host for food, lodging, transportation, etc., of inspectors.
OSI Team Rules	Host must provide telephone line from embassy to POE and inspection site. Host must assure inspectors arrive at site <9 hrs after naming of site. Inspectors may use specified equipment (see Table 5). Instant development cameras operated only by hosts, for inspectors. OSI team may use ≤20 persons for inspection of conversion or elimination. OSI team may use ≤10 persons for other inspections (>two inspectors must speak host language). Inspection duration shall be ≤24 hrs except for exhibitions, conversions, or eliminations. May extend for ≤8 hrs by request. Post-inspection procedures, including report, must be completed by ≤4 hrs. Information gained thru OSI requires host permission for third-party disclosure.

Table 4. (continued)

PPCM Team Rules	Team used for portal perimeter continuous monitor of mobile-missile production facilities. Team may use ≤30 persons. Monitors may be replaced as needed. Monitors may use specified equipment (see Table 6). Team establishes continuous perimeter monitor of the facility with portals for exit/entrance and monitoring of vehicles. Team inspects for TLIs.
SPECIFIC TYPES OF OSIs	
Inspections for Baseline Data, Data Updates, New Facilities	General Rules (as above).
Baseline Data	OSIs start 45 days after and end 165 days after entry into force (EIF) of START treaty. Teams will inspect large number of sites to help verify inventory data given in MOU.
Data Update	OSIs start 165 days after EIF. Certain movement restrictions apply one hour after notification of site. Each party may conduct fifteen data update OSIs per year.
Suspect Site	Each party may request SSI of one of three facilities listed in MOU that satisfies criteria for mobile-missile assembly capability. Challenged party may deny request for SSI, but steps must be taken to resolve issue. Formerly declared facilities may also meet requirements for SSI.
RV Inspections	Treaty permits ten inspections per year at ICBM and SLBM bases. Team follows general procedures similar to data update inspections but specific procedure required for viewing front section of selected missile to determine number of RVs. TLI movement restrictions apply to host at base during RV inspection.
Post-Exercise Dispersal (mobile missiles)	Treaty permits OSIs of deployed mobile missiles after an exercise dispersal to confirm inventory specified for that base.
Conversion/Elimination of TLIs	OSIs similar to INF treaty, but address both missiles and aircraft.
Close-Out Inspections	OSIs to confirm treaty-limited activities have ceased at site so declared and to confer change of status.

Table 5. Equipment for OSIs[a]

Equipment Characteristics	2-10	P6	P11	12,13	PPCM
Measuring tapes (30 m)	X		X	X	X[b]
Measuring tapes (3 m), M. stick (3 m)	X	X	X	X	X[b]
Plumb bobs, etc., 50 yds	X		X	X	
Cameras (w/flash, Polaroids, tripod, and filters)	X		X	X	X[b]
Flashlight, compass, and pocket calculator	X	X	X	X	X
Tamper indicating tape	X	X	X		
Dosimeters (ionizing and TLD) and chargers	X	X	X	X	
Satellite system receivers (provided by host)	X	X			
Neutron detectors w/electronic counters[c]	X	X		Y	
Neutron calibration source	X			Y	
Programmable calculator (HP 27)	X	X			
Hand tools	X	X	X	X	X
Magnifying glasses			X		
Calipers (20 cm)			X	X	
Combination square			X	X	
Hand levels				X	
Weighing devices (to be agreed by JCIC)			X		
Engineering site survey equipment and topographical maps					X
Portable computers, printers, and copier					X
Portable Fax					X
Video cameras (w/portable recorders, TV monitor)					X

[a]List includes principal equipment provided for U.S. teams. There is a similar list for USSR teams. The headings for the right-hand columns define the types of inspections for which the checked (X) equipment is provided (annex 8, inspections protocol, Ref. 1). The numbers refer to the defining paragraphs in Art. XI of the treaty. These are:

- 2-10 baseline data, data update, new facility, suspect site, post-exercise dispersal, conversion/elimination, close-out, and formerly declared facility.
- 6 reentry vehicle (RV).
- 11 technical characteristics exhibitions (ICBMs, SLBMs).
- 12,13 distinguishability exhibitions (heavy bomber, ALCM); baseline exhibitions for nonnuclear bombers.

PPCM perimeter portal continuous monitoring (listed in annex 8, inspections protocol).
Types checked (Y) indicate "right" to radiation measurements established in annex 4, inspections protocol.
[b]"As agreed by parties."
[c]"Right" to use neutron detectors specified only for ALCM distinguishability OSIs. All equipment may be inspected by host at POE.

Table 6. Equipment for Perimeter Portal Continuous Monitoring[a]

Equipment for PPCM (annex 9, inspections protocol)

- Vehicle dimensional screening
  - Infrared breakbeam system (metal base, infrared sensors)
- Weight sensors (provided by host)

- Surveillance system
  - Character generators
  - TV cameras (monochrome, adjustable mounting heads, towers, etc.)
  - TV monitors
  - Fiber optic cables, other cabling
  - Exterior lighting poles, lights
  - Data authentication devices

- Vehicle sensors and control equipment
  - IR breakbeam system
  - Induction-loop sensors
  - Gate-opening sensors
  - Traffic signal lights
  - Semaphore gates
- Communications equipment
  - Telephone, hand radios, and intercom
- Environmental shelter
- For use along perimeter
  - Video motion-detection equipment
  - Data authentication devices
  - Cabling as required
  - Surveillance system as above
- Operations center building
  - Backup power generator
  - Power supply equipment, etc.
- Operations center equipment
  - Programmable logic controller memory module
  - Control panel
  - Printers for PCs
  - PCs (hard & floppy disks, monitors, etc.)
  - TV and PC equipment
  - Software for PCs
  - Photocopying equipment
  - Communications
    - Laser Fax, telephone system, and intercom
    - Base station radio receiver, hand-held radio, and antennas
    - Fiber optic cabling
  - GPRs (by host)

[a]List includes principal equipment provided for U.S. teams. Similar list for USSR.
All PPCM equipment may be inspected by host at POE.

Table 7. Inspection Starting Times

Type of OSI	Starting Time
Baseline Data	t_0 + 45 days to 165
New Facility	t_0 + 45
Data Update	t_0 + 165
RV Count	t_0 + 165
Conversion/Elimination	t_0 + 45
Post-Exercise Dispersal	t_0 + notification
Close-Out	t_0 + notification (within 60 days of notification)
Formerly Declared Facility	t_0 + 165
RV Technical Charactenstics Exhibitions for ICBMs and SLBMs	Within 240 days after treaty signature (July 31, 1991)
HB/ALCM Distinguishability	Within 240 days after treaty signature (July 31, 1991)
Suspect Site	t_0 + 165
PPCM	t_0 + 30
	t_0 = EIF (entry into force of treaty; after ratification)

APPENDIX[1]

EXPANDED TABLE OF CONTENTS[2]

[1]Taken from Ref. 1.

[2]The 19 Articles in the Treaty Text and the Agreed Statements do not have titles, but titles have been added to this table of contents to assist the reader. Other titles in this table have been shortened slightly. Only the titles as they appear in the actual treaty text are official.

18. Andersen Air Force Base, Guam
19. Mobile Space Launchers
20. Reuse of Launch Canisters
21. Changes to the MOU
22. Relationship Between START and the INF Treaty
23. The Term "Accessible" with Respect to Underground Facilities
24. Front Section of Fundamentally New Design
25. Definition of "Variant" for ICBMs and SLBMs
26. Declaration of Space Launch Facilities at Eliminated-ICBM Bases
27. Exemption for Soft-Site Launchers at Cape Canaveral
28. Restrictions on ICBM and SLBM First Stages
29. STARS Booster Exempt from START
30. Space Launch Vehicles from Ships other than Submarines and from Airplanes other than Heavy Bombers
31. Telemetry Protocol Applicability to Objects in Orbit
32. Throw-weight of New Types of Missiles Deployed before the Eighth Flight Test
33. Special Purpose Submarines
34. Verifying Length and Throw-weight for New Types
35. Reimbursement of Costs for Telemetry Tape Exchange
36. Ban on Multiple Inspections of Certain U.S. Airbases
37. Management of Retired and Former Types of ICBMs and SLBMs
38. Reference Cylinders for ICBMs for Mobile Launchers of ICBMs with Liquid-Propellent Rocket Engines

Annex on Terms and Their Definitions
Definitions of 124 terms are set forth, in alphabetical order.

Protocol on Procedures Governing Conversion or Elimination

Section I: ICBMs for Mobile Launchers of ICBMs and their Launch Canisters
Section II: Silo Launchers, Silo Training Launchers, and Silo Test Launchers
Section III: Mobile Launchers of ICBMs, Mobile Training Launchers and Fixed Structures for Mobile Launchers of ICBMs
Section IV: SLBM Launchers
Section V: Soft-Site Launchers
Section VI: Heavy Bombers and Former Heavy bombers
Section VII: Removal from Accountability of ICBMs for Mobile Launchers of ICBMs as a result of Flight Tests or Static Testing
Section VIII: Other Procedures for Removal from or Changes in Accountability
Section IX: Facilities

Protocol on Inspections and Continuous Monitoring Activities

Section I: General Obligations
Section II: Legal Status of Inspectors, Monitors, and Aircrew Members
Section III: Notifications of Inspections and Continuous Monitoring Activities
Section IV: Arrangements for Air Transportation
Section V: Activities Beginning at the Point of Entry
Section VI: General Rules
Section VII: Baseline Data, Data Update, and New Facility Inspections
Section VIII: Suspect Site Inspections
Section IX: Reentry Vehicle Inspections
Section X: Post-Dispersal Inspections

Section III: Special Session
Section IV: Agenda
Section V: Work of
Section VI: Costs
Section VII: Communications
Section VIII: Additional Procedures

Memorandum of Understanding
on the Establishment of the Data Base

Section I: Warhead and Throw weight Attributions
Section II: Aggregate Numbers
Section III: Attribution with Reduced Number of Warheads
Section IV: Additional Aggregate Numbers

Annex A: ICBMs and ICBM Launchers
Annex B: SLBMs and SLBM Launchers
Annex C: Heavy Bombers and Former Heavy Bombers
Annex D: Space Launch Facilities
Annex E: Eliminated Facilities
Annex F: ICBM and SLBM Technical Data
Annex G: Heavy Bomber Technical Data
Annex H: Long-Range Nuclear ALCM Technical Data
Annex I: Other Data Required by the Treaty
Annex J: Other Requirements

Related Agreements

Agreement on Early Exhibitions of Strategic Offensive Arms

Agreement on Early Exchange of Lists of Inspectors, Monitors, and Aircrew Members Proposed for Inspections and Continuous Monitoring Activities

Agreement on Exchange of Coordinates and Site Diagrams (Not Released to the Public)

Agreement on Reciprocal Advance Notification of Major Strategic Exercises

Letters Signed by U.S. and Soviet Representatives

Phased Reductions of Heavy ICBMs

Bear D

B-1

Silo Launch Control Centers

Launch Canisters

Engineering Site Surveys

Providing Photographs

Certain Correspondence Related to the Treaty

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ABSTRACT

An overview of the Strategic Arms Reduction Treaty (START) and its associated protocols, annexes, and agreed statements is presented. Also examined in detail are the verification provisions in the treaty and their implications for arms control. The expanded table of contents of the treaty document is included as an Appendix. The negotiations since 1982 leading up to the signing of the treaty are summarized.

*Contact NTIS for a price quote.