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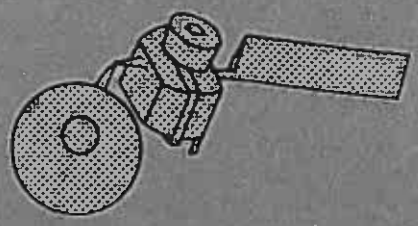

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Watching START Take Off

The Verification of a Complex Arms Control Treaty

A Briefing by
The Verification Technology Information Centre

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Watching START Take Off
The Verification of a Complex Arms Control Treaty

The Strategic Arms Reduction Treaty (START) will be the first arms control treaty to actually decrease the strategic nuclear arsenals of the US and the Soviet Union. On the eve of the signing of the START treaty, this VERTIC briefing looks into START: what's covered by the treaty, what are the counting rules, how are the strategic arsenals currently composed, and how will the treaty be verified. The overview of the verification regime will look into all aspects of START verification: (on-site inspections, remote sensing and intelligence gathering (National Technical Means), and cooperative ventures). Controversial issues throughout the design of the verification regime are also outlined.

1. History

The START talks are the third series of US-Soviet strategic arms reduction talks. The Strategic Arms Limitation Talks (SALT), held from 1969 to 1979 produced the 1972 SALT I Interim Agreement, the 1972 Anti-Ballistic Missile (ABM) Treaty, and SALT II Accord. The SALT II Accord was signed in 1979, but fell by the wayside as the US Senate never ratified it.

START negotiations were proposed by the Reagan Administration in 1982. The new talks were to focus on actually reducing the number of weapons by limiting missiles and warheads rather than limiting launchers.

2. Limits and Counting Rules

START, like the SALT talks before it, limits US and Soviet strategic nuclear forces. These are the intercontinental weapons, powerful enough to reach the US from the Soviet Union, or vice versa. This includes silo-based and mobile intercontinental ballistic missiles (ICBMs), sea-launched ballistic missiles (SLBMs), and air-launched cruise missiles (ALCMs). The treaty states numbers only for those weapons that are deployed, and does not broadly limit weapon modernization.

Both missiles and bombers, referred to as strategic nuclear delivery vehicles (SNDVs) and warheads themselves are limited by the treaty. (Nuclear gravity bombs and short-range attack missiles (SRAMs) are also limited by the treaty.) Each side must reduce to the following numbers over the course of seven years, which will be divided into three periods of three, two and two years:

- 1600 SNDVs (ICBMs, SLBMs or nuclear-carrying heavy bombers) with 6000 warheads

Sublimits are as follows:

- 4900 maximum warheads on ICBMs and SLBMs combined
- 154 maximum heavy ICBMs (SS-18) with 1540 maximum warheads
- 1100 maximum warheads on mobile missiles (SS-24 and SS-25s, potentially Midgetman, potential MX/Peacekeepers)

The START counting rules specify how many warheads are counted for each type of missile or launcher. They are as follows:

US:		Soviet Union:	
MX/Peacekeeper	10	SS-11	1
Minuteman II	1	SS-13	1
Minuteman III	3	SS-17	4
Trident I	8	SS-18	10
Trident II	8	SS-19	6
Poseidon	10	SS-24	10
		SS-25	1
		SS-N-6	1
		SS-N-8	1
		SS-N-17	1
		SS-N-18	7
		SS-N-20	10
		SS-N-23	4

Downloading:

To simplify the disarmament process, each side has the option of downloading up to 1250 warheads from up to 3 different missile types.

Downloading is the removal of a fraction of the total number of warheads on a missile. Along with dismantling missile systems, downloading is an additional way of reducing warheads to the specified sublimits. The USSR is considering the downloading of the SS-N-18 from 7 warheads per missile to 3 warheads per missile. Similarly, the US is considering the downloading of the Minuteman III from 3 warheads per missile to 1 warhead per missile.

Mobile missiles:

Road-mobile missiles will be confined to a restricted area of 25 square kilometres.

These missiles may be deployed within a 125 square kilometre area.

However, in a time of national emergency these restrictions will not apply

Rail-mobile missiles will be confined to a rail garrison, but there will be an unlimited deployment area.

There are limits on the number of rail-mobile missiles which can be housed in sheds and garages, so that there is a counting rule of one missile per garage.

Neither cruise nor ballistic missile launchers can be placed on or tethered to the ocean floor, the seabed, beds of internal waters, or the subsoil thereof.

Sea-launched cruise missiles (SLCMs):

Sea-launched cruise missiles are not covered under the treaty. In a separate, politically binding agreement, each side is allowed 880 nuclear SLCMs with a range of greater than 600 kilometres.

Heavy bombers:

Each bomber carrying nuclear gravity bombs and/or nuclear short-range attack missiles (SRAMs) counts as 1 SNDV with 1 warhead.

Under START, a bomber is considered an ALCM carrier if it holds nuclear ALCMs with a range greater than 600 kilometres.

The first 150 US ALCM carriers (B-1 or B-52) count as having 10 warheads. The first 210 Soviet ALCM carriers (Bear and Blackjack bombers) count as having 8 warheads. Beyond those numbers, the ALCM carriers count as having as many warheads as actually carried.

150 US ALCM carriers may not carry more than 20 ALCMs. 210 Soviet ALCM carriers may not carry more than 12 ALCMs.

Although unlimited numbers of ALCMs can be produced, they cannot be stored near bomber bases.

Non-nuclear heavy bombers are not limited by the treaty.

The Soviet Backfire bombers are not limited by START.

Modernization:

Modernization of weapons is, in general, not limited. This had been an issue in the case of the Soviet SS-18; it was resolved that new models of the SS-18 could not carry any heavier payload than the existing SS-18s, including warheads.

There is a restriction on heavy missiles (defined as having a throw-weight greater than or equal to that of the SS-18). Neither side can develop and

deploy new types of heavy missiles or new types of missiles with more than ten warheads.

Other modernization, such as improved accuracy, fuel efficiency or warheads, will not be limited.

Missiles which are follow-ons from older missiles is defined as new if their change in throw-weight is at least 21% and in length 5%. Such changes have to be demonstrated in flight testing over a minimum range of 11,000 km.

Non-circumvention:

Both sides are prohibited from circumventing the treaty by passing strategic weapons or weapons technology into the hands of third parties. This does not prohibit the US from providing Trident submarines to the UK, nor does it prohibit US-UK nuclear weapons ties in general, as long the programs do not upset the strategic balance.

Although the result of all the treaty limitations will not match the originally predicted 50 percent cut in total strategic warheads, there will be a 50 percent cut in the total deliverable destructive power of the Soviet nuclear arsenal. Additionally, there will be a 50 percent reduction in Soviet SS-18s, the largest Soviet missile. In return, the US waived its requirement for a cut in the number of SS-18 test flights.

3. EXISTING FORCES

US and Soviet strategic arsenals were as follows at the end of 1990:

USA:

	Launchers	Warheads
ICBMs		
Minuteman II	450	450
Minuteman III	500	1500
MX	50	500
TOTAL	1000	2450
SLBMs		
Poseidon C-3	176	1760
Trident I C-4	384	3072
Trident II D-5	48	384
TOTAL	608	5216
Bombers		
B-1B	90	1600
B-52G/H	154	1100
FB-111A	24	1600
TOTAL	268	4300

USSR:

	Launchers	Warheads
ICBMs		
SS-11 Mod 2	100	100
SS-11 Mod 3	210	210
SS-13 Mod 2	30	30
SS-17 Mod 3	50	200
SS-18 Mod 4, 5, 6	308	3080
SS-19 Mod 3	250	1500
SS-24 Mod 1, 2	86	860
SS-25	300	300
TOTAL	1334	6280
SLBMs		
SS-N-6	176	176
SS-N-8 Mod 1, 2	286	286
SS-N-17	12	12
SS-N-18 Mod 1, 3	224	1568
SS-N-20	120	1200
SS-N-23	96	384
TOTAL	914	3626
Bombers		
Bear H	85	680
Blackjack	21	294
TOTAL	106	974

(Data is from Bulletin of Atomic Scientists)

4. Verification

Verifying the START treaty is likely to be the most complex treaty verification task to date. Testifying before the US Senate in January 1988, then US Secretary of State George Shultz said of the Intermediate-range Nuclear Forces (INF) Treaty: "this agreement has the most stringent and comprehensive scheme of verification in the history of arms control." Yet, on his way to a February 1988 meeting with then Soviet Foreign Minister Eduard Shevardnadze, Shultz referred to INF verification as "child's play" when compared with START.

What makes START so difficult to verify is the large number of different limits on different classes of weapons, without any of the weapons being entirely eliminated. It is an axiom of treaty verification that it is always easiest to verify zero; if any more than zero constitutes a violation, you can report the first weapon you see. With class-by-class numerical limits, however, the process becomes more complicated.

As with any treaty, the purpose of verification in START is threefold:

1. To create a verification gauntlet tight enough to make the chances of discovering a treaty violation in time to remedy the situation very high

2. To create a verification gauntlet tight enough that a potential violator is so unsure of escaping detection that he doesn't even try

3. To build confidence in the treaty so that security is enhanced and futuretreaty negotiations go more smoothly.

Judging START by these criteria, the treaty will be adequately verified. However, there are a few features which, due to time pressures, were omitted from the treaty and had they been included confidence in the treaty would have been considerably increased for little extra cost.

The START verification regime includes the following measures:

- Data exchanges: each side will provide the other with numbers and locations of treaty-limited weapons (TLIs). These reports will be updated periodically.

- Baseline inspections: inspections will be held to verify the data exchanges, providing baseline figures from which to work.

- On-site observation of weapons elimination.

- Continuous on-site monitoring of critical production and support facilities. (This is referred to as perimeter portal monitoring.)

- Short-notice on-site inspection of undeclared and formerly declared operational facilities.

- Short-notice inspections of covert, suspected activities (within agreed limits).

- Non-interference with National Technical Means (NTMs)

- Cooperative measures to enhance NTM (a continuation from the INF Treaty)

Parts of the verification regime are unique to START and parts have been implemented in previous treaties, such as INF. Although the number of different types of on-site inspection (OSI) is unprecedented, the On-Site Inspection Agency (OSIA) handling START as well as INF and CFE has gained experience through the verification of INF.

However, verifying START will require new equipment and new training. Confidence-building measures such as early exchanges of information, and "try out" candidate verification procedures have already taken place in order to facilitate training with new techniques and procedures.

There are several types of on-site inspections (OSI) which include:

- short-notice OSI of declared facilities
- suspect-site inspections
  - challenges to undeclared facilities (with right of refusal)
  - challenges to declared facilities where TLIs are not supposed to be deployed (no right of refusal)
- OSI of production facilities
- continuous monitoring of key production facilities
- inspection of elimination
- inspections of closing down or converting deployment and production sites
- inspections of repair and storage facilities
- inspections of re-entry vehicles
- inspection of missile exhibitions

Particularly challenging points in the verification regime of START will be:

- Portal perimeter monitoring of TLIs and non-TLIs at production facilities. These include the production facilities which are being monitored under the terms of the INF agreement at Votkinsk, USSR and Magna, Utah, USA. Another two facilities are to be added, the production plant at Tavlogard in the Ukraine, USSR and the Thiokol company in Promotory, Utah, USA. In addition, four facilities on each side are to be declared as production plants which do not produce TLIs at present but which could do so. These will be open to inspection.

- Distinguishing between conventional and nuclear-armed heavy bombers (especially between conventional and nuclear ALCMs): it is crucial to be able to separate nuclear-armed heavy bombers, conventionally armed heavy bombers and heavy bombers that were nuclear-armed, but now perform other missions.

- Verifying the numbers of mobile missiles. Because the verification regime does not include unique tagging of missiles, road-mobile missiles will be more difficult to monitor. The negotiators have instead decided to rely on serial numbers to identify the missiles - clearly a less secure method of identification than copy-proof tags.

- Verifying warhead numbers in ballistic missile delivery vehicles. This is the most important verification task. The treaty permits the downloading of ballistic missiles of up to 1250 warheads although no more than 500 of these can be left as empty spaces - the remaining 750 spaces will be "filled-in" by changing the front end of the missiles. The main verification problem is not in distinguishing between nuclear warheads and empty spaces (this can be easily achieved with on-site nuclear detection techniques) but in how to be sure that hidden and stored warheads cannot be quickly added back into the re-entry vehicle after an inspection has taken place.

- Encryption of missile tests. Although the missile test encryption problem was solved during the final days of the negotiations by an agreement to exchange data (but not on re-entry vehicles), the distinction between an anti-ballistic missile test and a missile test will be difficult to make. There will be an allowed quota of tests for the Strategic Defense Initiative/Global Protection Against Nuclear Strike (SDI/GPALS) It is not difficult to foresee future disagreement over the role of missile tests and whether or not they are limited by the treaty.

Missing Elements:

1. There are no provisions covering the disposal of the nuclear material in the dismantled warheads. So while the number of nuclear weapons will go down, each side will have a large stockpile of weapons-grade nuclear material. This unsupervised stockpile will pose proliferation hazards (i.e. diversion of nuclear weapons material to another country) and risks of a re-invigorated arms race in the future. The instability of the Soviet Union illustrates that both of these contingencies could materialize in the near future.

2. Although Sea-Launched Cruise Missiles are limited by a separate political agreement, there are no verification provisions associated with the limitation. Each side will have to rely on National Technical Means (spy satellites, human intelligence, etc). However, verification work to date has demonstrated NTMs cannot count nuclear-tipped SLCMs accurately. As a result, the superpowers are signing onto a numerical SLCM limit that is not adequately verifiable.

3. Conspicuous by its absence is any use of specially developed tags for monitoring mobile missiles and dual capable missiles. Despite years and years of effort spent on developing suitable tags for START verification by the US National Laboratories , the treaty does not include tags in its range of verification technologies. The main purpose of tagging is to simplify the task of verifying START into a task similar to verifying INF. A tag which identifies a missile as a legally allowed missile enables inspectors to quickly check if there are any untagged missiles which would be clear violations. Such a technique would be particularly useful for verifying mobile missiles - they are difficult to keep track of - and for ensuring that legally allowed conventionally-tipped missiles are not confused with treaty limited nuclear-tipped missiles. The absence of tags does lessen the degree of confidence in the verification regime.

4. If the US deploys more than 150 ALCM carriers or the Soviet Union deploys more than 210 ALCM carriers, the number of warheads carried on the additional carriers will have to be counted accurately. However, there are no reliable counting measures in the treaty. Admittedly, it is, at present, unlikely that the US and Soviet Union will ever deploy such numbers of ALCM carriers. Nonetheless, this provision is not robust enough to survive political upheaval in the future.

5. Costs

A tight verification gauntlet does not come cheap. According to the US Congressional Budget Office, the one-off compliance and on-site inspection costs for START will be between 0.4 and 1.8 billion dollars. The US estimated the annual budget of the OSIA as increasing by $200 to $500 million after the Conventional Forces in Europe (CFE) and START treaties

were enacted. Sample costs were given as the on-site monitoring of one pair of production facilities (one US and one Soviet) costing $500 million over 15 years, with spot inspections costing $1 million.

Never the less, the US Congressional Budget Office estimates that there will be net savings to the US resulting from the START and CFE treaties. These two agreements were estimated to bring savings to the US of at least $9 billion per annum. From this point of view, the verification regime for START looks to be highly cost-effective.

6. Conclusions

The Strategic Arms Reduction Treaty is an important first step in reducing the numbers of long-range, intercontinental nuclear missiles. It does not however halt the nuclear arms race between the superpowers - most forms of modernization continue unabated.

The verification regime for START builds heavily on the successful working model of the INF treaty. Because START is more complex than INF and because, in the end, no class of missiles are being totally eliminated, the verification provisions are in some respects more comprehensive than for INF.

All in all, START is a verifiable treaty. All of the limits can be verified with a high level of confidence during peacetime. The verification provisions are extensive and indeed impressive. While a few additional provisions like missile tagging and nuclear material disposal could further enhance the treaty, the existing verification provisions are as rigourous as the provisions within previous arms control agreements like INF and CFE.

The START verification provisions are complex and labour-intensive. The efficiency of the regime and such organizations like the On-Site Inspection Agency (OSIA) remains to be seen. Nonetheless, the saving from START and CFE– estimated at $9 billion per annum for the USA – easily offset the total verification and compliance costs.

Now that the Cold War is over, many of the verification measures like challenge inspections may appear, to some observers, excessive. However, as the nuclear arms race between the USA and USSR is still continuing with the modernization of nuclear warheads and delivery systems, the rigourous verification provisions will provide the necessary insurance to move from this point to one of more substantial reductions.

Verification can now be thought of as a confidence-building measure in itself. Certainly the 1986 Stockholm Accord and the 1987 INF Treaty show this to be true. If properly structured and its limitations understood, verification regimes will act as a deterrent to cheating and will increase military transparency and hence increase security. In increasing confidence in treaty compliance, verification can set the scene for further reductions in nuclear weapons, if those reductions are also properly verified.