NUCLEAR WARHEAD DESTRUCTION

by

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While the topic of this working group is ''Nuclear Disarmament: Safety, Security and Storage,'' my remarks will be limited to the problems associated with achieving greater transparency in the nuclear warhead dismantlement process. I will not address issues related to dismantlement of the missiles and other delivery systems. I will first review where we are in the warhead dismantlement process; next I will address why it is important to incorporate more transparency, or verification, into the process; and finally I will examine some of the technical and political issues.

The Status of the Warhead Dismantlement Process:

Russia: The Soviet nuclear warhead stockpile peaked in 1986 at about 45,000 warheads. Between 1986 and mid-1993, it is estimated that about 25 percent of these warheads have been dismantled, leaving an estimated 33,000 warheads intact in Russia, Ukraine, Belarus, and Kazakhstan. Russia is believed to be dismantling warheads at the rate of 2000 to 2500 per year. These are estimates of the Natural Resources Defense Council (NRDC). There are probably only a handful of people in Russia that know the true figures.

Compiled by my colleague, Dr. Robert Standish (''Stan'') Norris, Table I shows our estimate of the composition of the ''operational'' CIS stockpile of some 15,000 warheads. The other 16,000 warheads (45,000-15,000=16,000), are primarily tactical warheads awaiting dismantlement or being held in inactive reserve. At the current rate of dismantlement it will be six to eight years--until 1999 to 2002--before the dismantlement of all of these 16,000 warheads could be completed.

The Russian Ministry of Atomic Energy (Minatom) has sole responsibly for the design, testing, construction, and dismantlement of nuclear warheads of the former Soviet Union. There are three major Russian assembly/disassembly plants: Sverdlovsk-45 at Nizhnaya Tura; Zlatoust-36 at Yuryuzan; and Penza-19 at Kuznetsk, a small city 115 kilometers east of Penza. Small scale production and disassembly also takes place at Arzamas-16, one of the two design laboratories. The U.S. Defense Intelligence Agency describes Sverdlovsk-45 as a "very large plant," Zlatoust-36 as a "much smaller facility," and Penza-19 as a "small component fabrication and assembly plant." Minatom Minister Viktor Mikhailov has said the total capacity of the complex is about 7000 warheads per year (assembly and disassembly), but many experts believe that the complex is not at full capacity, which would probably require a highly efficient, three-shift, 24-hour-a-day operation. Officials have said it takes more time to take a weapon apart than to assemble one, and some capacity is being used to modify existing warheads and assemble new ones, probably for the SS-25 ICBM. Finally, there is the issue of whether a high rate of dismantlement could be sustained in a safe and environmentally responsible manner. These factors, and the dismantlement rates from 1986 to 1992, lead us to estimate that the current dismantlement rate is probably between 2000 and 2500 warheads per year.

United States: The stockpile of U.S. nuclear warheads peaked in 1967 at just over 32,000 warheads. By the time the Soviet stockpile peaked in 1986, the U.S. stockpile had been reduced to 23,400 warheads. No new warheads have been produced in the United States since the summer of 1990.[1] By mid-1993 the inventory of assembled nuclear warheads had been reduced to about 17,000 warheads. The U.S. nuclear stockpile is now at the lowest level since late 1958 or early 1959.

Table 2 shows Dr. Norris' estimate of the composition of the current U.S. "operational" stockpile of approximately 10,500 warheads. There are two other stockpile categories: the "inactive reserve," and warheads awaiting eventual disassembly. According to the U.S. Department of Defense (DOD), "the IR [inactive reserve] holds the Nation's only capacity for augmenting our significantly reduced active nuclear forces in response to a reversal in current geo-political trends or the emergence of a new strategic threat." At present only the W84, the warhead for the former ground-launched cruise missiles, is known to be in inactive reserve. We estimate that 400 of these were built before production ceased in January 1988. Though the INF Treaty banned the missiles and other supporting equipment, the warheads were retained. Two other warheads, the W69 for the bomber-launched Short Range Attack Missile (SRAM) and the B53 nine-megaton bomb, are ambiguous cases. They may be in the inactive category as well.

We estimate that some 6000 warheads are in retirement category, stored at DOD or DOE depots awaiting dismantlement. In the two years, thousands of warheads have returned to central military storage depots in the United States and funneled to DOE's Pantex facility for final disassembly and disposal. They are being dismantled at the rate of 1500 to 2000 per year. Thus, it will take the United States only three or four years to dismantle the 6000 warheads now in the dismantlement category.

Under current plans--premised on Ukraine ratifying START and Russia and the United States ratifying START II--the future U.S. "operational" stockpile is scheduled to be 5100 warheads, comprised of some 3500 strategic and 1600 non-strategic weapons. This future operational stockpile will likely have six warhead types (B61, W76, W80, B83, W87, and W88).

But let's not be mislead. There is nothing in START, START II, or any other existing agreement between the United States and the CIS that limits the number of warheads to be held in reserve, or that limits the fissile weapon components or materials, also held in reserve. Even if the U.S. "operational" stockpile reaches 5100 warheads by the year 2000, the U.S. could still retain another 5800 warheads in inactive reserve, and retain fissile

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[1] The U.S. Department of Energy (DOE) is responsible for the design, testing, construction, and dismantlement of U.S. nuclear warheads. Before production ceased in November 1989, plutonium "pits" were produced at DOE's Rocky Flats plant in Colorado, and shipped to the Pantex plant in Texas where final assembly of warheads took place. By the summer of 1990 the supply of pits from Rocky Flats was exhausted.

material components for thousands of additional weapons. The Russian, or CIS, situation is likely to mirror that of the United States.

The Need for Greater Transparency in the Dismantlement Process:

There are only two verification, or transparency, agreements related to nuclear warhead dismantlement. The first, between Russia and Ukraine, ostensibly permits Ukraine to confirm that the warheads that have been removed from Ukraine after the breakup of the Soviet Union are in fact being dismantled. The second is an agreement signed by Vice President Albert Gore and Russian Premier Viktor Stepanovich Chernomyrdin in Washington, D.C. on September 2, 1993. It ostensibly permits the U.S. to confirm that the 500 tonnes of high-enriched uranium (HEU) purchased by the United States comes from dismantled warheads, and permits Russia to confirm that this material, after blending down to low-enriched uranium (LEU) will only be used as civil power reactor fuel. Neither the text of these agreements, nor details regarding how either is being, or will be, implemented, has been made public.

There are currently no verification, or transparency, procedures in place that permit the United States and Russia to determine, or confirm, the number of warheads being dismantled, the number that have been dismantled, or the number remaining in reserve. There is not even an exchange of unverified data in this regard.

Why is more transparency desirable? The primary reason is that failure of the United States and Russia to carefully track each other's dismantlement process will leave large uncertainties in the knowledge each side has with regard to the size and disposition of the other's inventories of residual warheads and fissile materials. To place this in perspective, at the recent annual symposium of the Uranium Institute in London, Minatom Minister Mikhailov revealed that Russia's sale of 500 tonnes of HEU to the United States represented only about 40 percent of the inventory of HEU in weapons and in stockpiles. This means the CIS HEU inventory is about 1250 tonnes, which is greater than the upper limit of previous U.S. intelligence estimates. The difference between the size of the HEU stockpile as revealed by Minister Mikhailov, and the mid-point of the U.S. intelligence community's estimate, is comparable to the entire U.S. HEU stockpile! Under these circumstances, without further transparency, the U.S. military establishment may be able to effectively argue that further nuclear warhead reductions would be imprudent, and that large warhead reserves and fissile material inventories must be retained. Similar arguments may be made in Russia, and in any case Russia will likely retain a large reserve if the United States does.

Should the United States and Russia maintain large stocks of warheads in inactive reserve and large stockpiles of fissile material as weapon components, there will be little incentive for other nuclear powers, such as France, China, U.K. and Israel, to join in the disarmament process. Chinese nuclear experts, with their far smaller nuclear stockpile, have already expressed the view that the START agreements do not represent genuine nuclear disarmament, but merely a shifting of the nuclear superpower stockpiles from active to reserve status. We need to devise mechanisms to increase international confidence that nuclear warhead destruction is being accomplished in an irreversible manner.

A second reason additional transparency is desirable--at least from the U.S. standpoint--is to increase confidence that no warheads or fissile materials are being diverted from the CIS for sale, or other unauthorized use. There are numerous reports of attempted sales of weapons-usable materials in the CIS. Fortunately, most have been hoaxes. Minatom, however, has reportedly registered three cases of theft of uranium in Podolsk, Glazov, and at Arzamas-16. Two cases involved LEU and one involved HEU. The U.S. government does not have any independent means of confirming evidence of diversion in Russia. Instead the U.S. government is forced to rely on statements by the Russian government, which is not always on top of the facts. This concern also applies to Ukraine, Belarus, and Kazakhstan.

Technical Challenges:

The technical requirements to verify nuclear warhead inventories, the dismantlement process, storage of fissile materials, and a cutoff in the production of fissile materials for weapons have been studied extensively and are well understood.[2]

The first step is for the countries involved to exchange date on inventories of warheads and fissile material, and to periodically update this data exchange. My colleague Christopher E. Paine and I have prepared in Table 3, a matrix showing the type of data that might be exchanged. We have been careful to construct it so that the fissile material inventory in a given warhead type could not be derived from the exchanged data. The next step is to start putting in place agreed upon procedures for verifying the data exchange.

The technology for verifying warheads in storage and transport involves mechanical locks, electronic and fiber optic seals, intrinsic fingerprint techniques for metal surfaces, bar codes, and surveillance devices. Most of these technologies are commercially available and many are presently in use by the International Atomic Energy Agency (IAEA) to verify the disposition of nuclear fuel.

Verifying the warhead dismantlement process itself presents unique problems due to the need to protect sensitive warhead design information. But here again, procedures for

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[2] See, for example, "Ending the Production of Fissile Materials for Weapons; Verifying the Dismantlement of Nuclear Warheads," Federation of American Scientists, June 1991; "Report on the Third International Workshop on Verified Storage and Destruction of Nuclear Warheads," held in Moscow and Kiev, December 16-20, 1991, Natural Resources Defense Council; "Report on the Fourth International Workshop on Nuclear Warhead Elimination and Nonproliferation," held in Washington, D.C., Federation of American Scientists and Natural Resources Defense Council; William G. Sutcliffe, "Fissile Materials from Nuclear Arms Reductions: A question of Disposition,"Lawrence Livermore National Laboratory, CONF-910208, CTS-31-92, February 18, 1991.

doing so have already been worked out. Using gamma-ray spectroscopy and computer algorithms, it is possible to confirm that warheads entering a dismantlement facility are authentic, and that all the fissile material removed from the facility is accounted for. The fissile material would be transferred to a safeguarded storage facility in sealed containers. The procedure could be greatly simplified if each side is willing to reveal to the other the quantity of fissile material in each warhead of a given type or class. While these data would not have to be revealed to other governments or made public for non-proliferation reasons; an exchange of these data by the United States and Russia would hardly threaten the national security of either country. If these data were exchanged there would be no need to closely monitor the portals to the dismantlement facility, or to authenticate each warhead prior to dismantlement. Each side would simply deliver periodically to the safeguarded storage facility the amount of fissile material consistent with the total number of warheads dismantled during a specified period.

The procedures and technology for verifying fissile material inventories and a cut-off in the production of fissile material for weapons are the same as those already being applied by the IAEA to the commercial fuel cycle. There will be special requirements to permit the continued supply of naval reactor fuel and replacement tritium for weapons. But these problems have been studied and are fairly well understood.

In sum, there are simply no technological show stoppers to verifying nuclear warhead inventories, the dismantlement process, storage of fissile materials, or a cutoff in the production of fissile materials for weapons. The difficulty is deciding what level of verification is desired, taking into account the need to reduce the uncertainties mentioned above, the cost of verification, and the need to protect some warhead design details. Once this is decided the procedures and technical requirements are straight forward.

Political Challenges:

Two years ago, October 17-19, 1991, the Second International Workshop on Verified Storage and Elimination of Nuclear Warheads was held in Washington, D.C.[3] This was shortly after Presidents Gorbachev and Bush had each made unilateral commitments to eliminate thousands of tactical nuclear warheads, and shortly after the failed putsch to oust Gorbachev. The workshop participants included Viktor Mikhailov, then deputy Minister of Atomic Power and Industry and now Minister of the Ministry of Atomic Energy (Minatom), Evgeniy Avrorin, Scientific leader of Chelyabinsk-70, and Sergei Kortunov, then Counsellor for Arms Limitations, Foreign Ministry of the USSR. The workshop participants reached general agreement on a number of steps that the two countries should undertake: (a) each should declare at an early stage that the fissile material removed from weapons would not be

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[3] This conference was organized on the U.S. side by the Federation of American Scientists and the Natural Resources Defense Council, and on the Soviet side by the USSR Foreign Ministry.

used for new weapons; (b) each should exchange and make public the total number of warheads in their respective stockpiles, the numbers of warheads, by class, that are planned to be eliminated, and the total quantity of plutonium and HEU removed from these warheads; (c) the two nations should establish at the earliest possible time bilateral safeguards over warheads to be dismantled; and (d) the two nations should discuss what additional steps should be undertaken at the dismantlement facilities to insure that the warheads in safeguarded storage are actually dismantled and that the fissile material recovered from warheads is placed under safeguards.

Despite the expressed Soviet interest in a data exchange and verification of warheads and fissile material, the Bush Administration chose not to pursue any of these options, arguing that the validity of the data exchanged could not be confirmed without intrusive inspections and that such inspections could compromise sensitive U.S. facilities and information and excessively complicate day-to day-operations of the U.S. nuclear weapons complex. In reality, Bush Administration officials feared that Russian oversight over U.S. weapon facilities and fissile materials would restrict future U.S. nuclear weapons policy.

In December of 1991, the Third International Workshop on Verified Storage and Destruction of Nuclear Warheads'' was held in Moscow and here in Kiev.[4] At that meeting NRDC offered to supply all materials and equipment to permit Ukraine and Russia to jointly tag and seal all tactical warheads slated to be transported to Russia for dismantlement. This idea was rejected by both the Russian and Ukrainian military representatives, in part because this was not part of a government-to-government agreement between the U.S., Russia and Ukraine which would involve reciprocity on the part of the United States.

In September of last year the U.S. Senate sought to compel the Administration to take even minimal action by attaching a condition to its ratification of START--referred to as the Biden Condition--that requires that the President "seek appropriate arrangements" for monitoring warheads and fissile materials "in connection with" a START II agreement.

Now, over eight months into the Clinton Administration, no effort has been made to reverse the Bush policy on warhead verification. In fact, two weeks ago the Clinton Administration asked the House Foreign Affairs Committee to drop a provision in a comprehensive non-proliferation bill sponsored by Congressmen McCloskey and Stark that would have required the Administration to report to Congress on progress being made to comply with the Biden Condition.

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[4] Organized on the Soviet side by the Arms Control Directorate of the USSR Foreign Ministry and the Ministry of Atomic Power and Industry; and on the U.S. side by the Federation of American Scientists and the Natural Resources Defense Council.

Conclusion:

In sum, the obstacle to improving transparency, or verification, in the nuclear warhead dismantlement process is not technical, but political. With political chaos in Russia, the initiative now will have to come from the United States. But for the past two years the Bush and Clinton Administrations have sought to shield the U.S. nuclear establishment from rigorous inspection by adopting a policy approaching benign neglect toward the disposition of the Russian nuclear weapons stockpile, production complex, and fissile material inventories. Had there been a modicum of political initiative in the United States, Russia, or perhaps even in the Ukraine, today we could have had hundreds of inspectors in the United States, Russia, Ukraine, Belarus, and Kazakhstan tracking the disposition of nuclear weapons and weapons-usable materials. Instead we are losing track of materials, and increasing the likelihood that the disarmament process will bog down over future uncertainty regarding how many warheads were built, how many destroyed, and whether all the weapons usable material can be accounted for. What is lacking is national and international leadership with wisdom and foresight to create the verification infrastructure to insure that we can continue the process toward truly deep reductions in nuclear weapons, and the secure storage of small remaining stockpiles under international monitoring, a process we call the ''virtual abolition'' of nuclear weapons.

TABLE 1: ESTIMATED RUSSIAN (C.I.S.) NUCLEAR STOCKPILE (JULY 1993)

Category/type	*Weapon system*	*Launchers*	*Warheads*
Strategic offense			
ICBMs	SS-18, SS-19, SS-24, SS-25	1,003	5,800
SLBMs	SS-N-18, SS-N-20, SS-N-23	456	2,400
Bombers	Blackjack, Bear H (AS-15 ALCMs, AS-16 SRAMs, bombs)	100	1,300
Subtotal			**9,500**
Strategic defense			
ABMs	SH-08 Gazelle (64), SH-11 Gorgon (36)	100	100
SAMs	SA-5B Gammon, SA-10 Grumble, SA-12B Giant	1,350	1,350
Subtotal			**1,450**
Land-based nonstrategic			
Bombers and fighters	Backfire, Blinder, Fencer, Flogger, Fitter, Bear G (AS-4 ASM, AS-16 SRAM, bombs)	1,650	2,000
Subtotal			**2,000**
Naval nonstrategic			
Attack aircraft	Backfire, Blinder, Fencer, Flogger, Fitter (AS-4 ASM, bombs)	450	600
SLCMs	SS-N-9, SS-N-12, SS-N-19, SS-N-21, SS-N-22	800	500
ASW aircraft	May, Bear F, Hormone A, Helix A (depth bombs)	250	150
ASW weapons	SS-N-15, SS-N-16, FRAS-1, Type 65 and ET-80 torpedoes	500	600
Subtotal			**1,850**
Total			**15,000**

TABLE 2: U.S. NUCLEAR WEAPONS STOCKPILE (JUNE 1993)

Category/type	*Weapon system*	*Launchers*	*Warheads*
Strategic			
ICBMs	Minuteman III, MX/Peacekeeper	550	2,000
SLBMs	Trident I, II	440	3,520
Bombers	B-52H, B-1B	190	3,100
Subtotal			**8,620**
Nonstrategic			
Bombers and fighters			
	F-16C/D, F-15E, F-111F, A-6, F-18, Non-U.S. NATO aircraft	500	1,525
Sea-launched cruise missiles		184	350
Subtotal			**1,875**
Total			**10,500**

TABLE 3

Sample U.S. - C.I.S Nuclear Stockpile Data Exchange under Biden Condition to START

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	DATA CATEGORY	Weapon and Fissile Material Inventories				Weapons Committed/Scheduled for Elimination				Nuclear Weapons Dismantled			
2		(Status as of 9/30/91 and each year thereafter)				(cumulative weapons and fissile material since 9/30/91)				(cumulative number of weapons and fissile material)			
3		# of weapons	Pu (kgs)	HEU (>20% U-235)		# of weapons	Pu (kgs)	HEU (>20% U-235)		# of weapons	Pu (kgs)	HEU (>20% U235)	
4				U-235 (kg)	Total (kg)			U-235 (kg)	Total (kg)			U-235 (kg)	Total (kg)
5	Warheads/bombs for SNDV's												
6	on strategic ballistic missiles												
7	at bases for operational strategic bombers												
8	in storage												
9	*Total - strategic weapons*												
10													
11	Nonstrategic Nuclear Weapons												
12	land-based missiles/artillery/mines/air-defense												
13	gravity bombs (Navy and Air Force)												
14	ship-launched weapons/sea mines												
15	*Total - nonstrategic weapons*												
16													
17	Other stocks available for weapons												
18													
19	Total nuclear weapons stockpile												
20													
21	Non-weapons Stockpile												
22	Transferred from weapons use												
23	Recovered from spent fuel												
24	In fresh enriched uranium (unirradiated)												
25													
26	Total weapons-usable												
27	fissile material inventory												
28													

Cell: A1
Note: Only Data in Unshaded Boxes would be exchanged, protecting specific weapons design information.

Cell: A17
Note: "Other stocks available for weapons" includes stored fissile material components of previously di.mantled and any other fissile materials usable in weapons without further chemical separation or isotopic enrichment.

Cell: A23
Note: "Recovered from spent fuel" category includes fissile material recovered from naval propulsion, research, test, and defense production reactors, and from nuclear power generating stations.

Cell: A24
Note: "In fresh enriched uranium" category includes fresh HEU fuel elements for naval propulsion, research, test, isotope production, and prototype power reactors, HEU fuel fabrication pipeline inventory, and stored inventories of highly-enriched product.