7

Progress in Nuclear Weapons Reductions

Thomas B. Cochran, Robert S. Norris and Christopher E. Paine

The Disarmament "Obligation" of the Nuclear-Weapon Powers

Since March 1970, the nuclear weapon parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) have been subject to the nuclear disarmament obligation contained in Article VI, which requires that "effective measures related to cessation of the arms race" – such as the Comprehensive Test Ban Treaty (CTBT) and a "cut-off" of fissile material production for weapons – be pursued in good faith "at an early date." Good faith negotiations, not necessarily at an early date, are also required on "effective measures related to nuclear disarmament," which the NPT preamble further describes as "effective measures *in the direction of* nuclear disarmament," leading to "the elimination from national arsenals of nuclear weapons and their means of delivery *pursuant to* a treaty on general and complete disarmament under strict and effective international control."

Despite the failure of the nuclear-weapon powers to achieve the cessation of the arms race at an early date, this race had indeed abated considerably by the time of the NPT's 25 year Review and Extension Conference in May 1995, with several arms reduction and arms race cessation measures already in place or pending. The Conference agreed to extend the NPT indefinitely; it also endorsed a "programme of action" to achieve the "full realization and effective implementation of Article VI," including "the determined pursuit by the nuclear weapon-states of systematic and progressive efforts to reduce nuclear weapons globally, with the ultimate goals of eliminating those weapons, and by all States of general and complete disarmament under strict and effective international control."

A recent advisory opinion of the World Court has ruled that "there exists an obligation to pursue in good faith and to bring to a conclusion negotiations leading to nuclear disarmament in all its aspects under strict and effective

international control." This ruling differs from the wording of Article VI of the NPT; there is no link between this obligation on nuclear weapons and a wider move to general and complete disarmament. The obligation stands without conditions or caveats attached.

In this Chapter we assess the progress made by the nuclear-weapon states (NWS) towards the ultimate goal of a nuclear-weapon-free world (NWFW) in the following areas:

- US and Russian strategic arms reductions
- Reduction in the overall size of the nuclear weapon stockpiles
- Data exchange, transparency and nuclear stockpile verification measures

Strategic Arms Reductions

START I and II

START I entered into force on 5 December 1994, and by the end of 2001, the treaty requires each side to have reduced its strategic nuclear forces to 1600 deployed delivery vehicles having 6000 "accountable" warheads, of which 4900 can be ballistic missile warheads.

Presidents Bush and Yeltsin concluded a framework agreement for START II on 17 June 1992, negotiated a further seven months and signed START II on 3 January 1993. Beginning 1 January 2003, the treaty limits the warheads on each side's intercontinental strategic forces to 3500 "accountable warheads," of which no more than 1750 may be deployed on MIRVed Submarine-Launched Ballistic Missiles (SLBMs), and the balance on single-warhead ballistic missiles and/or bombers.[1] "Heavy" intercontinental ballistic missiles (ICBMs) and MIRVed ICBMs are banned. "Reserve" stocks of strategic nuclear warheads, and nuclear weapons deliverable by shorter range systems, such as sea-launched cruise missiles and tactical aircraft, are not covered by the agreement.

On 26 January 1996 the US Senate approved a resolution consenting to ratification of START II by a vote of 87 to 4. However, the Russian State Duma has not done so, and a substantial body of opinion in Russia views the treaty as giving the United States a nuclear advantage. The treaty is also regarded as too costly to implement on the agreed timetable because it requires the early retirement of Russian ICBMs before the end of their useful service life, and the production and deployment of an additional 500 single warhead ICBMs just to reach the 3000 warhead level by 2003. To maintain parity with the USA, additional resources would have to be dedicated for missile submarine and SLBM modernization, silo conversion, and improved C^3I systems.

Moreover, since 1995 the proposal to expand NATO eastward to include such nations as Poland, Hungary, and the Czech Republic has provided Russian

hard-liners with an argument for not ratifying START II and for retaining large stocks of non-strategic nuclear weapons to offset a conventional imbalance, a logic reminiscent of NATO's during the Cold War. The Russian military leadership sees nuclear weapons as pre-eminent in deterring both conventional and nuclear war.

START III Negotiations

In the negotiations which resulted in the Joint Statement by Presidents Yeltsin and Clinton after their meeting in Helsinki in March 1997, the USA has recognized some of the Russian difficulties with START II. (The Joint Statement is given in Appendix A.) The deadline for the elimination of strategic nuclear delivery vehicles under that Treaty is extended to the end of 2007. It was also agreed that one basic component of a START III agreement would be to establish, by end-2007, lower aggregates of 2000-2500 nuclear warheads for each side. Further, the statement on START III components includes a reference to measures to prevent a rapid increase in the number of warheads. There is also the outline agreement limiting the capability of higher-altitude theatre missile defence systems. However, the requirement for the ratification of START II before START III negotiations begin still stands. The Duma may well wait to see the outcome of the NATO-Russian negotiations which are linked to NATO's proposed eastward expansion.

Implementation of START I. Implementation of START I by the five parties to the Treaty – the United States, Russia, Ukraine, Kazakhstan, and Belarus – is moving forward. The Treaty has been implemented in an orderly fashion since entering into force in December 1994. In fact, the United States had already reduced its operational strategic forces to START I levels before the treaty entered into force, while continuing several modernization programmes. Modernization of Russian strategic forces proceeds at a very modest pace.

START I requires exchanges of data, at periodic intervals, about the status of strategic forces of the five parties. Since entry into force of the treaty on 5 December 1994 there have been four updated memoranda of understanding (MOU) about the strategic forces. They have occurred at six month intervals – mid- and end-1995, and mid- and end-1996. After 90 days have elapsed they are made public.

United States Strategic Arms Reductions. There have been increases in the number of operational strategic nuclear weapons since 1994 due to the addition of the sixteenth and seventeenth Trident submarines. At the end of 1996 there were roughly 7000 strategic nuclear warheads deployed with US operational forces (Table 1). The number could rise in 1997 when the

eighteenth and final submarine joins the force.

ICBMs. In 1995 the Air Force made the decision to consolidate the 500 Minuteman III ICBMs at three bases, from the current four. On 4 October 1995 the first of the Minuteman IIIs to be phased out at Grand Forks AFB, North Dakota began its transfer to Malmstrom AFB, Montana. The transfer will proceed at the rate of about one missile per week over three years. The schedule is to complete the emplacement at Malmstrom by April 1998. Then there will be 200 Minuteman IIIs at Malmstrom, and 150 each at Minot AFB, North Dakota and F.E. Warren AFB, Wyoming.

During 1995 work was completed in removing Minuteman IIs from their silos at three bases. Work then proceeded to blow up the silos in accordance with START. On 13 September 1996 the 149th silo was blown up at Ellsworth AFB, South Dakota, completing the programme well ahead of schedule. It is proposed that the 150th silo (Delta Nine) at Ellsworth AFB should become a museum, along with its launch control facility (Delta One), eleven miles away. Eventually the 150 Minuteman III silos at Grand Forks will be blown up after the transfer is completed.

At the time of writing, 300 missiles have the higher yield W78 warhead and 200 have the W62 warhead. To comply with the ban on MIRVs under START II, each of the 500 Minuteman III missiles will have the number of warheads reduced from three to one, if the Treaty enters into force (Table 2). It has been decided to replace the higher-yield W78s and older, lower-yield W62s with single W78s removed from the 50 Peacekeeper (MX) missiles. The W87 warhead has the preferred safety features, including insensitive high explosive (IHE), fire resistant pit (FRP), and enhanced nuclear detonation safety (ENDS), whereas the W78 only has ENDS.

A $5.2 billion programme is underway to extend the operational life of the Minuteman IIIs to the year 2020 and improve their capability. There are three major parts to the programme. First, launch control centres have been updated with Rapid Execution and Combat Targeting (REACT) consoles. The REACT programme was completed by the end of 1996. Second, improvements to the missile's guidance system will be implemented between 1998 and 2002. These measures eventually will increase the accuracy of the Minuteman III to near that of the current MX – a circular error probable of 100 metres. The third part involves "repouring" the first and second stages, incorporating the latest solid propellant and bonding technologies. The third stage will either be refurbished or rebuilt.

SSBNs and SLBMs. One new Ohio-class submarine, the USS *Maine* (SSBN-741), the sixteenth of the class, joined the fleet on 29 July 1995. The USS *Wyoming* (SSBN-742) joined the fleet on 13 July 1996 and the USS *Louisiana* (SSBN-743) will be delivered in 1997, completing the nuclear powered ballistic missile submarine (SSBN) fleet.

This is in keeping with the conclusions of the 1994 Nuclear Posture Review

(NPR), which decided to complete construction of 18 Ohio-class submarines, and to retire four older SSBNs of the same class based in the Pacific at Bangor, Washington. Which four of the eight is under review. The current plan is to retain the four submarines until close to the 2003 target date for full implementation of the START II force reductions. If START II is implemented sooner, then the retirement dates could be advanced.

Another decision in the NPR was to purchase additional Trident II D-5 SLBMs for the four Bangor-based submarines that will remain. The increased Trident II programme now calls for purchase of 462 missiles at a cost of $27.7 billion, or $60 million per missile. This is an increase of 45 missiles and $2.2 billion in costs from previous levels. The Bangor base will have to be adapted to support the Trident II. The backfitting of the four SSBNs will take place from FY 2000 to FY 2005. Eventually, two or three submarines will be shifted from Kings Bay, Georgia to Bangor to balance the fourteen submarine fleet. To comply with START II, SLBMs will be "downloaded" from eight to five warheads each.

A third decision in the NPR was to have more SSBNs patrolling on "modified-alert" status than "alert" status. Modified alert apparently means that a lower percentage of SSBNs at sea routinely patrol within range of potential targets and maintain continuous communications with command authorities. This is a very minor adjustment. Two-thirds of the SSBNs are still at sea at any given time; patrol rates equal to those at the height of the Cold War remain unaltered, as does the practice of each SSBN having two crews. Reducing the patrol rate and going to one crew would constitute major changes. The Congressional Budget Office estimated that switching to single crews could save $300 million per year, or a total of $4.5 billion through the year 2010.

Like the ICBM force SLBM targeting and retargeting is being improved. The SLBM Strategic Retargeting System (SRS) operational requirement document was approved in 1995. When and if the SRS achieves an operational capability, ballistic missile submarines will have the ability to rapidly target and retarget Trident IIs to any spot on the globe.

Bombers. The first B-2 bomber was delivered to the 509th Bombardment Wing at Whiteman AFB, Missouri on 17 December 1993. The wing will have two squadrons, the 393rd and the 715th, each with eight planes. The first squadron, the 393rd, is scheduled to become operational in FY 1997. During 1994 four B-2s were delivered, another three in 1995, six in 1996, and one is planned for delivery in 1997. The 20th and last operational B-2 is scheduled to be delivered on 31 January 1998. In a change of plans all of the six (instead of five) aircraft now in the test programme will be modified to achieve an operational capability. The planes will be delivered in 1998, 1999, and 2000.

The B-2 remains controversial. The General Accounting Office concluded in an August 1995 report that, "After 14 years of development and evolving mission requirements, including six years of flight testing, the Air Force has yet

to demonstrate that the B-2 design will meet some of its most important mission requirements." A congressionally mandated study, done by a Pentagon think tank and provided to Congress on 3 May 1995, concluded that the planned force of 20 B-2s is sufficient to meet future contingencies, a finding in concert with the Air Force and Defense Department positions.[2]

According to an Air Force estimate the programme acquisition costs for 20 operational aircraft, expressed in then-year dollars totals $44.389 billion, or $2.2 billion each. By comparison an average Boeing 747 costs about $155 million, and the new Boeing 777 costs about $130 million. By using other categories, such as "flyaway cost" or "procurement cost," which leave out significant expenses, such as $25 billion in development costs, unit costs for the B-2 can be made to seem half of what they really are.

Under START II the B-1B bombers will no longer be counted as nuclear weapon carriers. This transition to a conventional role is already occurring, though START II has not entered into force. By the end of 1997 the B-1 will be out of the SIOP mission altogether and oriented to conventional missions. However, under the "bomber hedge" option of the NPR, sufficient nuclear weapons will be retained in a reserve status to reconvert the B-1Bs to a nuclear role.

In 1994 the NPR determined that 66 B-52Hs would be retained, but the Department of Defense (DOD) later decided to keep 71, with 12 serving as trainers and another 15 put on attrition reserve/depot maintenance status. The Air Force estimates the B52Hs will be structurally sound until about 2030.

Russian Strategic Arms Reductions. With implementation of START I and the break-up of the Soviet Union, operational strategic nuclear forces have decreased markedly – over 325 ballistic missiles have been withdrawn from active service and over 3400 strategic warheads that were deployed in Ukraine, Kazakhstan, and Belarus have been transferred to Russia. From Kazakhstan all warheads were removed by April 1995; from Ukraine all strategic warheads – some 1900 – were removed between March 1994 and 1 June 1996, and all non-strategic warheads – some 2500 – were removed by May 1992; and from Belarus all warheads were removed by the end of 1996. The array of Russian nuclear forces at the end of 1996 is shown in Table 3.

Under START I counting rules, as of 1 January 1996, there were 1497 operational strategic launchers and 6681 warheads in Russia. In reality, some of the systems are not operational, and the bombers are capable of carrying more warheads than are attributed to them under START counting rules. By our estimates Russia's operational strategic force as of 1 January 1996, consisted of about 1253 launchers carrying about 6,685 warheads.

In Table 4, we have projected how Russian operational strategic forces might look in 2003, the agreed date for full implementation of START II reductions. We have projected four scenarios, two that assume START II will

not be ratified by the Russian State Duma, and two that assume that it will be ratified. With respect to each of these two assumptions we project force levels based on two budget scenarios: (a) a "High Budget," which assumes sufficient funds will be made available to provide for extending the service life of some existing systems; and (b) a "Low Budget" that assumes a more rapid retirement of older systems. An interesting result of our projections is that, if START II is ratified, the permitted START II force level of some 3000-3500 strategic warheads is not reached under either of these two budget scenarios. This situation should provide incentives for the Russian security establishment to seek a nuclear balance with the USA at a lower, and more economically sustainable, level of forces, and for the United States to cuts its own costs by further reductions in the size and operating tempo of its nuclear forces. The Helsinki Joint Statement suggests that this point has now been recognized by both sides.

ICBMs. At full deployment there were 308 SS-18s in the Soviet Union, 104 in Kazakhstan and 204 in Russia. By the end of 1996 all SS-18s in Kazakhstan, and 24 in Russia are assumed to be non-operational, leaving 180 operational SS-18s in Russia as of 1 January 1997. Six silos at Dombarovski and 12 at Uzhur have been blown up. Under START I Russia is permitted to retain 154 SS-18s. If START II is fully implemented, all SS-18 missiles must be destroyed, but Russia may convert up to 90 SS-18 silos for deployment of single-warhead, non-heavy, SS-25 type ICBMs.

As of the end of 1996 there were approximately 160 deployed SS-19s in Russia. If START II is not ratified, we assume about 120 SS-19 will be retained with six warheads each. Under the START II limits, Russia could retain up to 105 SS-19 missiles "downloaded" to a single warhead. Some in Russia would like to increase this number. As part of an agreement with Ukraine announced in November 1995, 32 SS-19s will be returned to Russia. After transfer they will be used as spares and for parts to support the SS-19 force that will remain deployed in Russia, with the purpose of extending the service life of the weapon system. The other SS-19s, once deployed in Ukraine, are being withdrawn and put in storage.

Of the original 56 silo-based SS-24 M2s, 46 were in Ukraine at Pervomaysk, and 10 are in Russia at Tatishchevo. Only the 10 in Russia are considered operational. In addition, there are 36 rail-based SS-24 M1s – 12 each at Bershet, Kostroma and Krasnoyarsk in Russia. If START II is ratified, these missiles must be converted to single warhead missiles or retired altogether.

SS-25s are deployed only in Russia. SS-25 deployment in Belarus peaked in December 1991 at 81 missiles at Lida and Mozyr. By the end of 1996 all had been removed.

The SS-25 is deployed in regiments of nine launchers, as was the SS-20. The SS-25 shares a nearly identical first-stage with the SS-20. Several of the bases (*e.g.*, Kansk and Novosibirsk) were used for the SS-20. The missile can

be fired from field deployment sites or through the sliding-roof garage it occupies at its base. The SS-25 has a throwweight of 1000 kg, slightly smaller than the US Minuteman III at 1150 kg.

The SS-25, which is assembled at Votkinsk in Russia, is the only strategic weapon system still under production and will likely be the mainstay of the ICBM force if and when START II is implemented. On 20 December 1994 the Russians first flight-tested a variant of the SS-25 (called "Topol-M"). Flight tests continued during 1995 and 1996. The Topol-M, unlike earlier models, is being produced entirely in Russia, under the direction of designer Boris Lagutin. Previously various components were made in Ukraine and other republics. The Topol-M was scheduled to be operational at the end of 1996, but that schedule has now apparently slipped. It is planned for silo-basing but could also supplement or replace the mobile force.

SSBNs and SLBMs. More than one-half of the SSBN fleet have been withdrawn from operational service since 1990. Table 3 assumes that all the Yankee Is, Delta Is, Delta IIs, and one Delta III have been withdrawn, leaving 26 SSBNs of three classes (13 Delta III, 7 Delta IV and 6 Typhoon). These SSBNs are based on the Kola Peninsula and on the Kamchatka Peninsula.

The first Typhoon submarine, which entered the Severodvinsk shipyard in 1991 for overhaul, is still there. Five others await overhaul and missile conversion, giving rise to rumours that the entire class may be retired in the next five to ten years. One of the Typhoons is used for training, after an accident in 1992. No SSBNs or SLBMs are presently in production. The slow process of upgrading the six Typhoon-class submarines with a new missile (the so-called SS-N-26 to replace the SS-N-20) continues. A second new SLBM, for the Delta V, a new class of SSBN that might replace the Typhoon and Delta IV, is also under development.

Strategic Bombers. For the strategic bomber force (*Dalnyaya Aviatsiya*-DA) and tactical aircraft – always lesser priorities in Soviet/Russian armed forces – maintenance and modernization have been cut drastically and in some cases deferred completely. This is, in part, the result of a shrinking budget, but the fighting in Chechnya consumed a large share of the Russian Federation Air Force's (RFAF) operating funds, leaving units without fuel, spare parts, or adequate bases.

The 19 Blackjacks at Priluki air base in Ukraine are poorly maintained and basically non-operational, as are the 25 Bear H bombers at Uzin air base. An agreement, announced on 24 November 1995, calls for Ukraine to eventually return all the Blackjack and Bear bombers, and more than 300 cruise missiles, to Russia. The precise timing of the transfer and the amount of money to be paid were not made public. Bear H and Blackjack production has been terminated. It is likely that most of the planes will be used for spare parts to support the bombers in Russia, with only a very few, if any at all, returning to service.

Bear H bombers are configured in two ways, those that carry 16 ALCMs and those that carry 6 ALCMs. According to the 1 June 1996 START I MOU the bombers are deployed as follows: Bear H16 – 19 at Mozdok, 16 at Ukrainka, and 21 at Uzin (Ukraine). Bear H6 – 2 at Mozdok, 26 at Ukrainka, and 4 at Uzin (Ukraine). In addition to the 19 Blackjacks at Priluki there are six at Engels AFB near Saratov in Russia.

Reduction in the Overall Size of Nuclear Weapon Stockpiles

There is a wide disparity in what has been publicly revealed about the history of the nuclear warhead stockpiles of the various weapon states. More is known about the history of the US nuclear warhead stockpile than that of Russia or those of other weapons states, due in part to the Openness Initiative of the US Department of Energy (DOE). But even in the case of the United States, the DOD continues to insist that the inventory of currently stockpiled warheads remains classified.

The estimated, year-by-year, total stockpile and megatonnage of US nuclear forces is given in Table 5. Table 6 gives the number of warheads, strategic and non-strategic, for the Soviet Union and (later) Russia.

The US Nuclear Weapon Stockpile

The US nuclear weapons stockpile peaked in 1967 at about 32,000 warheads (Figure 1). The estimated inventory of US nuclear warheads, as of the end of FY 1990 (30 September 1990) – a year before the breakup of the Soviet Union – was about 21,000 warheads. At the end of 1996 there were about 8500 warheads in DOD's operational (deployed) stockpile and another 2600 spare and reserve warheads[3] (Table 1). The total DOD stockpile is estimated to be about 11,000 warheads. In addition, there are an estimated 2800 retired warheads in Air Force, Navy and DOE depots that are in a queue, awaiting their turn on the Pantex disassembly line. In Table 1 in the reserve category, we have included 192 warheads for the 24 Trident II SLBMs that will be on the eighteenth and final Trident submarine, which is expected to enter the force in July 1997. Even now, the mindless momentum of the arms race continues, as the US operational stockpile has actually *increased* over the past two years with the Navy's addition of a sixteenth and seventeenth Trident submarine, and a further increase in the summer of 1997 with the addition of the eighteenth.

The dismantlement goal for FY 1995 was 2000 warheads, but only 1393 were dismantled in that year, and an estimated 1166 were dismantled in FY 1996. At the end of FY 1996 (30 September 1996) there was still a backlog of about 2800 retired nuclear warheads awaiting dismantlement. Under current

DOE plans, and assuming no further significant reductions in the stockpile, this backlog should be eliminated by the end of FY 1999. Currently, there are no further planned reductions in the stockpile beyond those warheads that will be removed for evaluation disassembly and disposal. Between FY 1997-2003, the DOE estimates that the number of warheads that will undergo evaluation disassembly and disposal will reduce from 73 to 42 annually, averaging 51 warheads annually over this seven year period.[4] Some of these will be replaced by new warheads manufactured at the Los Alamos National Laboratory. An average of 58 warheads annually are projected to undergo evaluation disassembly and reassembly during the same seven year period.

While the public perception is that the US and Russian nuclear weapon stockpiles will be reduced to about 3500 warheads by 2003 under START II, the truth is that the Clinton Administration is planning a stockpile some three times this amount – approximately 11,000 warheads (Table 2). In addition to the 3500 operational strategic warheads in the US arsenal in 2003, the Pentagon plans to retain another 950 warheads for non-strategic forces, and presumably additional spares which we estimate will equal about 10 per cent of the active inventory. The strategic reserve, originally created for use after a nuclear war with Russia, now is conceived as a force allowing the USA to resist potential coercion by such nations as China, North Korea, and Iran which might attempt to take advantage of the United States following a nuclear war. The reserve force could also be directed towards these or other countries irrespective of the Russian context, should the national command authorities so decide.

In addition, another 2500 warheads are destined for what the DOD calls the "hedge." When fully implemented in 2003, the hedge will be a contingency stockpile made up of warheads removed from active strategic forces pursuant to START II, but not dismantled. The purpose of retaining them intact is so that they can be "uploaded" on existing strategic delivery systems, thereby "reconstituting" US strategic forces to something close to the START I force levels.

Finally, the Pentagon plans to retain about 3400 warheads in "inactive reserve." These warheads will be retained without maintaining the tritium inventory, and presumably without servicing other limited life components, such as batteries. DOD has said that if START II is not ratified by Russia, it intends to retain these warheads in an active status, thus increasing the tritium requirements about 25 per cent – equivalent to five years of tritium decay.

At the end of FY 1996 there were about 9200 pits in storage at Pantex. By the end of FY 1999 there will be about 12,000 pits in storage at Pantex; and Pantex has been approved for future storage of up to 20,000 pits.

Some 5000 of the 12,000 plutonium intact pits recovered in the warhead disassembly process will be retained as a "strategic reserve." This pit reserve is estimated at about 15 tonnes (t) of plutonium, or roughly half the 32t that will remain in intact weapons, for a total of 47t to be retained for weapons use, out

of a total stockpile of 85t of weapon-grade plutonium. The US government has declared that the balance of 38t of WGPu - almost half of it not in pit form - is surplus to military needs and may be permanently withdrawn from the US weapons stockpile.

On highly-enriched (> 20 per cent U-235) uranium (HEU) from weapons, the US DOE has announced that it produced 994t for all purposes through 1992. Current estimates assume that the USA had about 500t of "orally" (Oak Ridge Alloy - 93.5 per cent U-235), and about 230t between 20 per cent and 90 per cent enriched, in weapons or assigned for weapons use. The US government has declared 14t of HEU excess to its military requirements; only about one half of this figure was ever in weapons or produced for weapons use. It follows that the US is continuing to reserve around 530 tonnes of HEU for potential military use, including an estimated 330t for weapons and about 200t of oralloy for the Navy, sufficient for a 100+ year reserve.

The Russian Nuclear Weapon Stockpile[5]

The size of the Russian nuclear weapon stockpile – past, present, and future – is still cloaked in secrecy. Our best estimate, presented in Figure 2, is highly uncertain and is based on the following conflicting information. According to Ministry of Atomic Energy (MINATOM) Minister Viktor Mikhailov, the Soviet nuclear weapons stockpile grew rather steadily until it peaked in 1986 at 45,000 warheads;[6] and then declined more than 20 per cent to about 35,000 warheads by May 1992.[7] An official CIA estimate given in May 1992 placed the stockpile of the former Soviet Union at 30,000 nuclear weapons with an uncertainty of plus or minus 5000.[8] The upper limit of the CIA estimate is consistent with the MINATOM figures.

According to Russian sources, Russia had 21,700 air defence and tactical warheads in service in 1991. President Mikhail Gorbachev in October 1991 pledged to dismantle all atomic land mines by 1998, all nuclear artillery shells by 2000, half of the surface-to-air missile warheads by 1996, half the tactical naval warheads by 1995 (with the other half stored ashore), and half of the bombs for the non-strategic air force by 1996. According to a Russian official, as of mid-1996 this schedule was still being followed. Thus, the 1991 Gorbachev initiative called for the elimination of about 14,200 of these warheads. Accounting for the 3,000 warheads already withdrawn as a result of the 1988 INF Treaty, brings the total withdrawn to about 17,200.

According to MINATOM the stockpile was projected to decline to 40-50 per cent of its mid-1992 level as a result of arms control initiatives agreed to through early-1992.[9] Assuming the mid-1992 stockpile was 35,000 warheads, this implies a planned reduction of 14,000 to 17,500 warheads, which is consistent with the estimated reduction of 17,200 warheads. The CIA, on the other hand, stated in May 1992 that:

> ... the Russians have something on the order of 9000 to 16,000 nuclear weapons slated for dismantling. They have not given us an official figure for how many weapons are slated for dismantling as a result of the Gorbachev-Yeltsin initiative. This is our estimate. We have a highly uncertain estimate of the size of their tactical nuclear weapon inventory. Their initiative included something on the order of 1200 strategic [air defense] weapons; 5000 to 12,000 tactical nuclear weapons, and our estimate of 2700 weapons remaining from the INF treaty.[10]

The CIA's upper limit of 16,000 warheads slated for dismantlement in 1992 is reasonably consistent with our estimate of 17,200 warheads derived from MINATOM and other Russian data.

We assume that 20,350 strategic air defence and tactical warheads will be retired from the operational stockpile by 2003-2004, because most of the remaining fractions of weapons in the stockpile under the Gorbachev initiative will become obsolete. Adding approximately 3000 INF warheads already retired and 1900 strategic warheads from Ukraine, gives some 25,250 warheads that were potentially available for disassembly beginning in 1991. These can all be disassembled by about 2004, assuming an average disassembly rate of 2000 warheads per year. By our estimates this would leave Russia with a stockpile of about 11,000 warheads, at which point it would be comparable in size to the US stockpile.

On 17 June 1992, Presidents Bush and Yeltsin announced that the US and Russian strategic arsenals would each be reduced to 3000-3500 strategic warheads no later than 1 January 2003. This agreement was codified as START II. Depending on many decisions about the future composition of Russian forces, the Russian operational, or active, stockpile in the 2003-2004 period could be anywhere from 1800 to 4300 warheads (Table 4). Since, at the projected retirement rate of 2000 warheads per year, it is estimated that the number of intact Russian warheads will be about 11,000 warheads in 2004, it is likely that Russia also will retain a reserve of several thousand intact warheads; and if START II is ratified, Russia surely will follow the US lead and retain a "hedge" category of warheads to enable rapid uploading of SS-19 and SS-24 ICBMs. Our projection of likely candidates for the "hedge" and reserve warhead categories is presented in Table 4.

While we have assumed a disassembly rate of about 2000 warheads per year, information about the pace and scope of Russian warhead dismantlement is very sketchy. In the United States the public is provided with a detailed accounting of the number and kinds of warheads that have been dismantled, but in Russia, secrecy about such matters is still the rule. Dismantlement work is performed at Sverdlovsk-45 at Nizhnaya Tura, Zlatoust-36 at Yuruzan, and the Avanguard facility at Arzamas-16. The combined dismantlement rate at these three facilities, according to statements made by Mikhailov in 1992, was about

1500 to 2000 per year, or slightly higher than the average rate of dismantlement at Pantex in the United States during the past few years.

In sum, we believe the Russian nuclear stockpile, including retired but still intact warheads awaiting dismantlement, is about 25,000 warheads, and that warheads are being dismantled at a rate of about 2000 per year. Should Russia continue at this dismantlement rate, the stockpile would reach about 11,000 warheads in about 2004 – comparable in size to the currently planned US stockpile level for the same period.

We estimate that Russian reactor production of WGPu since 1948 amounts to some 150-170t, of which 115-130t was actually fabricated into weapon components, with the balance in production scrap, solutions, residues and losses to nuclear waste and the environment. An additional 30t of separated reactor grade plutonium is stored at Chelyabinsk-65. This estimate for Russian WGPu in pits is roughly double the 66t of WGPu contained in US weapon pits, and Russia's total separated plutonium inventory of close to 200t is roughly double that of the US. Given the agreement between the two sides that US and Russian plutonium disposition programmes should proceed in parallel with the goal of reducing to equal levels of military plutonium, Russia will be required to dispose of its plutonium at a rate three times that of the USA to reach equal levels by a given date.

While the total production of Soviet/Russian HEU has never been officially disclosed, it is believed to be on the order of 1200t. Under a 1994 contract for US purchase of HEU derived from Russian weapons, Russia agreed to sell the US up to 500t of HEU equivalent (in the form of LEU) at a rate of 10t per year for the first five years, and 30t per year for the next 15 years. Thus far, the US Enrichment Corporation, executive agent for the US side of the deal, has taken delivery of 6t of HEU equivalent in 1995, and 12t in 1996.

While we are projecting that the process of nuclear weapons disarmament will continue in Russia over the next eight years, the disarmament process could be halted or reversed as a consequence of political changes within Russia, or changes in Western policies toward Russia. In an article written in 1996, Mikhailov and two senior colleagues from the Arzamas-16 weapons laboratory raised the prospect of a radical reworking of Russia's nuclear arsenal to adapt to the changed circumstances of NATO's expansion eastward and the precipitous decline in Russia's capabilities to mount a credible conventional defence. According to Mikhailov *et al.*:[11]

> If Russia sees its interests ignored or NATO expansion proves spearheaded against Russia, it will have to take economic and military measures that should be prepared well in advance.
>
> ... Nuclear arms modernization can be carried out within the framework of the Comprehensive Test Ban Treaty, though this would require maximum mobilization of the Russian Atomic Energy Ministry capacities.

> In the military-political field, Russia should not rush to ratify START-II cuts in its strategic offensive arms, except for systems which have already exhausted their potential – until the political picture has taken shape.
>
> ... We should be aware that for all the pledges and declarations made by the West, in the near future Russia cannot afford to carry out nuclear disarmament, otherwise it may find itself defenceless after a possible turnaround in the West's policies.
>
> Russia could make one move to change the perception of nuclear arms as arms of mass destruction, and the next step – to diminish the nuclear threat. These moves are: modernization of all adopted nuclear arms, creation of an additional yield level not exceeding several hundred tons of TNT equivalent. This lower yield level should be the routine state of nuclear warheads. If there were no such means, a nation may prove unable to retaliate for a strike from any point of the globe, its deterrence potential being illusory. If there arises a threat of a full-scale nuclear attack on Russia, its nuclear warheads must be upgraded to a higher yield level. Technically, this is feasible, and the Ministry of Atomic Energy is capable of solving this problem without additional nuclear tests and great expenses. Russia could make these moves even unilaterally.

United Kingdom : Reductions and Trends

1998

Over the past six years British armed forces have given up all but two of their nuclear roles. By 1999 there will be only one British nuclear weapon system, the submarine-launched ballistic missile.

British reductions came in the aftermath of the dissolution of the Soviet Union. Following the Bush-Gorbachev initiatives of 27 September and 5 October 1991, British Secretary of State for Defence Tom King said that, "we will no longer routinely carry nuclear weapons on our ships." On 15 June 1992 the Defence Minister announced that all nuclear weapons – the WE177C – had been removed from surface ships and aircraft, that this nuclear mission would be eliminated and that the "weapons previously earmarked for this role will be destroyed." The C version of the WE177 bomb was assigned to selected Royal Navy Sea Harrier FRS.1 aircraft and ASW helicopters. The arsenal was thought to number about 25. It existed in both a free-fall and depth-bomb modification and had an estimated yield of approximately 10 kilotons (kt).

The Royal Air Force (RAF) has been progressively decreasing its stockpile of nuclear bombs over the past few years, and the number of aircraft squadrons with nuclear missions. Currently the RAF operates eight squadrons of dual-capable, strike/attack Tornado GR.1/1A. Each squadron has 12 aircraft. These include four squadrons at RAF Bruggen, Germany (Nos. 9, 14, 17, 31). The three strike/attack Tornado squadrons at RAF Laarbruch, Germany were disbanded between September 1991 and May 1992, and the base will be closed in 1999. Two squadrons previously at RAF Marham were redeployed to RAF

Lossiemouth in 1994. They replaced the Buccaneer S2B in the maritime strike role. Tornado reconnaissance squadrons 2 and 13 are at RAF Marham. It is likely that less than a full complement of bombs is assigned to the Tornadoes that have maritime strike and reconnaissance roles.

The total number of WE177 nuclear gravity bombs produced was estimated to have been about 200, of which 175 were versions A and B. The 1992 White Paper stated that, "As part of the cut in NATO's stockpile we will also reduce the number of British free-fall nuclear bombs by more than half." A number of British nuclear bombs were returned to the UK from bases in Germany. The 1993 Defence White Paper stated that the WE177, "is currently expected to remain in service until well into the next century," but the government announced in March 1994 that this meant until the year 2007. On 4 April 1995 the government announced that the remaining WE177s would now be withdrawn from service by the end of 1998. On 1 May 1996 Defence Secretary Michael Portillo announced that RAF Bruggen would close in 2002. The Tornadoes (four years after becoming non-nuclear) will be reassigned to bases in the UK.

this was later advanced to the end of March.

Britain also ended its involvement in operating several tactical nuclear weapon systems. The US nuclear weapons for certified British systems have been removed from Europe and returned to the United States, specifically for the 11 Nimrod ASW aircraft based at RAF St Magwan, Cornwall, UK, the single Army regiment with 12 Lance launchers and the 4 Army artillery regiments with 120 M109 howitzers in Germany. Squadron No. 42, the Nimrod maritime patrol squadron, disbanded in October 1992. The 50 Missile Regiment (Lance) and the 56 Special Weapons Battery Royal Artillery were disbanded in 1993.

Britain built and deployed four *Resolution*-class SSBNs, commonly called Polaris submarines after the missiles they carry. The first boat (HMS *Resolution*) went on patrol in mid-June 1968, the fourth (HMS *Revenge*) in September 1970. *Revenge* was retired on 25 May 1992. *Resolution* was retired in 1994 and *Renown* and *Repulse* were retired in 1996.

Construction, training, testing, and sea trials continue with the Vanguard-class SSBN system. Each Vanguard-class SSBN carries sixteen US produced Trident II D-5 SLBMs. The first submarine of the class, the HMS *Vanguard*, went on its first patrol in December 1994. The second submarine, *Victorious* entered service in December 1995. The third submarine, *Vigilant* was launched in October 1995 and will enter service in the summer or fall of 1998. The fourth and final boat of the class, *Vengeance* is under construction. Its estimated launch date is 1998 with service entry in late 2000 or early 2001. The current estimated procurement cost of the programme is $18.8 billion.

We estimate that the British stockpile as of the end of 1996 to be approximately 260 warheads of two types. The British stockpile peaked in the mid-1970s at some 350 warheads. We estimate that it will increase slightly to

about 275 warheads of only one type at the turn of the century.

France: Reductions and Trends

On 22 and 23 February 1996 President Jacques Chirac announced several dramatic reforms for French armed forces for the period 1997 to 2002. The most significant will be the introduction of a professional armed force and the phasing out of conscription over a six year period, ending in 2001. The size of the armed forces will decrease from almost 400,000 to 260,500.

The decisions in the nuclear area were a combination of the withdrawal of several obsolete systems with a commitment to modernize those that remain. Already many of the programmes announced in the early 1980s to increase the size of the French stockpile had been cancelled, modified, or scaled back for budgetary and geopolitical reasons. More recently, in May 1992 it was announced that the number of new *Triomphant*-class SSBNs would be reduced from six to four. There was some speculation that President Chirac might not purchase the fourth boat, but he reaffirmed that he would and also stated that a new ballistic missile, the M51, would replace the M45 in the 2010-2015 time period.

The lead SSBN, *Le Triomphant*, was rolled out from its construction shed in Cherbourg on 13 July 1993. It ~~was scheduled to depart on its first patrol by the end of~~ 1996 armed with the M45 SLBM and new TN 75 warheads. The second SSBN, *Le Téméraire*, is under construction, and will not be ready until 1999. The schedule for the third, *Le Vigilant* has slipped and it will not be ready until 2001. The service date for the fourth SSBN is approximately 2005. We estimate that eventually there will be 288 warheads for the fleet of four new *Triomphant*-class SSBNs, because enough missiles and warheads will be purchased for only three boats. This loading is the case today with five submarines in the fleet – only four sets of M4 SLBMs were procured.

He entered service in September 1996

After considering numerous plans to replace the silo-based S3D IRBM during President Mitterrand's tenure, President Chirac announced in February that the missile would be retired and there would be no replacement. On 16 September, all 18 missiles on the Plateau d'Albion were deactivated.

The number of Mirage 2000N aircraft committed to nuclear missions was scaled back in 1989 from 75 aircraft in five squadrons to 45 aircraft in three squadrons. On 11 September 1991, President Mitterrand announced that as of 1 September the AN 52 gravity bomb, once carried by Mirage IIIEs, Jaguar As and Super Etendards, had been withdrawn from service. From that point on France no longer had a nuclear gravity bomb. The Air-Sol-Moyenne-Portée (ASMP) supersonic missile was deployed in 1988 and today there are 45 ASMPs with two Mirage 2000N squadrons at Luxeuil and one at Istres. The number of nuclear-armed Super Etendard aircraft scheduled to carry the ASMP

was also reduced due to budgetary constraints, from about 50-55 to 24 planes with 20 ASMPs allocated to them.

The Pluton short range ballistic missile was retired by the end of 1993. The longer range Hadès was to have replaced it. The original programme called for 60 launchers and 120 missiles (and warheads). The programme was reduced several times, eventually to 15 launchers and 30 missiles. The first regiment was activated at Suippes, in eastern France, on 1 September 1991. Further introduction was impossible given geopolitical events and the Hadès was shelved. The missiles and warheads were stored intact allowing them to be reintroduced if need be. In a significant action President Chirac announced that the Hadès system would be dismantled and the regiment reassigned to other duties.

In July 1996, after thirty-two years of service, the Mirage IVP relinquished its nuclear role and was retired. Five Mirage IVPs will be retained for reconnaissance missions at Istres. The other planes will be put into storage at Chateaudun.

The three squadrons of Mirage 2000N have now assumed the "strategic" role, in addition to their "pre-strategic" one. A fourth Mirage 2000N squadron at Nancy – now conventional – is scheduled to be replaced with Mirage 2000Ds. Those aircraft may be modified to carry the ASMP and distributed to the three 2000N squadrons at Luxeuil and Istres, along with the Mirage IVP's ASMP missiles. President Chirac also said that a longer-range ASMP (500 km vs. 300 km, sometimes called the "ASMP plus") will be developed for service entry in about a decade.

The Rafale is planned to be the multi-purpose Navy and Air Force fighter/bomber for the next century. Its roles include conventional ground attack, air defence, air superiority and nuclear delivery of the ASMP and/or ASMP+. The carrier-based Navy version will be introduced first with the air force Rafale D attaining a nuclear strike role in approximately 2005.

We estimate that the French stockpile as of the end of 1996 is approximately 450 warheads of three types. The historical peak of 538 was reached in 1991-92. We estimate that the future stockpile of 2005 will decrease slightly to around 400 of two types.

China: Trends

The Chinese have been very effective in keeping secret the details about the size and composition of their nuclear stockpile. Thus there remains uncertainty about the size of the nuclear bomber force, the number of ballistic missiles deployed, and whether or not there are "tactical" nuclear weapons. We estimate that the Chinese stockpile, as of the end of 1996, was approximately 400 warheads in two basic categories: some 250 "strategic" weapons structured in a "triad" of land-based missiles, bombers, and submarine-launched ballistic

missiles; and about 150 "tactical" weapons – low yield bombs for tactical bombardment, artillery shells, atomic demolition munitions, and possibly short range missiles.

The mainstay of Chinese nuclear forces is the ballistic missile, which varies in range from 1700 to 13,000 kilometers, with only a handful capable of the longest ranges. More advanced systems have long been under development with emphasis on improved accuracy and guidance, increased range, mobile launch platforms, solid fuel technology, and multiple warheads. It is logical to assume that the last series of nuclear tests was aimed at providing warheads with improved yield-to-weight ratios for the next generation of ballistic missiles. The yield estimates of the 11 nuclear tests since 1990 suggests that one warhead may be in the 100 to 200 kt range and a larger one in the 600 to 700 kt range.

One feature of all Chinese weapon system programmes is that it takes a long time for the missile, submarine or bomber to enter service. From initial research through development and testing to deployment can take a decade or two, by which time it is largely obsolete. It is important to keep China's military modernization in perspective. Is its purpose a routine upgrade or, as some would have it, evidence of aggressive designs in the region? As a close observer of China, David Shambaugh, has recently written, "It is important ... not to confuse ambition with capability." "The PLA's current weapons inventory remains 10 to 20 years or more behind the state of the art in almost all categories, although some gaps are being closed."[12] While the size of China's military budget is difficult to calculate, many Western experts believe it is in the $28 to $36 billion range, seven to nine times smaller than the US military budget.

The bomber force is antiquated, as it is based on Chinese produced versions of 1950s-vintage Soviet aircraft. The Hong-5, a redesign of the Soviet Il-28 Beagle, has been retired from air force service. The main bomber is the Hong-6, based on the Tu-16 Badger, which entered service with Soviet forces in 1955. Under a licensing agreement the Chinese began producing the H-6 in the 1960s. It was used to drop live weapons in two nuclear tests in 1965 and 1967.

For more than a decade China has been developing a new supersonic fighter-bomber, the Hong-7 (or FB-7) at the Xian Aircraft Company. According to a 1995 RAND study on China's Air Force, the FB-7 is for the Chinese navy and does not have air force participation.[13] The FB-7 will not be ready for deployment until the late 1990s and then will only be produced in very small numbers – not more than 20. It will not have a nuclear mission.

A quicker route for China to modernize its bomber force would be to adapt aircraft for a nuclear role that it has already purchased from abroad, or may purchase in the future. In the former category are 26 Soviet/Russian Su-27 Flankers that were delivered in 1992 at a cost of $1 billion. They are currently with the 3rd Air Division at Wuhu airfield, 250 kilometres west of Shanghai.

Under a new agreement Russia intends to sell production rights to China to assemble and produce Su-27s in China. The Su-27 does have an air-to-ground capability though there is no evidence that the PLAAF is modifying it for a nuclear role. Many reports of purchases or licensed manufacturing of other types of Russian aircraft (for example, MiG-31, Tu-22M, and Su-25) remain unsubstantiated.

With only one operational SSBN to date China has had a difficult time with developing and deploying this leg of its Triad. Technical difficulties with solid fuel for the missiles and nuclear reactors have slowed the programme. The Julang-1 SLBM was China's first solid fueled ballistic missile. A second generation SLBM is also under development. It seems unlikely that a future fleet will number more than four to six submarines.

Information on Chinese tactical nuclear weapons is limited and contradictory, and there is no confirmation from official sources of their existence. China's initial interest in such weapons may have been spurred by worsening relations with the Soviet Union in the 1960s and 1970s. Several low yield nuclear tests in the late 1970s, and a large military exercise in June 1982 simulating the use of tactical nuclear weapons by both sides, suggests that they have been developed.

Data Exchange, Transparency and Verification Measures

On 10 May 1995 Presidents Clinton and Yeltsin issued a "Joint Statement on the Transparency and Irreversibility of the Process of Reducing Nuclear Weapons" (reproduced in Appendix B). This Joint Statement represents the fullest and most recent description of the intentions of the two countries with regard to warhead dismantlement and transparency. Among the key provisions of this joint statement, the USA and Russia agreed to establish:

- an exchange on a regular basis of detailed information on aggregate stockpiles of nuclear warheads, on stocks of fissile materials and on their safety and security;
- a cooperative arrangement for reciprocal monitoring at storage facilities of fissile materials removed from nuclear warheads and declared to be excess to national security requirements to help confirm the irreversibility of the process of reducing nuclear weapons, recognizing that progress in this area is linked to progress in implementing the joint US-Russian programme for the fissile material storage facility at Mayak; and
- other cooperative measures, as necessary to enhance confidence in the reciprocal declarations on fissile material stockpiles.

With respect to transparency, the agreement also states that:

> The United States of America and the Russian Federation will also examine and seek to define further measures to increase the transparency and irreversibility of the process of reducing nuclear weapons, including intergovernmental arrangements to extend cooperation to further phases of the process of eliminating nuclear weapons declared excess to national security requirements as a result of nuclear arms reductions.
>
> The United States of America and the Russian Federation will seek to conclude in the shortest possible time an agreement for cooperation between their governments enabling the exchange of information as necessary to implement the arrangements called for above, by providing for the protection of that information. No information will be exchanged until the respective arrangements enter into force.

Unfortunately, there has been no progress between the United States and Russia on implementation of the agreed upon data exchange, or any warhead dismantlement and fissile material storage transparency and verification measures, since October 1995, when without explanation Russia cut off bilateral talks directed toward concluding an Agreement for Cooperation, the legal instrument that would permit the data exchange and transparency measures to go forward. Russian hard-liners among President Yeltsin's inner circle were apparently responsible for this turn of events.

Russia's refusal to move forward with an Agreement for Cooperation has brought to a halt virtually all reciprocal transparency initiatives related to nuclear warhead dismantlement and warhead component storage, including (a) a US proposal for mutual inspections of warhead storage and dismantlement sites to verify the rate at which nuclear warheads are being dismantled, the number that await dismantlement, and the number that have been dismantled already, and (b) the demonstration of techniques for verifying the presence of pits and other nuclear weapon components in sealed storage containers.

Even if these political issues are resolved, the US DOD and the Russian Ministries of Defence and Atomic Energy are likely to keep most, if not all, of the data classified and available only to the two governments, even though most of the data could be publicly released without harm to either side's national security. Moreover, the US proposal was weakened considerably by the exclusion of operational nuclear warheads and tritium inventories from the proposed categories of data to be exchanged.

At their Helsinki meeting in March 1997, the two Presidents agreed that START III negotiations should include "measures relating to the transparency of strategic nuclear warhead inventories and the destruction of strategic nuclear warheads," and would also consider "issues related to transparency in nuclear materials." However, these negotiations are waiting for the Russian Duma's ratification of START II.

The two countries could have implemented the data exchange and extensive transparency with regard to warhead dismantlement had the United States

availed itself of a window of opportunity and moved on these issues in 1991 and 1992 instead of waiting until 1994.

Summary and Conclusions

While the public and media perception is that US and Russian nuclear weapon stockpiles under START II will be reduced to no more than 3500 warheads each by 2003, the truth is that both nations are planning stockpiles that are three times this amount, on the order of 10,000-11,000 warheads.

The various forward plans of the nuclear-weapon states still indicate that they intend to retain nuclear weapons into the indefitinite future. The Joint Statement of March 1997 on nuclear weapon policy, by Presidents Clinton and Yeltsin, does not have any reference to an eventual objective of eliminating them altogether.

Finally, Russia and the United States have made almost no progress in negotiating formal agreements for nuclear stockpile data exchanges, reciprocal monitoring of warhead fissile material storage sites, and other cooperative measures to enhance confidence in reciprocal stockpile declarations. Russia has essentially cut off bilateral talks on these issues, and it is unclear when they will be restored. The 10 May 1995 Joint Statement on Transparency and Irreversibility of the Process of Reducing Nuclear Weapons remains essentially a dead letter.

Appendix A

Joint Statement on Parameters on Future Reductions in Nuclear Forces
White House text, Helsinki, 21 March 1997

Presidents Clinton and Yeltsin underscore that, with the end of the Cold War, major progress has been achieved with regard to strengthening strategic stability and nuclear security. Both the United States and Russia are significantly reducing their nuclear forces. Important steps have been taken to detarget strategic missiles. The START I Treaty has entered into force, and its implementation is ahead of schedule. Belarus, Kazakstan and Ukraine are nuclear-weapon free. The Nuclear Non-Proliferation Treaty was indefinitely extended on 11 May 1995 and the Comprehensive Nuclear Test Ban Treaty was signed by both the United States and Russia on 24 September 1996.

In another historic step to promote international peace and security, President Clinton and President Yeltsin hereby reaffirm their commitment to take further concrete steps to reduce the nuclear danger and strengthen strategic stability and nuclear security. The Presidents have reached an understanding on further reductions in and limitations

on strategic offensive arms that will substantially reduce the roles and risks of nuclear weapons as we move forward into the next century. Recognizing the fundamental significance of the ABM Treaty for these objectives, the Presidents have, in a separate joint statement, given instructions on demarcation between ABM systems and theater missile defense systems, which will allow for deployment of effective theater missile defenses and prevent circumvention of the ABM Treaty.

With the foregoing in mind, President Clinton and President Yeltsin have reached the following understandings.

Once START II enters into force, the United States and Russia will immediately begin negotiations on a START III agreement, which will include, among other things, the following basic components:

- Establishment, by 31 December 2007, of lower aggregate levels of 2000-2500 strategic nuclear warheads for each of the parties.
- Measures relating to the transparency of strategic nuclear warhead inventories and the destruction of strategic nuclear warheads and any other jointly agreed technical and organizational measures to promote the irreversibility of deep reductions including prevention of a rapid increase in the number of warheads.
- Resolving issues related to the goal of making the current START treaties unlimited in duration.
- Placement in a deactivated status of all strategic nuclear delivery vehicles which will be eliminated under START II by 31 December 2003, by removing their nuclear warheads or taking other jointly agreed steps. The United States is providing assistance through the Nunn-Lugar program to facilitate early deactivation.

The Presidents have reached an understanding that the deadline for the elimination of strategic nuclear delivery vehicles under the START II Treaty will be extended to 31 December, 2007. The sides will agree on specific language to be submitted to the Duma and, following Duma approval of START II, to be submitted to the United States Senate.

In this context, the Presidents underscore the importance of prompt ratification of the START II Treaty by the State Duma of the Russian Federation.

The Presidents also agreed that in the context of START III negotiations their experts will explore, as separate issues, possible measures relating to nuclear long-range sea-launched cruise missiles and tactical nuclear systems, to include appropriate confidence-building and transparency measures.

Taking into account all the understandings outlined above, and recalling their statement of 10 May 1995, the Presidents agreed the sides will also consider the issues related to transparency in nuclear materials.

Appendix B

Joint Statement on the Transparency and Irreversibility of the Process of Reducing Nuclear Weapons 10 May 1995

The President of the United States of America and the President of the Russian Federation

After examining the exchange of views which took place during the December 1994 meeting of the Gore-Chernomyrdin Commission in regard to the aggregate stockpiles of nuclear warheads, stocks of fissile materials, and their safety and security, as well as a discussion of the Joint Working Group on Nuclear Safeguards, Transparency and Irreversibility of further measures to improve confidence in and increase the transparency and irreversibility of the process of reducing nuclear weapons,

Reaffirm the commitment of the United States of America and the Russian Federation to the goal of nuclear disarmament and their desire to pursue further measures to improve confidence in and increase the transparency and irreversibility of the process of nuclear arms reduction, as they agreed in January and September 1994;

Reaffirm the desire of the States of America and the Russian Federation to exchange detailed information on aggregate stockpiles of nuclear warheads, on stocks of fissile materials and on their safety and security and to develop a process for exchange of this information on a regular basis; and

Express the desire of the United Sates of America and the Russian Federation to establish as soon as possible concrete arrangements for enhancing transparency and irreversibility of the process of nuclear arms reduction.

Taking into account the proposal by President B N Yeltsin for a treaty on nuclear safety and strategic stability among the five nuclear powers, they declare that:

Fissile materials removed from nuclear weapons being eliminated and excess to national security requirements will not be used to manufacture nuclear weapons;

No newly produced fissile materials will be used in nuclear weapons; and

Fissile materials from or within civil nuclear programmes will not be used to manufacture nuclear weapons.

The United States of America and the Russian Federation will negotiate agreements to increase the transparency and irreversibility of nuclear arms reduction that, *inter alia*, establish:

An exchange on a regular basis of detailed information on aggregate stockpiles of nuclear warheads, on stocks of fissile materials and on their safety and security;

A cooperative arrangement for reciprocal monitoring at storage facilities of fissile materials removed from nuclear warheads and declared to be excess to national security requirements to help confirm the transparency and irreversibility of the process of reducing nuclear weapons, recognizing that progress in this area is linked to progress in implementing the joint US-Russian programme for the fissile material storage facility at Mayak; and

Other cooperative measures, as necessary to enhance confidence in the reciprocal declarations on fissile material stockpiles.

The United States of America and the Russian Federation will strive to conclude

as soon as possible agreements which are based on these principles.

The United States of America and the Russian Federation will also examine and seek to define further measures to increase the transparency and irreversibility of the process of reducing nuclear weapons, including intergovernmental arrangements to extend cooperation to further phases of the process of eliminating nuclear weapons declared excess to national security requirements as a result of nuclear arms reduction.

The Presidents urged progress in implementing current agreements affecting the irreversibility of the process of reducing nuclear weapons such as the 23 June 1994, agreement concerning the shutdown of plutonium production reactors and the cessation of use of newly produced plutonium for nuclear weapons, in all its interrelated provisions, including, *inter alia*, cooperation in creation of alternative energy sources, shutdown of plutonium production reactors mentioned above, and development of respective compliance procedures.

The United States of America and the Russian Federation will seek to conclude in the shortest possible time an agreement for cooperation between their governments enabling the exchange of information as necessary to implement the arrangements called for above, by providing for the protection of that information. No information will be exchanged until the respective arrangements enter into force.

Notes

1. START II Treaty, Report together with Additional Views, Committee on Foreign Relations, United States Senate, Exec. Report 104-10, 104th Cong., 1st Session, December 15, 1995, pp. 10-11.

2. SASC, DOD FY1996, Hearings, Part 7, p. 366.

3. The "inactive reserve" is reportedly composed of intact warheads stored without the limited-life components, such as plutonium-238 batteries, neutron generators, and deuterium-tritium boost gas reservoirs.

4. Tom Walton, Public Affairs Office, Albuquerque Field Office, DOE, to Robert S. Norris, 9 May 1996.

5. T.B. Cochran, R.S. Norris and O.A. Bukharin, *Making the Russian Bomb: From Stalin to Yeltsin*, Boulder, Co.: Westview Press, 1995, pp. 31-32.

6. Private communication to authors concerning remarks by Viktor Mikhailov. The 45,000 figure was criticized as being too high by a senior official of the Twelfth Main Directorate of the Russian Ministry of Defense (MOD).

7. "According to Minister Viktor Mikhailov approximately 13,000 nuclear munitions have been dismantled in this time [the last eight to 10 years], 2000 a year on average." Sergei Ovsiyenko, "Weapons-Grade Plutonium Stocks Dwindling," Rossiyskiye Vesti, 19 May 1993, p. 7. Viktor Mikhailov and Evgeni Mikerin, in remarks at the International Symposium on Conversion of Nuclear Warheads for Peaceful Purposes, Rome, Italy, 15-17 June 1992, stated that the stockpile had declined by 20 per cent since it peaked in 1986, which implies that the stockpile was 36,000 in 1992. In an interview with Evgeni Panov, Moscow Rossiyskaya Gazeta, in Russian, 11 December 1992, p. 7 (translated in the Foreign Broadcast Information Service series, FBIS-SOV-92-239, 11 December 1992, p. 3), Mikhailov is quoted as having said, "...

if destruction of nuclear weapons in our country is halted as a result of financial and technical difficulties, by the year 2000 the Americans will be scrapping their own weapons but we will be unable to. They will have 10,000 charges left, we will have 35,000." See also, Trip Report, Senate Armed Services Committee Delegation's Visit to Russia, Kazakhstan and Ukraine, 15-20 January 1992, p. 4. "According to officials of the Ministry and other informed sources, some 8-10 thousand warheads have been disassembled in Russia since 1985."

8. Lawrence K. Gershwin, National Intelligence Officer for Strategic Programs, Central Intelligence Agency, Hearings before the House Committee on Appropriations, DOD Appropriations for 1993, Part 5, 6 May 1992, p. 499.

9. Mikhailov and Mikerin, International Symposium, Rome, 15-17 June 1992.

10. Gershwin in HAC, DOD FY 1993, Part 5, p. 499.

11. V. Mikhailov, I. Andryushin, and A. Chernyshov, "NATO's Expansion and Russia's Security," *Vek*, 20 September 1996.

12. D. Shambaugh, "China's Military: Real or Paper Tiger?" *The Washington Quarterly*, Spring 1996, p. 24.

13. K.W. Allen, G. Krumel and J.D. Pollack, *China's Air Force Enters the 21st Century*, Santa Monica, CA: RAND, 1995.

Table 1. U.S. Nuclear Forces, End-1996.

Type	Name	Launchers/ SSBNs	Warhead Type	Yield (kilotons)	Total Warheads	Total Megatons
Operational Forces						
Strategic						
ICBMs						
LGM-30G	Minuteman III:					
	Mk-12	200	3 W62 (MIRV)	170	600	102
	Mk-12A	300	3 W78 (MIRV)	335	900	302
LGM-118A	MX/Peacekeeper	50	10 W87-0 (MIRV)	300	500	150
Subtotal (ICBM)		**550**			**2000**	**554**
SLBMs						
UGM-96A	Trident I C-4	192/8	8 W76 (MIRV)	100	1,536	154
UGM-113A	Trident II D-5	216/8				
	Mk-4		8 W76 (MIRV)	100	1,344	134
	Mk-5		8 W88 (MIRV)	475	384	182
Subtotal (SLBM)		**408/17**			**3,264**	**470**
Bomber/Weapons						
B-1B	Lancer	95/48	only bombs			
B-2	Spirit	13/10	only bombs			
B-52H	Stratofortress	71/44	bombs, ALCM, ACM			
			B53	9,000	9	81
			B61-7, -11	0.3-300	400	40
			B83-0, -1	1,000	600	600
			ALCM/W80-1	5-150	400	40
			ACM/W80-1	5-150	400	40
Subtotal (Bombers)					**1,809**	**801**
Subtotal (Operational Strategic)					**7,073**	**1,825**
Non-strategic						
SLCM			W80-0	5-150	320	32
Air Force Non-strategic Bombs			B61-3, B61-4, B61-10	0.3-170	630	62
Subtotal (Operational Non-strategic)					**950**	**94**
Subtotal (Operational)					**8,023**	**1,919**
Spares for Operational Forces					**536**	**136**
Subtotal (Operational with Spares)					**8,559**	**2,055**
Reserves						
SSBN to be delivered mid-1997		2/1	8 W76 (MIRV)	100	200	20
Bomber Weapons			B61-3, B61-4, B61-10	0.3-170	700	69
			B61-7	0.3-300	260	26
			W80-1	5-150	1030	103
GLCM (inactive)			W84	0.2-150	400	60
Subtotal (Reserves)					**2,596**	**278**
Grand Total					**11,155**	**2,333**

Notes: First bomber number reflects total inventory. Second number is "primary mission" number which excludes trainers and spares. Bombers are loaded in a variety of ways depending on mission. B1-Bs and B-2s do not carry ALCMs or ACMs. The first 16 B-2s will initially carry only the B53. Eventually, all B2s will carry both B61s and B83s. B53 bombs are being retired and replaced with B-11s.
ACM--advanced cruise missile; ALCM--air-launched cruise missile; ICBM--intercontinental ballistic missile (range greater than 5,500 kilometers); MIRV--multiple independently targetable reentry vehicle SLBM--submarine-launched ballistic missile; SSBN--nuclear powered ballistic missile submarine.

Table 2. U.S. Nuclear Forces, 2003 (START II).

Type	Name	Launchers/ SSBNs	Warhead Type	Yield (kilotons)	Total Warheads	Total Megatons
Operational Forces						
Strategic						
ICBMs						
LGM-30G	Minuteman III	500	1 W87-0	300	500	150
Subtotal (ICBM)		**500**			**500**	**150**
SLBMs						
UGM-133A	Trident II D-5	14/336				
	Mk-4		5 W76 (MIRV)	100	1,296	130
	Mk-5		5 W88 (MIRV)	475	384	182
Subtotal (SLBM)		**14/336**			**1,680**	**312**
Bomber/Weapons						
B-2A	Spirit	21	bombs, ALCM, ACM			
B-52H	Stratofortress	66	bombs, ALCM, ACM			
			B61-7, B61-11	0.3-200	300	30
			B83	1,000	600	600
			ACM/W80-1	5-150	400	40
Subtotal (Bombers)					**1300**	**670**
Subtotal (Operational Strategic)					**3,480**	**1,132**
Non-strategic						
SLCM			W80-0	5-150	320	48
Air Force Tactical Bombs			B61-3, B61-4, B61-10	0.3-170	630	107
Subtotal (Operational Non-strategic)					**950**	**155**
Subtotal (Operational)					**4,430**	**1,287**
Spares for Operational Forces					**493**	**108**
Subtotal (Operational with Spares)					**4,923**	**1,394**
"Hedge"						
ICBM warheads to upload Minuteman III			W78 (MIRV)	335	670	291
SLBM warheads to upload Trident II		336/14	W76 (MIRV)	100	925	93
Bomber weapons for B-1 and B-52H			B61-7, B61-11	0.3-300	200	20
			W80-1	5-150	500	50
Subtotal ("Hedge")					**2,495**	**454**
Inactive Reserves						
ICBM			W62	170	600	102
SLBM			W76	100	800	80
Bomber Weapons			B61-3, B61-4, B61-10	0.3-170	600	59
			B61-7, B61-11	0.3-300	135	14
			W80-1	5-150	900	90
GLCM			W84	0.2-150	390	39
Subtotal (Inactive Reserves)					**3,425**	**403**
Grand Total					**10,843**	**2,251**

ACM--advanced cruise missile; ALCM--air-launched cruise missile; ICBM--intercontinental ballistic missile (range greater than 5,500 kilometers); MIRV--multiple independently targetable reentry vehicle; SLBM--submarine-launched ballistic missile; SSBN--nuclear-powered ballistic missile submarine.

Table 3. Russian Nuclear Forces, End-1996.

Category/Type	*Weapon System*	*Launchers*	*Warheads*
Strategic Offense			
ICBM	SS-18 (180), SS-19 (160), SS-24 (46), SS-25 (369)	755	3,750
SLBM	SS-N-18 (208), SS-N-20 (120), SS-N-23 (112)	440	2,350
Bomber	6 Blackjack, 27 Bear-H6, 36 Bear-H16 (AS-15 ALCMs, AS-16 SRAMs, bombs)	69	1,400
Subtotal			**7,500**
Strategic Defense			
ABM	SH-08 Gazelle (64), SH-11 Gorgon (36)	100	100
SAM	SA-5B Gammon, SA-10 Grumble	1,100	1,100
Subtotal			**1,200**
Land-based Non-strategic			
Bomber and fighter	Backfire (80), Blinder (42), Badger (24), Fencer (280)	426	1,600
Subtotal			**1,600**
Naval Non-strategic			
Attack aircraft	Backfire (135), Blinder (30), Badger (50), Bear G (25) (AS-4 ASM, bombs)	240	600
SLCM	SS-N-9, SS-N-12, SS-N-19, SS-N-21, SS-N-22	--	500
ASW	SS-N-15, SS-N-16, torpedoes, depth bombs	n/a	500
Subtotal			**1,600**
Grand Total			**11,900**

ABM: anti-ballistic missile; **ALCM**: air-launched cruise missile; **ASM**: air-to-surface missile; **ASW**: anti-submarine weapons; **ICBM**: intercontinental ballistic missile; **SAM**: surface-to-air missiler; **SLBM**: submarine-launched ballistic missile;**SLCM**: submarine-launched cruise missile; **SRAM**: short-range attack missile; **SSBN**: nuclear powered ballistic missile submarine.

Table 4. Russian Nuclear Force Scenarios, 2003-2004.

	Without START II				Under START II			
	High Budget		Low Budget		High Budget		Low Budget	
	Launchers	Warheads	Launchers	Warheads	Launchers	Warheads	Launchers	Warheads
Operational Strategic								
ICBMs	666	2,040	496	1,870	611	611	441	441
SLBMs	256	1,520	168	928	256	1520	168	928
Bombers	45	688	30	448	45	688	30	448
Subtotal (Strategic)	**967**	**4248**	**694**	**3246**	**912**	**2819**	**639**	**1817**
Operational Non-strategic								
SLCM		350		350		350		350
Tactical Bombs		1,000		1,000		1,000		1,000
Subtotal (Non-strategic)		**1,350**		**1,350**		**1,350**		**1,350**
Spares (10%)		**560**		**460**		**417**		**317**
"Hedge" Warheads								
ICBM warheads to upload SS-19 and SS-24					151	939	151	939
Subtotal ("Hedge")					**151**	**939**	**151**	**939**
Possible Inactive Warheads								
ICBM (SS-18, SS-19)		2962		2962		3452		3452
SLBM (SS-N-18, SS-N-20, SS-N-23)		880		1,472		880		1,272
Strategic Bomber Weapons		612		812		612		812
Subtotal (Inactive)		**4,454**		**5,246**		**4,944**		**5,536**
Grand Total		**10,612**		**10,302**		**10,469**		**9,959**

Table 5. US Nuclear Warheads and Megatonage, FY 1945- 96

End-FY	Stockpile	Yield (Mt)
1945	2	0
1946	9	0
1947	13	0
1948	50	1
1949	170	4
1950	299	10
1951	438	35
1952	841	50
1953	1,169	73
1954	1,703	339
1955	2,422	2,880
1956	3,692	9,189
1957	5,543	17,546
1958	7,345	17,304
1959	12,298	19,055
1960	18,638	20,491
1961	22,229	10,946
1962	26,082	12,825
1963	28,827	15,977
1964	29,571	16,944
1965	31,229	15,153
1966	31,301	14,037
1967	31,345	12,786
1968	29,687	11,838
1969	27,326	11,714
1970	25,739	9,695
1971	25,745	8,584
1972	26,230	8,532
1973	27,607	8,452
1974	26,309	8,425
1975	27,277	7,368
1976	25,773	5,936
1977	24,996	5,845
1978	23,898	5,721
1979	23,769	5,696
1980	23,614	5,619
1981	22,705	5,383
1982	22,500	5,359
1983	22,841	5,232
1984	23,064	5,192
1985	22,950	5,217
1986	22,915	5,415
1987	23,236	4,882
1988	22,958	4,790
1989	21,944	4,743
1990	21,234	4,519
1991	19,034	3,796
1992	13,834	3,168
1993	11,534	2,647
1994	11,302	2,375
1995	11,244	2,363
1996	11,172	2,336

Table 6. USSR/Russian Nuclear Warheads, 1949-1996

End Year	Strategic	Non-Strategic	Stockpiled Warheads	Intact Warheads
1949		1	1	?
1950		5	5	?
1951		25	25	?
1952		50	50	?
1953		120	120	?
1954		150	150	?
1955		200	200	?
1956	126	300	426	?
1957	160	500	660	?
1958	269	600	869	?
1959	360	700	1,060	?
1960	405	1,200	1,605	?
1961	471	2,000	2,471	?
1962	522	2,800	3,322	?
1963	638	3,600	4,238	?
1964	821	4,400	5,221	?
1965	929	5,200	6,129	?
1966	1,089	6,000	7,089	?
1967	1,539	6,800	8,339	?
1968	1,799	7,600	9,399	?
1969	2,138	8,400	10,538	?
1970	2,443	9,200	11,643	?
1971	2,592	10,500	13,092	?
1972	2,678	11,800	14,478	?
1973	2,815	13,100	15,915	?
1974	2,985	14,400	17,385	?
1975	3,743	15,700	19,443	?
1976	4,205	17,000	21,205	?
1977	4,744	18,300	23,044	?
1978	5,793	19,600	25,393	?
1979	7,035	20,900	27,935	?
1980	7,882	22,200	30,082	?
1981	8,549	23,500	32,049	?
1982	9,152	24,800	33,952	?
1983	9,704	26,100	35,804	?
1984	10,031	27,400	37,431	?
1985	10,497	28,700	39,197	
1986	10,723	30,000	40,723	45,000
1987	11,159	27,700	38,859	43,000
1988	11,630	25,700	37,330	41,000
1989	12,117	23,700	35,817	39,000
1990	11,815	21,700	33,515	37,000
1991	10,672	18,933	29,606	35,000
1992	10,089	16,167	26,256	33,000
1993	9,385	13,400	22,785	31,000
1994	8,434	10,633	19,067	29,000
1995	7,748	7,867	15,615	27,000
1996	7,622	5,100	12,722	25,000

Figure 1. U.S. Nuclear Weapon Stockpile

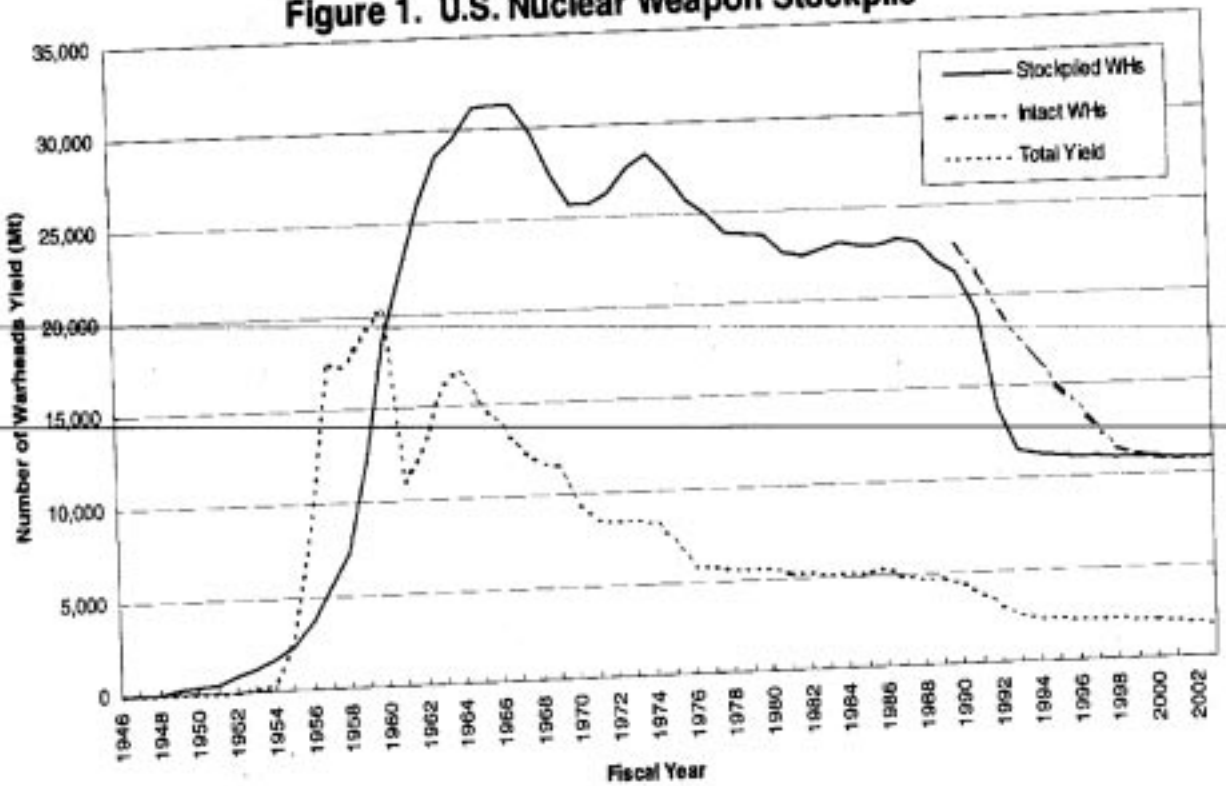
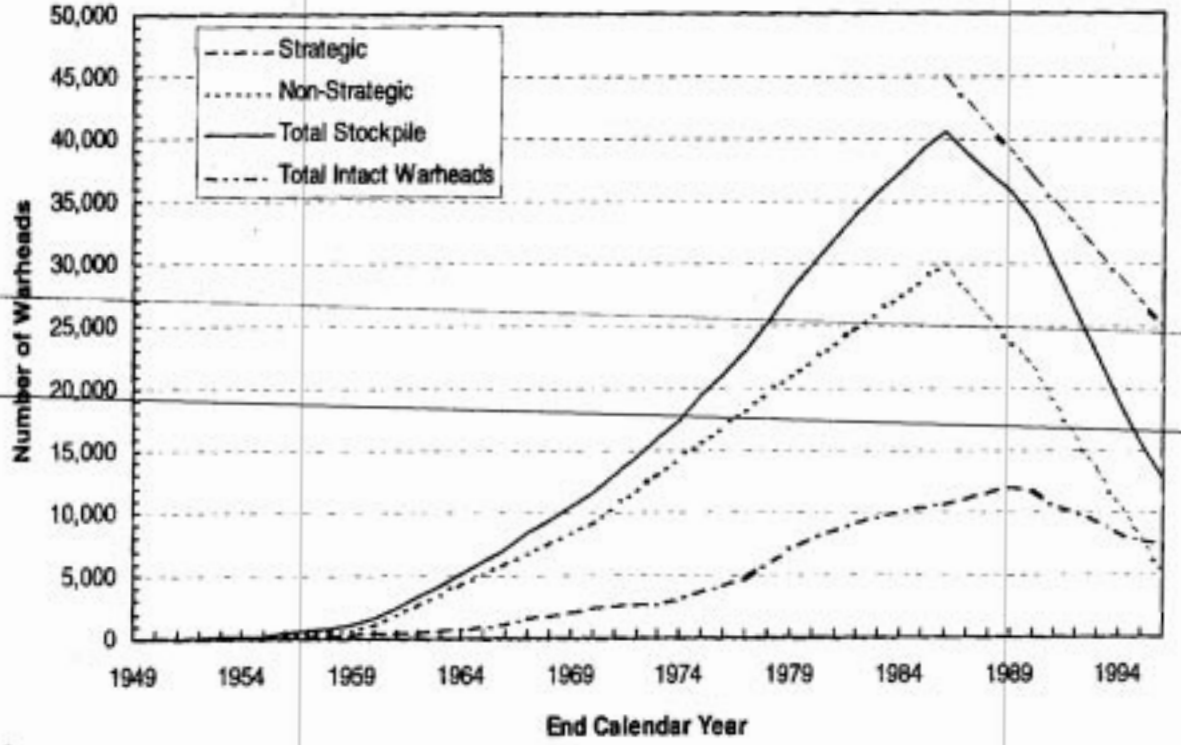


Figure 2. USSR/Russian Nuclear Stockpile, 1949-1996



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made this 30 day of August 1997

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London WC1B 3BJ
United Kingdom

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in this Agreement referred to as the Author, and WESTVIEW PRESS, Inc., 5500 Central Avenue, Boulder, Colorado, 80301, in this Agreement referred to as the Publisher, with respect to a Work tentatively titled:

NUCLEAR WEAPONS: THE ROAD TO ZERO
edited by Joseph Rotblat

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IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement the day and year first above written.

By _____
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AUTHOR

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