

**Russian Nuclear Warhead Dismantlement Rates  
and Storage Site Capacity:  
Implications for the Implementation of START II  
and De-alerting Initiatives**

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**CEES Report No. AC-99-01**

February 1999

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Acknowledgements: The author would like to thank Frank von Hippel for his insightful comments, encouragement and patience, and Oleg Bukharin, Dino Brugioni, Carroll Lucas, Charles Tuten and Hal Feiveson for their very helpful input. Special thanks are due to: Phil Schuler and Rachel Schmidt for critical logistical support; Bob Matthews for lessons on the enlarger; Taylor Photo of Princeton, New Jersey, for stepping in when the Princeton U. photo lab stepped out; Joe Goodhouse for help with the microscopes; Costi, Kevin and Kirk for computer support; and the Federation of American Scientists Fund for support at the initial stage of this project.

## 1. Introduction

The safety and security of Russian nuclear weapons have been a matter of widespread international concern. START I and START II deactivations or de-alerting proposals that involve the removal of warheads from launchers may lead to over 3,000 additional strategic nuclear warheads being removed from ICBMs and SLBMs and placed in storages during the next five years. Some have argued such deactivation or de-alerting proposals are impossible because Russian nuclear weapons storages would not be able to safely hold the offloaded warheads.

Two factors, however, that are intrinsic to solving this problem -- the rate of dismantlement of Russian nuclear weapons and Russian nuclear weapons storage capacity -- have received little attention. A high rate of dismantlement or a sufficiently large warhead storage capacity may mean Russian nuclear weapons storages will have enough room to accommodate warheads removed from Russian strategic systems under a START II or a de-alerting initiative. A low rate of dismantlement or a small warhead storage capacity may mean removing warheads from launchers may exacerbate any safety or storage space problem the Russians may have.

The rate of dismantlement and the status of Russian nuclear weapons storages also have significant ramifications for the security of Russian nuclear weapons. The faster the rate of dismantlement, the smaller the remaining number of weapons available for theft and the greater the ease in guarding and tracking them. A small number of larger nuclear weapons storages may provide greater security and may simplify the warhead accounting problem compared to a large number of small, dispersed storage sites. Also, the U.S. CTR program will find it easier to provide security upgrades if there are a few dozen nuclear storage sites rather than hundreds.

Finally, the Russian warhead dismantlement rate could effect efforts to implement a warhead stockpile transparency regime to insure the irreversibility of U.S.-Russian nuclear weapons reductions. A high Russian warhead dismantlement rate may mean that by the time an agreement is reached the majority of warheads to be dismantled will have been taken apart, making the verification of the dismantlement of thousands of previously dismantled warheads difficult. A slow Russian warhead dismantlement rate compared to a high U.S. dismantlement rate will create a reciprocity problem, which may also lead to problems in creating a transparency regime. Russia may be very reluctant to acquiesce to a regime where the United States gets to verify the destruction of thousands of Russian warheads, while Russia only will be able to verify the destruction of hundreds of U.S. warheads.

This paper attempts to estimate Russia's warhead dismantlement rate and nuclear weapons storage capacity to determine if Russian nuclear weapons storages can accommodate planned and possible off-loading of nuclear warheads from strategic launchers. It examines existing information on the size of the Soviet/Russian arsenal, Russian warhead dismantlement rates, and the numbers and types of nuclear weapons storages in Russia to

understand how rapid was and is the flow of warheads into Russian storages and how fast warheads were and are being dismantled. Since one potential bottleneck to this process is the lack of storage for the fissile components from dismantled warheads, this paper also addresses the adequacy of efforts to store the fissile material from dismantled warheads or convert it into reactor fuel.

There is a large amount of information relating to all these questions, but much of it is imprecise, unofficial or contradictory. Public statements by U.S. and Russian officials, information provided to the U.S. Congress, official background briefings, reports in the U.S. and Russian press, and recently declassified U.S. Corona satellite imagery from the 1960s and early 1970s offer enough perspectives, however, that the parameters of the problem can be understood.<sup>1</sup>

Overall, it appears that if Russia has been dismantling warheads at a rate of 2,000 or more a year since 1991-1992, then Russia should have enough warhead storage space to accommodate any additional off-loading of warheads required by START II or an equivalent de-alerting initiative. Dismantling 2,000 warheads a year seems well within the capacity of the Russian nuclear weapons complex. There are some doubts, however, whether these levels of dismantlements have been achieved. Moreover, although Russia may have adequate storage space on average, at a number of MIRVed ICBM bases or at naval bases where SSBNs are based, local storages may not be able to hold or ship-away off-loaded warheads rapidly enough to avoid a crowding problem. Thus Russian preferences to achieve START II mandated deactivations through means other than warhead removal may have some merit since Russian storages could face a problem if additional warheads were off-loaded.

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<sup>1</sup> For descriptions of the Corona satellite program: William Broad, "Big Picture of Cold War: U.S. Spy Photos Go Public," *The New York Times*, 25 February 1995; Kevin C. Ruffner, ed., *Corona: America's First Satellite Program*, Center for the Study of Intelligence, CIA, Washington, DC, 1995; Curtis Peebles, *The Corona Project: America's First Spy Satellites*, (Annapolis, MD: The Naval Institute Press, 1997); Dwayne Day, John Logsdon and Brian Latell, eds., *Eye in the Sky: The Story of the Corona Spy Satellites*, (Washington, DC: Smithsonian Institution Press, 1998); Robert McDonald, "Corona: Success for Space Reconnaissance, A Look into the Cold War, and a Revolution for Intelligence," *Photogrammetric Engineering & Remote Sensing*, June 1995, pp. 689-720; William E. Burrows, *Deep Black: Space Espionage and National Security*, (New York: Random House, 1986). Corona images are available from the U.S. Geological Survey, EROS Data Center, at [edcwww.cr.usgs.gov](http://edcwww.cr.usgs.gov).

Satellite imagery of U.S. nuclear-weapons facilities is available on Microsoft's Terraserver website at: [www.terraser.com](http://www.terraser.com). Coverage of the United States is not complete, but, for example, nuclear weapons storages are visible: at the now closed Pease Air Force Base (AFB), New Hampshire; at the currently operational Barksdale AFB, Louisiana; at the Manzano facility near Albuquerque, New Mexico; at Charleston, South Carolina, for the SSBNs formerly based there; at the Norfolk Naval Air Station for the tactical naval nuclear weapons formerly carried on the ships, submarines and aircraft based at the Norfolk Naval Base complex in Virginia; at the Yorktown Naval Weapons Station, near Norfolk; at Naval Air Station, North Island, San Diego, California, for the tactical naval weapons formerly carried on ships and submarines homeported there; and at the Pantex nuclear-warhead assembly/disassembly plant northeast of Amarillo, Texas.

The Federation of American Scientists will post the Corona imagery utilized for this report as well as additional imagery of Soviet nuclear-weapons related facilities on its website at: [www.fas.org](http://www.fas.org).

The uncertainties surrounding this issue could be resolved if Russia was more open about its warhead dismantling rate, the size and capacity of its nuclear weapons storages, its overall stockpile size, or all three. Such openness might be difficult to achieve, but in the case of the warhead dismantling rate, the United States has already provided this information indicating it should not be such sensitive information. However, the information available does suggest that Russia could be facing problems transporting and dismantling enough nuclear weapons to reduce crowding in storages and eliminate aging nuclear weapons. The U.S. CTR program has already made some proposals to Russia to address the transportation problem. These proposals need to be pursued, and expanded to deal with the dismantlement problem as well.

The first part of this paper provides the basic information and conclusions. The Appendices and Figures provide the detailed background information and satellite imagery which serve as the basis for the main text. Assumed deployments of strategic nuclear warheads are based on the START I treaty Memorandum of Understanding data exchanges from September 1990 to July 1998 and START II warhead accounting rules. To avoid confusion in cross-referencing estimates throughout the paper, several series of numbers have not been rounded. However, the reader should appreciate that they represent estimates not precise numbers.

## 2. The Storage Space Crunch

Reports of overloading of nuclear weapons storage sites surfaced as the withdrawal of all tactical nuclear weapons into Russia was being completed in the spring of 1992. General Sergei Zelentsov, then chief of the MOD's 12th Main Directorate, remarking on the shipments of nuclear weapons back to Russia, reportedly said, "There isn't a single storage facility that hasn't been filled to capacity."<sup>2</sup> One official at Chelyabinsk-70 noted, "We were removing warheads from their prepared storage areas to other sites. The weapons were sited at bases built long ago and, furthermore, ones not designed to take additional warheads."<sup>3</sup>

One set of Russian analysts later estimated that Ministry of Defense storages in rear areas were overloaded to 135 - 220 per cent of their seemingly nominal capacity.<sup>4</sup> In 1994, another unofficial Russian estimate suggested that rear-area storages had been overfilled to 118 - 207 per cent after all the tactical nuclear weapons had been withdrawn into Russia and removed from front-line units, although they were probably less overfilled by 1994 due to

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<sup>2</sup> Quoted in Andrew Higgins, "Deadly secrets for sale," *The Independent*, (UK) 19 April 1992.

<sup>3</sup> Interview with Gennady Novikov, Chief of the Sector Special Security Laboratory at Chelyabinsk-70, by V. Umnov, "Few Bombs Will Survive Till the Year 2000: In the Past Year the Safety of Our Nuclear Weapons Has Declined Sharply," *Komsomolskaya Pravda*, 12 March 1992, (FBIS-SOV-92-051, 16 March 1992, p. 7).

<sup>4</sup> Dr. Sergei Rogov and Dr. Alexander Konovalov, Institute of USA and Canada Studies, eds., *The Soviet Nuclear Legacy Inside and Outside Russia: Problems of Non-Proliferation, Safety, and Security*, (Institute of USA and Canada Studies: Moscow, 1993), p. 29.

dismantlements.<sup>5</sup> However, overloading problems may have persisted. In late 1996, General Igor Valynkin, then-First Deputy Head of the 12th Main Directorate, said that nuclear weapons storages were overloaded with weapons with expired service lives and weapons scheduled for disassembly under Russia's international commitments because disassembly plans were not being fulfilled.<sup>6</sup>

If the warhead dismantlement rate has been low, the warhead deactivation requirements of the Helsinki-modified START II treaty as well as proposed de-alerting initiatives may aggravate a warhead storage overloading problem. At the March 1997 Clinton-Yeltsin Helsinki Summit, the two presidents agreed that the 1 January 2003 deadline for the elimination of strategic launchers under the START II treaty would be slipped to 31 December 2007. However, they also agreed that all strategic launchers to be eliminated under START II should be placed in "a deactivated status," by 31 December 2003 through "removal of their nuclear warheads or taking other jointly agreed steps."<sup>7</sup> Because of possible nuclear weapons storage problems, Russia may be interested in meeting the Helsinki deactivation requirements through methods which do not involve the removing of several thousand more strategic warheads to old and crowded storages.

In the United States, Russia's economic problems have created questions about the reliability of the Russian strategic command and control system. The deteriorating command and control system, combined with a Cold War hair-trigger alert nuclear posture, could perhaps lead to an accidental launch of a strategic nuclear weapon. This concern has led some to propose that Russian and U.S. strategic nuclear forces be de-alerted, in part through

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<sup>5</sup> Anton Surikov and Igor Sutyagin of the USA and Canada Institute, "Nuclear Weapons in the Former Soviet Union: Safety and Security Aspects," presentation at Royal Institute of International Affairs' Former Soviet States and European Security Project, 15 March 1994, pp. 20 and 34-38.

<sup>6</sup> Comments by General Igor Valynkin, then First Deputy Head of the 12th Main Directorate before the Duma Committee on Security, "Stenographic Record of the Parliamentary Hearings on the Topic: Issues Concerning the Security of Hazardous Nuclear Facilities," *Yaderny Kontrol Digest*, No. 5, Fall 1997, p. 12. The hearings were held on 25 November 1996.

<sup>7</sup> The White House, Office of the Press Secretary, "Joint Statement on Parameters on Future Reductions in Nuclear Forces," Helsinki, Finland, 21 March 1997.

These elements of the joint statement were crafted into a Protocol to the START II agreement which was signed by U.S. Secretary of State Madeline Albright and then Russian Foreign Minister Yevgeny Primakov on 26 September 1997 in New York City. In an exchange of letters accompanying the Protocol, Albright and Primakov said that the U.S. and Russia would "deactivate, by December 31, 2003, all strategic nuclear delivery vehicles which will be eliminated under the Treaty, by removing their nuclear reentry vehicles or taking other jointly agreed steps." The protocol and letters are available from the ACDA at [www.acda.gov](http://www.acda.gov).

In addition, Primakov's letter added: "Taking into account the supreme national interests of the country, the Russian Federation proceeds from the understanding that well in advance of the above deactivation deadline the START III Treaty will be achieved and enter into force." An accelerated START III implementation may also affect the warhead storage situation. Although this scenario is not explicitly analyzed in this paper, it is partially addressed by considering the likelihood that economic constraints may lead to the early retirement of Russian strategic weapons.

the removal of nuclear warheads from submarine and land-based missiles.<sup>8</sup> Russian analysts, however, claim there is not enough room to store warheads removed under a de-alerting regime. New storages would have to be built, particularly at ICBM bases, at a great and an unaffordable expense to accommodate warheads from de-alerted missiles.<sup>9</sup>

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<sup>8</sup> Sam Nunn and Bruce Blair, "From Nuclear Deterrence to Mutual Safety; As Russia's Arsenal Crumbles, It's Time to Act," *The Washington Post*, 22 June 1997; Bruce Blair, Harold Feiveson and Frank von Hippel, "Taking Nuclear Weapons off Hair-Trigger Alert," *Scientific American*, November 1997, pp. 74-81.

Concerns about reactions to accidental launches of nuclear armed missiles led the United States and Russia to agree at the September 1998 Moscow Summit to share data on missile launches and exchange early-warning information; The White House, Office of the Press Secretary, "Fact Sheet: Joint Statement on the Exchange of Information on Missile Launches and Early Warning," 1 September 1998. See also explanations provided by White House officials in: The White House, Office of the Press Secretary, "Press briefing by Robert Bell, Special Assistant to the President for National Security Affairs, Ted Warner Assistant Secretary for Defense Policy, Strategy and Threat Reduction, Gary Samore, Senior Director for Nonproliferation, NSC, Debra Cagan, Director of Policy and Regional Affairs for Russia and the New Independent States," 1 September 1998.

This agreement helps address the problem of misinterpretation of benign missile launches, however it does not deal with tensions and stresses generated by keeping significant numbers of strategic weapons on alert. This latter problem could be solved by de-alerting warheads and altering U.S. and Russian nuclear postures.

Although the number of U.S. strategic weapons on alert will decline under the START II and START III agreements, the proportion of alert warheads to the total force will still remain quite high.

In spring 1998, according to General Eugene Habiger, then-Commander-in-Chief U.S. Strategic Command, the United States had, "a little over 2,300 nuclear weapons on alert." He said, under START II, there would be less than 1,000 nuclear weapons on alert, and under START III there would be less than 700; General Eugene Habiger testimony before the SASC, FY 1999, Strategic Forces, 31 March 1998, S. Hrg. 105-605, Pt. 7, p. 489.

According to the START I MOU, as of 1 July 1998, the United States had 7,982 warheads on deployed strategic launchers. Under START II, the United States will be allowed 3,000 - 3,500 strategic warheads, and under START III, 2,000 - 2,500. Thus the proportion of strategic warheads on alert, about one-third, will remain the same.

<sup>9</sup> Maj. General (Ret.) Vladimir Belous, chief of the military policy sector at the Committee of Scientists for Global Security Scientific Research Center and professor at the Academy of Military Science, "Premature Initiatives. Removal of Missile Warheads Not In Russia's Interests," *Nezavisimoye Voyennoye Obozreniye*, 19-25 September 1997, (FBIS-TAC-97-267, 24 September 1997).

Ironically, earlier Russian government proposals to de-alert strategic missiles from warheads apparently faced the same appraisal. On 12 February 1992, Russian Foreign Minister Andrei Kozyrev, delivering a message from President Yeltsin at the U.N. Conference on Disarmament in Geneva, proposed that Russia and the United States should de-alert their strategic forces by separating their warheads from the launchers; Lyudmila Alexandrova, Sergei Sedov, and Boris Shabaev, "Kozyrev's Speech at Disarmament Conference -- Summary," *ITAR-TASS*, 12 February 1992; Robert Evans, "Russia Proposes 'Zero Alert' for Nuclear Arms," *Reuters*, 12 February 1992; Michael Parks, "Russia Urges End of Nuclear Arms Alerts; Disarmament: The Weapons Would Be Taken Off Combat Status, Ending Long Confrontation," *The Los Angeles Times*, 13 February 1992.

Sokov reports the Russian military rejected the proposal due to lack of prior consultation about the initiative, "but only because of the lack of storage facilities;" Nikolai Sokov, "Russia's Approach to Nuclear Weapons," *The Washington Quarterly*, Summer 1997, pp. 108 and 113.

In a contemporaneous critique, a Strategic Rocket Forces officer complained that removing the missiles' warheads would lead to a "complete loss of combat readiness." However, he did not explicitly mention a storage space problem; see: Kim Kukholev, "Rocket Forces Commander on Politicians' Interference in Army Reorganization," *Radiol* (Moscow), 20 February 1992, (BBC Summary of World Broadcasts, 24 February 1992).

Does Russia have enough room to store retired or de-alerted warheads or parts from dismantled warheads? Answering this question involves examining a two-step stock-and-flow problem: first, whether a stream of warheads flowing into the Russian "nuclear weapons storage barrel" is being adequately offset by a flow out of dismantled warheads. And, second, whether the stream of warhead components is flowing into an adequately large "warhead-component storage barrel" and/or is being adequately offset by a flow out of fissile materials turned into reactor fuel.<sup>10</sup>

#### **a. The Nuclear Weapons Storage Barrel**

Russian nuclear warheads are thought to have been kept in five different categories of storage facilities:<sup>11</sup>

1. Some limited storage at the nuclear weapons assembly/disassembly plants utilized just prior to the disassembly of a warhead or just after its assembly.
2. Large storages controlled by the MOD's 12th Main Directorate associated with the Sverdlovsk-45 and Zlatoust-36 nuclear weapons assembly/disassembly plants;
3. National-level storages controlled by the 12th Main Directorate and spread throughout the former Soviet Union;
4. Regional rocket/repair technical bases (RTBs, *raketno/remontno tekhnicheskaya baza*) storage sites which were operated by the military services' armaments directorates in conjunction with the services' 6th Directorates and are now controlled by the MOD's 12th Main Directorate;
5. Front-line RTB storages controlled by the military services.

The breakup of the Soviet Union and the fall 1991 Bush-Gorbachev decisions to withdraw most tactical nuclear weapons from deployment led to a reduction in the number of nuclear weapons storages. According to U.S. government statements, the number of nuclear weapons storage sites in the former Soviet Union has declined from some 500-600 during the last years of the Soviet Union to less than 100, all located in Russia.<sup>12</sup> Russian statements also indicate that the number of storages has declined by several hundred sites and that today

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<sup>10</sup> At the moment only highly-enriched uranium (HEU) from warheads is being used in reactor fuel after being blended down to low-enriched uranium. Plutonium disposal options -- vitrification or "mixed-oxide" plutonium-uranium fuel (MOX) -- are still being explored.

<sup>11</sup> See Appendix C for a more extensive discussion of the organization and control of Russian nuclear weapons storages.

For information on the location and number of U.S., French, U.K. nuclear weapons storage sites, as well as an earlier estimate of the number and location of Russian storages see: William M. Arkin, Robert Norris, and Joshua Handler, *Taking Stock: Worldwide Nuclear Deployments 1998*, (Washington, DC: Natural Resources Defense Council, March 1998).

<sup>12</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, November 1997, p. 43; John Deutch, DCI, statement before the SGAC, Permanent Subcommittee on Investigations, hearing on "Global Proliferation of Weapons of Mass Destruction," Part II, 22 March 1996, S. Hrg. 104-422, Pt. 2, p. 311.

there are some 80 storage sites.<sup>13</sup>

Approximately 16-20 are thought to be the large national-level storage sites controlled by the 12th Main Directorate. They consist of 6-8 bunkers and are estimated to be able to hold 240 - 400 nuclear weapons each.<sup>14</sup>

Another 20 or so are service-controlled RTB storage sites associated with Russia's several remaining strategic bomber bases and 19 ICBM bases. Their capacity is thought to be sized to support the nearby base. Since the fall 1991 Presidential nuclear initiatives resulted in the withdrawal of tactical nuclear weapons to central storages, the approximately 40 remaining RTBs are service-controlled regional storages associated with naval bases<sup>15</sup> and Air Force units (note: due to the Russian military's reorganization, the Air Force now includes the nuclear-capable tactical surface-to-air missile units of the former Air Defense Troops).<sup>16</sup> The Strategic Rocket Forces also may operate their own service-level regional RTBs.<sup>17</sup>

Service-level RTB regional storage sites seemingly contain fewer bunkers than their national-level counterparts. For example, several service-level storages have been identified which have distinctive two-bunker configuration.<sup>18</sup> Other storages are described as

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<sup>13</sup> Interfax, "Sergeyev on Use of Russian 'Suitcase' Nuclear Weapons," 15 November 1997, (FBIS-SOV-97-318, 14 November 1997).

<sup>14</sup> A Russian press report describing a central site said: "On average there are around a dozen structures on a unit's territory, each with six to eight storage facilities. The storage facilities contain 40-50 special items each; Alexei Sinelnikov, incorporating account of interview with Russian Army officer identified only as "Valery", "Can a Nuclear Train Be Seized? Chernobyls Carried Past Us Every Day in Freightcars Without Our Even Suspecting," *Komsomolskaya Pravda*, 9-16 January 1998, (FBIS-TOT-98-009, 9 January 1998).

Assuming that this means six to eight storage bunkers, some 240 - 400 warheads could be at such a base. According to the Corona satellite imagery, a few of the storage sites -- e.g., those near the two main warhead dismantlement plants, Sverdlovsk-45 and Zlatoust-36 -- seem to be at least double the size of a standard central storage site (see Figures 1-11 and 16-18 in Appendix F). Thus, although only 16 national-level storage site areas have been identified, several may have extra storage capacity or consist of two distinct storages, yielding the equivalent of some 20 central storages. See Appendix C for discussion.

<sup>15</sup> E.g., General Habiger, then-Commander-in-Chief, U.S. Strategic Command, visited a Navy-controlled nuclear storage facility near Severomorsk for naval nuclear weapons; General Eugene Habiger, "Department of Defense News Briefing," 16 June 1998.

<sup>16</sup> Official Kremlin International News Broadcast, "Press Conference with Defense Minister Igor Sergeyev," 7 August 1997, (Federal News Service).

<sup>17</sup> E.g., a two-bunker Strategic Rocket Forces-controlled regional RTB storage is located near Surovatikha (about 40 miles south of Nizhniy Novgorod). It was photographed by Corona satellite Mission 1116-2 of 6 May 1972 (see Figure 13 in Appendix F), but now may be out of service.

<sup>18</sup> E.g., in addition to the Surovatikha storage site above, a similarly configured storage site was analyzed in: CIA, "Regional Nuclear Weapons Storage Site Near Berdichev, USSR," May 1963, in Kevin C. Ruffner, ed., *Corona: America's First Satellite Program*, Center for the Study of Intelligence, CIA, Washington, DC, 1995, pp. 170-171.

A third such two-bunker nuclear weapons storage located southwest of Minsk and just east of the city of Stolbtsy is visible in a declassified Corona satellite image from Mission 1023-1 of 21 August 1965.

containing one bunker.<sup>19</sup> The START I MOU date exchanges imply that storages at strategic air bases may house 350-400 nuclear warheads. Russian reports and declassified U.S. National Intelligence Estimates suggest the service-level RTB regional storages other than those at strategic air bases can hold 100 - 200 nuclear weapons each.<sup>20</sup> However, post-1989 analyses seemingly indicated that RTB storages held less nuclear weapons than pre-1989 NIE estimates suggested. Thus, the lower-capacity estimate for RTB storages may be more appropriate. Overall, as of 1998, the 80 national- and service-level RTB storages may be able to hold 10,030 - 17,700 nuclear warheads, with a possibility that the actual range may be 10,000 - 13,000. (See Table 1 below and Appendix C for discussion of the types, locations and capacity of Russian nuclear weapons storages.)

Table 1: Russian National-level and Service-controlled RTB Storages, 1998			
Type of Storage	Numbers and Capacity of Storages	Number of WHs at Storages	
		Low Estimate	High Estimate
National-level Storages	20 sites, holding 240 - 400 WHs each	4,800	8,000
<b>Total National-level Sites</b>		<b>4,800</b>	<b>8,000</b>
Service-controlled RTB Storages			
19 ICBM bases	19 storages of various sizes	180	500
3 Bomber bases	3 storages, each holds 350 - 400 WHs	1,050	1,200
Other RTB storage sites	40 storages, each holds 100 - 200 WHs	4,000	8,000
<b>Total Service-Controlled Sites</b>		<b>5,230</b>	<b>9,700</b>
<b>Total</b>		<b>10,030</b>	<b>17,700</b>

**Stockpile Size** Estimates of the Russian nuclear arsenal's size mainly come from a few statements by Russian officials reported in the media, estimates by the U.S. Department of Defense (DOD), the Central Intelligence Agency (CIA), or the U.S. military, and estimates generated by the Natural Resources Defense Council (NRDC).

A frequent assumption, based on remarks by then Russian Minister of Atomic Energy (Minatom) Victor Mikhailov, is that in the 1991-1992 timeframe Russia's arsenal had 30,000 nuclear weapons. In February 1992, in one of his first public comments on this question, the

<sup>19</sup> Moysey Rabinovich, "Soviet Conventional Arms Transfers to the Third World: Main Missile and Artillery Directorate (1966-1990)," Global Consultants, Inc., Alexandria, VA, 1993, pp. 8, 15-16, and 19.

<sup>20</sup> Moysey Rabinovich, "Soviet Conventional Arms Transfers to the Third World: Main Missile and Artillery Directorate (1966-1990)," Global Consultants, Inc., Alexandria, VA, 1993, pp. 8, 15-16, and 19; General Anatoly Gribkov and General William Smith, *Operation Anadyr: U.S. and Soviet Generals Recount the Cuban Missile Crisis*, (Chicago, Edition Q, 1994), pp. 26-27 and 46; CIA, *Warsaw Pact Forces Opposite NATO*, NIE 11-14-79, (Top Secret; partially declassified), 31 January 1979, pp. 45-46.

*Washington Post* quoted Mr. Mikhailov as saying that the then common estimate that the Soviet arsenal contained some 27,000 warheads was "the lowest estimate." He was not more specific but added this estimate was accurate "within 15 to 20 percent," which the *Post* calculated could mean the arsenal was "as high as 32,000 warheads."<sup>21</sup>

In 1992-1993, Mr. Mikhailov, however, made several additional notable statements about the size of the Soviet/Russian nuclear stockpile, which were not widely covered in the western press. In July 1992, Mr. Mikhailov told *Komsomolskaya Pravda* that Russia had over "25,000 nuclear munitions: warheads, mines and shells."<sup>22</sup> In December 1992, he told the Russian Duma and press that, if Russia had to stop dismantling warheads, at "the end of this century," the United States would have 10,000 nuclear warheads, while Russia would have 35,000.<sup>23</sup> In June 1993, Mr. Mikhailov told Russian television that Russia had over 40,000 nuclear weapons at the beginning of 1986 and that the number had been reduced by "virtually 15,000" weapons,<sup>24</sup> suggesting an arsenal of more than 25,000 nuclear weapons.

Finally, in September 1993, Mr. Mikhailov's comments once again received international attention. *The New York Times*, in a widely noted article based on a report by NRDC on the Russian nuclear arsenal, reported Mr. Mikhailov had said that Russia had some 45,000 nuclear weapons in its arsenal in 1986.<sup>25</sup> Taking into account the reports of Russian warhead dismantlement rates since the mid-1980s, NRDC calculated that this implied an arsenal of some 32,000 weapons in 1993.<sup>26</sup>

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<sup>21</sup> i.e., 32,400 warheads; Fred Hiatt, "A-Arms Chief Says Russia Needs Help," *The Washington Post*, 5 February 1992.

<sup>22</sup> O. Volkov and A. Khokhlov, "Nuclear Danger is No More Than a Myth. That is What Russian Nuclear Minister Victor Mikhailov Believes," *Komsomolskaya Pravda*, 22 July 1992, (JPRS-TND-92-026, 31 July 1992, p. 21).

<sup>23</sup> Minatom Minister Victor Mikhailov's speech to the Seventh Congress of People's Deputies," Kremlin, Moscow, 9 December 1992, (JPRS-TAC-92-037, 30 December 1992, p. 13; Yegeny Panov, interview with Minatom Minister Victor Mikhailov, "Mikhailov: Such Agreements Can Only Be Welcomed," *Rossiyskaya Gazeta*, 11 December 1992, (FBIS-SOV-92-239, 11 December 1992, p. 3).

<sup>24</sup> Interview with Victor Mikhailov by Alexander Peslyak, *Russian Television Network*, 3 June 1993, (JPRS-TND-93-017, 7 June 1993, p. 19).

<sup>25</sup> William Broad, "Russian Says Soviet Atom Arsenal Was Larger Than West Estimated," *The New York Times*, 26 September 1993, reporting on Thomas Cochran and Robert Norris, *Russian/Soviet Nuclear Warhead Production*, NWD-93-1, Natural Resources Defense Council, Washington, DC, 8 September 1993, p. 22.

The quotation of Mr. Mikhailov's information apparently came from a talk he made while in the United States.

For a lengthy comparative analysis of estimates of the size of the Soviet arsenal and the methodologies for making estimates as of the late 1980s, see: "Chapter Two: The Soviet Nuclear Stockpile," in Thomas Cochran, William Arkin, Robert Norris, and Jeffrey Sands, *Nuclear Weapons Databook Volume IV: Soviet Nuclear Weapons*, (New York: Harper and Row/Ballinger, 1989), pp. 22-43.

<sup>26</sup> Particularly an article in May 1993, in which Mr. Mikhailov told *Rossiyskie Vesti* that about 13,000 nuclear munitions had been dismantled since 1987; Sergei Ovsienko, "Melting of Weapons-Grade Plutonium Stockpile," *Rossiyskie Vesti*, 19 May 1993.

See discussion in: Thomas Cochran and Robert Norris, *Russian/Soviet Nuclear Warhead Production*, NWD-93-1, Natural Resources Defense Council, Washington, DC, 8 September 1993, p. 22.

In addition to Mr. Mikhailov's comments, one Russian specialist from the nuclear-weapons laboratory in Chelyabinsk-70 said in 1992 that the 30,000 warhead number for the size of the Russian arsenal, although not official, "is the most reliable."<sup>27</sup>

All these numbers are uncertain. Indeed, in October 1993 Minatom's Information Directorate felt compelled to issue a warning about using Mr. Mikhailov's statements to make estimates of the size of the Soviet nuclear arsenal:

Data on the nuclear potential of the former USSR, obtained by way of collating information from various public speeches by Minister of Atomic Energy Victor Mikhailov, does not correspond to reality and henceforth, cannot be taken into account.<sup>28</sup>

Nevertheless, U.S. government estimates have tended to suggest an arsenal of the size mentioned by Minister Mikhailov.<sup>29</sup> In late 1991, as the Soviet Union was beginning to break up, the CIA stated that the Soviet arsenal had some 30,000 nuclear weapons.<sup>30</sup> Two-thirds of these weapons were estimated to be in Russia.<sup>31</sup> In May 1992, the CIA stated that its official estimate was that Russia had 30,000 nuclear weapons with a range of error of plus or minus 5,000 warheads.<sup>32</sup> In 1993, the CIA said that, in the fall of 1991, it had estimated that 6,000 - 9,000 nuclear weapons were outside of Russia, 3,000 of which were strategic, and the rest tactical.<sup>33</sup>

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<sup>27</sup> Interview with Gennady Novikov, Chief of the Sector Special Security Laboratory at Chelyabinsk-70, by V. Umnov, "Few Bombs Will Survive Till the Year 2000: In the Past Year the Safety of Our Nuclear Weapons Has Declined Sharply," *Komsomolskaya Pravda*, 12 March 1992, (FBIS-SOV-92-051, 16 March 1992, p. 7).

<sup>28</sup> "Ministry Refutes Data on Nuclear Potential of Former USSR," *ITAR-TASS*, 1 October 1993, (JPRS-TND-93-034, 27 October 1993, p. 34).

<sup>29</sup> Note, however: In early 1993, the CIA stated that although it had a good understanding of Russian nuclear weapons locations, the U.S. intelligence community did not have a complete accounting database of nuclear weapons in the former Soviet Union. Thus, the CIA, "estimate of the total number in the inventory [was] subject to considerable uncertainty;" Lawrence Gershwin, National Intelligence Officer (NIO) for Strategic Programs, testimony before SASC hearing on "Current Developments in the Former Soviet Union," 3 February 1993, Senate Hearing (S. Hrg.), 103-242, p. 42.

<sup>30</sup> Robert Gates, Director of Central Intelligence (DCI), "Statement before the House Armed Services Committee Defense Policy Panel," 10 December 1991, p. 15. See also: Robert Gates, DCI, testimony before U.S. Senate Governmental Affairs Committee (SGAC) hearing on "Weapons Proliferation in the New World Order," 15 January 1992, S. Hrg. 102-720, p. 19; Robert Gates, DCI, testimony before SASC hearing on "Threat Assessment, Military Strategy, and Defense Planning," 22 January 1992, S. Hrg. 102-755, pp. 9 and 16.

<sup>31</sup> Robert Gates, DCI, "Statement before the House Armed Services Committee Defense Policy Panel," 10 December 1991, p. 15.

<sup>32</sup> "The uncertainty is plus or minus 5,000, which gives you a sense of how uncertain it is;" Lawrence Gershwin, NIO for Strategic Programs, CIA, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, p. 499.

Also see: Robert Gates, DCI, testimony before the SFRC, Hearings on "The START Treaty," 30 June 1992, S. Hrg. 102-607, Pt. 2, pp. 158 and 162.

<sup>33</sup> Lawrence Gershwin, NIO for Strategic Programs, CIA, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, p. 495.

**Numbers of Stored Weapons** According to the above discussions, in 1991-1992, the Soviet arsenal may have contained 30,000 - 32,000 operational nuclear weapons. Some 3,311 strategic warheads on missiles and bombers in Ukraine, Kazakhstan, and Belarus, however, remained outside of Russia, leaving 26,700 - 28,700 warheads in Russia in the 1991-1992 timeframe.<sup>34</sup>

Of the 26,700 - 28,700 warheads in Russia, the START I MOU suggests 7,082 were deployed on Russian-based strategic nuclear missiles and were not in need of immediate storage. Thus, in 1991-1992, Russian nuclear weapons storages had to accommodate 19,600 - 21,600 tactical weapons, strategic aviation bombs, and some strategic missile warheads from older missiles withdrawn from service.

Since 1992, the 3,311 strategic nuclear warheads on missiles and bombers in Ukraine, Kazakhstan and Belarus have been withdrawn to Russia. Also, a net of 2,073 nuclear warheads from retired Russian strategic systems and from the re-deployment of existing bomber warheads within Russia have been moved into existing operational storages.<sup>35</sup> Thus, in total, 5,303 additional strategic warheads would have required storage and by the end of 1998, 24,900 - 26,900 warheads may have needed storage in Russia. (Note: some storage space would have been freed-up by warhead dismantling. This is discussed below.)

Under the START I treaty, 584 more warheads should be removed from Russian strategic launchers by the end of 2001, bringing to 25,500 - 27,500 the total number of warheads to be stored.

Under the START II treaty, 2,627 more warheads could be removed from launchers by the end of 2003, if "de-activation" is carried out by warhead removal, suggesting 28,100 - 30,100 warheads would have to be accommodated in Russian storages.

Finally, Russian strategic forces may fall below the levels allowed by START II due to economic constraints.<sup>36</sup> If so, all the above warheads plus another 1,385 warheads could

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<sup>34</sup> By May 1992, all the *tactical* warheads had been consolidated into Russian storages from Eastern Europe and the former Soviet Republics. The *strategic* warheads outside of Russia were returned to Russia between July 1993 and November 1996. See: the chronology of warhead withdrawals from Eastern Europe and the former Soviet republics into Russia in Appendix A.

<sup>35</sup> Since the 81 single warhead SS-25 ICBMs in Belarus were redeployed in Russia, storage space for their associated warheads would not have been needed.

<sup>36</sup> For an analysis of the likely decline of Russian strategic forces due to economic constraints, which has been updated for this paper, see: Joshua Handler, "The Future of Russian Strategic Forces," *Jane's Intelligence Review*, April 1995, pp. 162-165.

Also see: Dean Wilkening, "The Future of Russia's Strategic Nuclear Force," *Survival*, Autumn 1998, pp. 89-111 and Paul Podvig's presentation concerning Russian "Projected Forces With and Without Start II," in the Conference Summary of "The Future of Russian-U.S. Arms Reductions: START III and Beyond," MIT Security Studies Program, Cambridge, MA, 2-6 February 1998, pp. 4-7.

The U.S. Department of Defense also recently noted that economic problems will cause a reduction,

be removed from service by the 2004 timeframe,<sup>37</sup> meaning that 29,500 - 31,500 warheads would need to be stored (see Table 2 below).

Table 2: Estimates of Russian Nuclear Weapons Placed in Storages	
Chronology of WHs Placed in Storages	WHs to be Stored
In 1991/92 tactical and strategic WHs in storages	19,600 - 21,600
5,303 strategic WHs added 1991/92 - 1998	24,900 - 26,900
584 strategic WHs added 1999 - end 2001 from START I	25,500 - 27,500
2,627 strategic WHs added end 2001 - end 2003 from START II	28,100 - 30,100
1,385 strategic WHs added through 2004 due to aging systems	29,500 - 31,500

**Nuclear Warhead Dismantlement Rates** Russian and U.S. officials have made various claims about the number of warheads that have been dismantled or eliminated. In November 1991, President Gorbachev said that 15,000 Soviet nuclear weapons were to be eliminated as a result of his October 1991 response to President Bush's September 1991 proposals on eliminations and reductions of strategic and tactical nuclear weapons.<sup>38</sup> This 15,000 number seemingly included both tactical and strategic warheads.<sup>39</sup> General Vladimir Lobov, then Chief of the Russian MOD's General Staff, said that the dismantling of these

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estimating that: "Russian strategic forces are likely to decline to fewer than 3,000 operational warheads by the middle of the next decade as a result of economic constraints and system obsolescence," U.S. Department of Defense, *Proliferation: Threat and Response*, November 1997, p. 43.

<sup>37</sup> Note: the amount of warheads needing to be stored may be reduced depending on how many new SS-27 ICBMs are produced. This may amount to over a 100 missiles by the middle of the next decade.

General Vladimir Yakolev, Chief of the Strategic Rocket Forces said in February 1998 that Russia plans to deploy 1-2 regiments of SS-27 ICBMs a year (of 10 missiles each) up to 2001, and after 2001, to deploy 3-4 regiments a year; General Vladimir Yakovlev, 19 February 1998 News Conference.

A Russian Security Council meeting in September 1998 may have modified this schedule to 10 missiles a year to through 2003, and 31 a year starting in 2004; *Kommersant Vlast* reprinted in the *Guardian* (U.K.), 14 November 1998.

<sup>38</sup> TASS, "Gorbachev Interviewed by Japanese News Agency [Kyodo Tsushin]," 27 November 1991, (BBC Summary of World Broadcasts, 29 November 1991). See Appendix A for a discussion of the fall 1991 Bush and Gorbachev Presidential nuclear initiatives (PNIs) and President Yeltsin's January 1992 follow-up speech and proposals.

<sup>39</sup> In terms of the breakdown of strategic vs. tactical nuclear weapons to be destroyed, according to the CIA, the Gorbachev and subsequent Yeltsin initiatives involved some 1,200 strategic warheads and 5,000 - 12,000 tactical nuclear weapons. In addition, by CIA estimates, there were some 2,700 nuclear weapons remaining from the INF treaty awaiting dismantlement; Lawrence Gershwin, NIO for Strategic Programs, CIA, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, p. 497.

warheads was to begin in the second half of 1992 and would be completed by the year 2000.<sup>40</sup> If 15,000 warheads were taken apart over 7.5 years, this implies an anticipated dismantlement rate of 2,000 warheads a year.

With regard to actually realized dismantlement rates, Russian and U.S. statements suggest dismantlements varied from 1,000 to 3,000 warheads a year. During the 1991-1992 U.S.-Russian meetings on the implementation of the fall 1991 presidential nuclear initiatives, Russian officials claimed that Russia was dismantling at least 1,000 warheads a year and could dismantle as many as 4,000 a year with the existing labor force at the nuclear weapons assembly/disassembly facilities. In April 1993, then Minatom Minister Victor Mikhailov told the press that Russia had dismantled 3,000 nuclear "charges" in 1992, and that "beginning from 1987 we dismantled about 13,000 nuclear charges. In other words, during these six odd years we have been dismantling an average 3,000 nuclear charges a year." He noted that, in 1992, due to the Presidential nuclear initiatives, "dismantling proceeded at a faster pace."<sup>41</sup> In one case, General Sergei Zelentsov claimed at a non-governmental conference that Russia could dismantle up to 8,000 warheads a year if no production was undertaken. Finally, in spring 1997, Minister Mikhailov reportedly stated that 50 percent of Russia's nuclear arsenal had been scrapped.<sup>42</sup> If the baseline was the 30,000 - 32,000 nuclear warheads estimated to be in existence in 1991/92, then his statements imply a rate of approximately 3,000 warheads a year.

U.S. officials have suggested that Russia could be dismantling weapons at a rate of at least 2,000 warheads a year as Russia claims.<sup>43</sup> However, U.S. statements have generally concluded that it is more likely Russia is dismantling warheads at a slower rate, perhaps some 1,000 - 1,500 warheads a year. In November 1997, the U.S. DOD said that "As of January 1997, the stockpile of Russian strategic and tactical nuclear warheads was estimated at 25,000

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<sup>40</sup> Alexander Yakovlev, interview with General Vladimir Lobov, "Military Observer on Achieving Disarmament," *Moscow Radio Moscow World Service*, 6 December 1991, (FBIS-SOV-91-236, 9 December 1991, p. 1).

<sup>41</sup> "Press Conference by RF Atomic Energy Minister Victor Mikhailov (Tomsk Accident and Other Problems)," held at Bolshaya Ordynka Str., Official Kremlin International News Broadcast, 20 April 1993, (Federal News Service).

However, in May 1993, Mr. Mikhailov told *Rossiyskie Vesti* that approximately 13,000 nuclear munitions had been dismantled since 1987, when active dismantling began, or about 2,000 warheads a year on average were being dismantled [i.e. over some six years]; Sergei Ovsiyenko, "Melting of Weapons-Grade Plutonium Stockpile," *Rossiyskie Vesti*, 19 May 1993.

<sup>42</sup> Anton Trofimov, "Russia Has Rid CIS Of Her Nuclear Warheads," *Segodnya*, 11 March 1997, (Russian Press Digest, RUSSICA Information Inc).

<sup>43</sup> R. James Woolsey, DCI, testimony before SGAC hearing on "Proliferation Threats of the 1990s," 24 February 1993, S. Hrg. 103-208, p. 46; Ashton Carter, ASD, Nuclear Security and Counterproliferation, testimony on "Nuclear Disarmament of the Former Soviet Union," before the HAC "DOD Appropriations for 1995, Part 4," 9 March 1994, p. 567; Richard Morningstar, Special Advisor to the President and the Secretary of State on Assistance to the NIS, Department of State, "Answers to Questions for the Record" for his testimony to the HCIR hearing on "Effectiveness of U.S. Assistance Programs in Russia, Ukraine, Armenia, and the Other Newly Independent States," 13 June 1996, p. 212.

warheads," a reduction of "more than 5,000 warheads since a major elimination program began in 1992."<sup>44</sup> This implies a dismantlement rate of around 1,000 warheads a year (had the DOD felt confident about a dismantlement rate of 2,000 warheads a year, it should have suggested that some 10,000 warheads had been eliminated during 1992-1997).

Finally, indicating that a lower number is appropriate, First Deputy Atomic Energy Minister Lev Ryabev reportedly said in July 1998 that, several hundred warheads a year were being dismantled as a result of agreements made at the end of the Cold war.<sup>45</sup> Table 3 below outlines the possible number of nuclear weapons dismantled by the end of 1991 to the end of 2003 under these various dismantling rates. It must be kept in mind, however, that dismantling rates could vary from year to year or could have steadily declined from 1991-1992 due to economic and social problems and/or some success in dismantling the warheads scheduled for elimination. (See Appendix D for a discussion of the dismantlement rate estimates.)

Total Cum. End	1,000/yr	1,500/yr	2,000/yr	2,500/yr	3,000/yr	3,500/yr	4,000/yr
1991	1,000	1,500	2,000	2,500	3,000	3,500	4,000
1992	2,000	3,000	4,000	5,000	6,000	7,000	8,000
1993	3,000	4,500	6,000	7,500	9,000	10,500	12,000
1994	4,000	6,000	8,000	10,000	12,000	14,000	16,000
1995	5,000	7,500	10,000	12,500	15,000	17,500	20,000
1996	6,000	9,000	12,000	15,000	18,000	21,000	24,000

<sup>44</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, November 1997, p. 43.

See also: Robert Gates, DCI, testimony before SGAC hearing on "Weapons Proliferation in the New World Order," 15 January 1992, S. Hrg., 102-720, pp. 8, 17 and 38; Robert Barker, ASD, Atomic Energy, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, p. 505; Lawrence Gershwin, NIO for Strategic Programs, testimony before SGAC hearing on "Proliferation Threats of the 1990s," 24 February 1993, S. Hrg. 103-208, p. 39; DOD answers to questions for the record, testimony on "Counterproliferation of Weapons," before the HAC "DOD Appropriations for 1995, Part 5," 1 March 1995, p. 288;

<sup>45</sup> Adam Tanner, "Russia Seeks Billions to Convert Nukes," *Reuters*, 29 July 1998.

Interestingly, indicating dismantlements were not proceeding as fast as planned through the end of 1996, in November 1996 General Igor Valynkin, then a first deputy of the MOD's 12th Main Directorate complained the "disassembly plans" were not being fulfilled, and as a result over two thousand weapons with expired service lives were sitting in storages. He noted, at current dismantlement rates, the backlog of warheads with expired services lives to be dismantled would increase "several-fold;" Comments by General Igor Valynkin, then First Deputy Head of the 12th Main Directorate before the Duma Committee on Security, "Stenographic Record of the Parliamentary Hearings on the Topic: Issues Concerning the Security of Hazardous Nuclear Facilities," *Yaderny Kontrol Digest*, No. 5, Fall 1997, p. 12. The hearings were held 25 November 1996.

The situation may have improved in 1997 as then Minatom Minister Victor Mikhailov claimed in a February 1998 press conference reviewing Minatom's activities in 1997 that warheads were dismantled ("utilized") according to the plan; "Press Conference with Nuclear Energy Minister Victor Mikhailov," Official Kremlin International News Broadcast, 18 February 1998 (Federal News Service).

1997	7,000	10,500	14,000	17,500	21,000	24,500	28,000
1998	8,000	12,000	16,000	20,000	24,000	28,000	32,000
1999	9,000	13,500	18,000	22,500	27,000	31,500	36,000
2000	10,000	15,000	20,000	25,000	30,000	35,000	40,000
2001	11,000	16,500	22,000	27,500	33,000	38,500	44,000
2002	12,000	18,000	24,000	30,000	36,000	42,000	48,000
2003	13,000	19,500	26,000	32,500	39,000	45,500	52,000

**Overloaded Storages?** As noted above, the current 80 or so operational Russian nuclear weapons storages are estimated to be able to accommodate 10,030 - 17,700 nuclear weapons. Also, as discussed above, by 1998, 24,900 - 26,900 nuclear weapons may have been placed into storage. Thus, under the low-storage capacity scenario, 14,870 - 16,870 nuclear weapons would have had to be dismantled to avoid overloading. While under the high-storage capacity scenario, 7,200 - 9,200 nuclear weapons would have had to be dismantled. This suggests that, if Russia has been eliminating 1,900 - 2,100 warheads a year from 1991 (over eight years), it is likely that it has solved its warhead storage overloading problem. However, if Russia has been eliminating less than 1,900 warheads a year, storages could still be crowded in the low-capacity scenario. In the case of the high-capacity scenario, slower dismantlement rates of around 900 - 1,200 warheads may have solved a storage space problem (See Tables 3 and 4).

Table 4: "Extra" Warheads Needing Storage by 1998					
		Low-High WH Storage-Capacity Scenarios, 1998		Warheads Needing to Be Dismantled a Year	
		10,030 WHs	17,700 WHs		
WHs Needing Storage by 1998, Low-High Estimates	24,900 WHs	14,870	7,200	1,859	900
	26,900 WHs	16,870	9,200	2,109	1,150

As for the future, for the low-capacity storage scenario, if Russia has maintained and continues to maintain an average dismantlement rate of 1,500 - 1,700 weapons year (over 13 years, 1991-2003), then it may succeed in alleviating its overloading problem at storage sites by the 2001-2003 timeframe. The backlog of retired warheads could be worked off and the additional 4,596 warheads downloaded under the START I and START II treaties and from systems retired because of age by 2001-2004 (approximately 900 warheads a year over five years) could be accommodated. In the high-capacity storage scenario, a dismantlement rate of some 900 - 1,100 warheads should suffice to deal with the additional downloaded warheads. Finally, if Russia has achieved a dismantlement rate of 2,000 warheads or higher per year through 1998, in the low-capacity scenario, Russian storages most likely could accommodate the additional downloaded warheads even if the dismantlement rate drops to around 1,100 warheads a year. The remaining backlog of withdrawn warheads from the early to mid-1990s could be dealt with as well as the additional warhead retirements (see Tables 3 and 5).

Table 5: "Extra" Warheads Needing Storage by 2003					
		Low-High WH Storage-Capacity Scenarios, 1998		Warheads Needing to Be Dismantled a Year	
		10,030 WHs	17,700 WHs		
WHs Needing Storage by 2003, Low-High Estimates	29,500 WHs	19,470	11,800	1,498	908
	31,500 WHs	21,470	13,800	1,652	1,062

## b. The Eliminated-Weapons Storage Barrel

As nuclear weapons have been dismantled, Minatom storages have filled up with fissile material storage containers. According to then-Minatom Minister Victor Mikhailov, the materials from an eliminated warhead are placed into 3-4 containers.<sup>46</sup> Thus, if from 1991/92 through 1998, 22,563 warheads – 17,900 tactical and 4,663 strategic warheads<sup>47</sup> – were available for dismantling, then storage for 67,700 - 90,300 fissile material containers may be needed. To these numbers should be added, another 30,000 - 60,000 containers perhaps already in storage containing the parts of the 10,000 - 15,000 warheads eliminated from the mid-1980s to around 1991-1992.<sup>48</sup> Thus, secure storage may eventually be needed for 97,700 - 150,300 fissile material containers (see Table 6 below).

Under START I/II or an equivalent de-alerting plan an additional 3,211 warheads may be removed from ICBMs and SLBMs by 2004, creating a need for storing an additional 9,600 - 12,800 fissile material containers if these warheads were eliminated. Finally, as discussed, Russian strategic forces may fall below the levels allowed by START II and another 1,385 warheads from ICBMs and SLBMs could be removed from service. If these warheads are eliminated, another 4,200 - 5,500 containers may need to be stored. In addition, some portion or all of the 814 warheads currently assigned to bombers may be retired and require dismantling. If all were retired and dismantled, space for another 2,400 - 3,300 containers may be needed. Thus, by the middle of the next decade 113,900 - 171,900 containers may

<sup>46</sup> Overall, he claimed that about 100,000 containers will be needed to handle the materials taken from dismantled warheads in the 1990s; Interview with Victor Mikhailov in "Russian Treatment of Nuclear Materials Described," Vienna *ORF Television Network*, 16 October 1992, (JPRS-TND-93-039, 28 October 1992, p. 18).

The internal cylindrical dimensions of the containers are: 11-12 inches high and some 8 inches in diameter (see Figure 20 in Appendix F).

Previously it was assumed that pits were going to be stored whole in containers, but recently Russia approached the United States for assistance to produce internal racks to hold two 2-kg solid spheres of plutonium removed from warheads; U.S. Cooperative Threat Reduction Program Office, February 1998 briefing on status of CTR program.

<sup>47</sup> According to the START I MOU data exchange, overall the number of START II accountable warheads on bombers has been reduced by 549 warheads from 1,363 to 814 from September 1990 to July 1998. Added to this were the 4,114 ICBM and SLBM warheads taken off missiles in Russia, Ukraine, and Kazakhstan by July 1998 on the assumption all these warheads are up for dismantling (See Table B4 in Appendix B).

<sup>48</sup> See above and Appendix D for discussion of the number of warheads dismantled since the mid-1980s.

need to be stored.

However, several thousand of the smaller nuclear warheads -- e.g., for artillery shells, surface-to-air missiles, torpedoes, mines -- may have a small primary component and no secondary and so require only one container. Post-1991, 5,200 or so tactical nuclear weapons may be in this category (see Table B7 in Appendix B), suggesting the total amount may be lower by 10,400 to 15,600 containers (note: some portion of the weapons dismantled in the 1980s also may have needed less than three containers for their component parts).

The total capacity for fissile material container storage is unclear. Some storage of fissile materials from dismantled warheads may be occurring at the assembly/disassembly facilities and at the fissile material production complexes at Chelyabinsk-65 and Tomsk-7.<sup>49</sup> In addition, some materials removed from warheads may be placed back into military facilities. In 1993, the CIA reported that the Russians had stated that the plutonium from dismantled weapons was "presently being stored at military sites."<sup>50</sup> Thus, parts of eliminated warheads may be being stored at 12th Main Directorate sites near the dismantlement facilities in places vacated by warheads shipped to dismantlement facilities or other military storage sites.

Russian officials, however, have insisted that there is and will be a shortage of storage space for fissile material containers. As a result, as part of the Pentagon's Cooperative Threat Reduction (CTR) program, the United States is working with Russia to construct a 50,000-container storage facility at Chelyabinsk-65. The facility will be constructed in two phases. The first half was recently scheduled to begin operation in late 1999 or the year 2000, however, some officials think it will not be ready until the year 2002.

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<sup>49</sup> One Russian report said as of late 1994, 23,000 containers with uranium and plutonium materials from dismantled warheads were stored at the Siberian Chemical Plant in Tomsk-7; Alexander Bolsunovsky and Valery Menshchikov, "Nuclear Security Is Inadequate and Outdated," *Moskovskiy Novosti*, No. 49, 9-15 December 1994, (FBIS-SOV-95-006-S, 10 January 1995).

Although, they were not being stored in specially designed facilities but in ones adapted for these purposes: "Recyclable fissile materials are stored in buildings adapted for the purpose, rather than in specially constructed storage facilities. According to SCC [Siberian Chemical Combine] data, the total number of units of FM [fissile material] storage is currently 23,000 containers;" Draft of Security Council Report, "Report of Working Group of RF Security Council on Results of Verification of Assurance of Radiation and Ecological Safety of Siberian Chemical Combine (Tomsk-7) and Adjacent Territories," 1994, (JPRS-UST-95-003-L, 21 March 1995).

Note: One report said the Russian Ministry of Atomic Energy's Board that visited Mayak on 9-12 June 1997 decided that Chelyabinsk-65, "will also start to store plutonium obtained during the nuclear disarmament process in special American-made containers;" *Interfax*, "'Siberian' Business Report," No. 25, 17-23 June 1997, (FBIS-SOV-97-122, 23 June 1997).

It is unclear whether this refers to the facility being partially financed by the United States or an additional facility.

<sup>50</sup> Adm. William O. Studeman, Acting DCI, 23 August 1993 letter with answers for questions for the record for R. James Woolsey, DCI's testimony for the SGAC hearing on "Proliferation Threats of the 1990s," 24 February 1993, S. Hrg. 103-208, p. 144.

In addition to increasing the capacity for fissile material container storage, Minatom storages of highly-enriched uranium (HEU) from weapons are being emptied by converting HEU from weapons into low-enriched uranium (LEU) for powerplant fuel. On 18 February 1993, the United States and Russia signed an agreement which provided for the United States to purchase the blended-down equivalent of 500 metric tons of 90% HEU over a 20 year period.<sup>51</sup> The first shipments containing the equivalent of 6.1 metric tons of HEU were received in 1995. In 1996, the equivalent of 12 metric tons was shipped, and in 1997, 18 metric tons. In 1998, USEC has placed orders for the equivalent of 24 metric tons of HEU.<sup>52</sup> It is planned to increase the amount to 30 metric tons equivalent of HEU per year in 1999 and thereafter. If each fissile material container holds 7-15 kgs of HEU, then downblending 500 metric tons of HEU may mean 33,300 - 71,400 fissile material containers would no longer be needed (see Appendix E for discussion).

If several thousand warheads only require one fissile material container, dismantled warheads fit into three containers each, and containers hold closer to 7 kgs rather than 15 kgs HEU, there is the possibility that existing and planned storages will be able to accommodate all the fissile material containers.<sup>53</sup> This, in fact, may be the case: due to the HEU deal, some Russian officials have suggested to their U.S. counterparts that the first half of the Chelyabinsk-65 facility may be enough, particularly if more containers of plutonium are stored than was initially expected.<sup>54</sup> However, additional storage may still be needed in the near term (through 2003) because: the majority of the shipments of downblended HEU

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<sup>51</sup> The agreement calls for 500 tons of HEU "extracted from nuclear weapons" with an enrichment of U-235 of 90% or higher being delivered as LEU with an enrichment of less than 20% U-235; "Agreement Between the Government of the United States of America and the Government of the Russian Federation Concerning the Disposition of Highly Enriched Uranium Extracted from Nuclear Weapons," 18 February 1993, available from the Arms Control and Disarmament Agency, Public Affairs Office; Andrew Bieniawski, U.S. Department of Energy (DOE), and Vladislav Balamutov, Minatom, Briefing on the "HEU Purchase Agreement," 11 June 1997.

For a history of the HEU deal see: Richard Falkenrath, "The HEU Deal," in Graham T. Allison, et al., *Avoiding Nuclear Anarchy: Containing the Threat of Loose Russian Nuclear Weapons and Fissile Material*, (Cambridge, MA: MIT Press, 1996).

<sup>52</sup> U.S. Enrichment Corporation, "Megatons to Megawatts Program Status as of August 24, 1998," available at <http://frontpage.USEC.inter.net/>.

<sup>53</sup> In addition to the Chelyabinsk-65 facility being constructed with U.S. assistance, it seems a new fissile material container storage facility is also being built in Tomsk-7. In July 1998, First Deputy Atomic Energy Minister Lev Ryabev said that two special storage facilities for plutonium removed from warheads were being built -- one in Siberia [Tomsk-7] and one in the southern Urals [Chelyabinsk-65]; Adam Tanner, "Russia Seeks Billions to Convert Nukes," *Reuters*, 29 July 1998.

<sup>54</sup> According to U.S. officials, the storage facility was designed assuming that only one-third of the containers would hold plutonium. If the HEU deal removes "more" HEU containers, the number of containers holding plutonium can be increased. Apparently this will not cause an overheating problem per se, because the initial design requirements were conservative: the facility is designed to accommodate a passive cooling of the containers for up to a month in case the active cooling system fails. If this criterion is relaxed, more plutonium containers can be stored, i.e. the normal operating of the cooling system could handle a higher number of plutonium containers.

would come after considerable numbers of weapons had been dismantled<sup>55</sup> or because the HEU deal suffers delays or falls through over the next 15 years.<sup>56</sup>

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<sup>55</sup> By the end of 2003, if Russia is dismantling some 1,000 - 3,000 weapons a year, then 13,000 to over 30,000 weapons may have been dismantled. If each warhead contains 22 kg - 30 kg of HEU, then only 7,000 - 9,500 warhead equivalents of HEU will have been removed from Russia under the HEU deal.

<sup>56</sup> The privatization of the U.S. Enrichment Corporation in 1998 has created concerns the deal may fall through; Matthew L. Wald, "U.S. Privatization Move Threatens Agreement to Buy Enriched Uranium From Russia," *The New York Times*, 5 August 1998.

Table 6: Estimates of the Number of Fissile Material Containers (FMC) Needing Storage		
Total Possible FMCs needing storage due to:	3 FMCs per WH	4 FMCs per WH
Warheads dismantled to early 1990s (Note: some may require only 1 FMC)	30,000	60,000
Warheads available for dismantling by 1998	67,700	90,300
<b>Total by 1998</b>	<b>97,700</b>	<b>150,300</b>
<u>Post-1998</u>		
ICBM and SLBM WH retirements due to START I/II	9,600	12,800
ICBM and SLBM WHs retired due to economic problems	4,200	5,500
Bomber WHs retired due to economic problems	2,400	3,300
<b>Total Post-1997</b>	<b>16,200</b>	<b>21,600</b>
<b>Total Possible FMCs Needing Storage</b>	<b>113,900</b>	<b>171,900</b>
Subtract FMCs not needing storage:		
FMCs for WHs which only need 1 FMC	-10,400	-15,600
FMCs Stored in Future Mayak FMC Facility <sup>57</sup>	-50,000	-50,000
<b>Total FMCs Not Needing Storage</b>	<b>-60,400</b>	<b>-65,600</b>
<b>Total FMCs Possibly lacking Secure Storage Without HEU deal</b>	<b>53,500</b>	<b>106,300</b>
	Low	High
FMCs obviated by HEU Deal:	-33,300	-71,400
Low (15 kgs HEU/FMC)- High (7 kgs HEU/FMC)		
<b>Total FMCs Possibly Lacking Secure Storage if:</b>		
FMCs hold 15 kgs HEU/FMC	<b>20,200</b>	<b>73,000</b>
FMCs hold 7 kgs HEU/FMC	<b>0</b>	<b>34,900</b>

### 3. Conclusions

#### a. Stockpile Size, Storage Space, and Dismantlement Rates

Large uncertainties in estimating the Russian nuclear warhead storage overloading problem still exist. The size of the arsenal, the rate of warhead dismantlement, and the amount of storage space are not precisely known. However, this paper has tried to make use of existing diverse but plausible estimates to outline the parameters of the problem.

In terms of the Soviet/Russian arsenal's size, this paper has hypothesized that the arsenal held a total of 30,000 - 32,000 nuclear warheads in the 1991-1992 timeframe. This

<sup>57</sup> As noted above, other facilities for the storage of FMCs with an unknown capacity and of unknown quality currently exist. E.g., 23,000 FMCs reportedly already were in storage at Tomsk-7 by the early 1990s.

hypothesis is based upon the convergent U.S. and Russian official and unofficial estimates of the size of the Russian arsenal. It is made, however, with some discomfort because little or no hard data exist to support it. Also, a number of these seemingly separate estimates of the size of the Soviet stockpile could be derived from one another. Yet, at least, this hypothesis should help make the calculations derived from it consistent within a commonly accepted frame of reference.<sup>58</sup>

As for the amount of nuclear weapons storage space, this paper has concluded there appears to be some 80 operational nuclear weapons storage sites in Russia today, 16-20 of which are large national-level storage sites. They hold on the order of 240 - 400 nuclear weapons each. The remaining 60 or so service-level sites are smaller in size and capacity (except for the strategic bomber base associated storage facilities) and are assumed to store 100 - 200 nuclear weapons each. Overall, the Russian nuclear weapons storage complex today may be able to hold 10,000 - 18,000 nuclear warheads, with a possibility the actual range is 10,000 - 13,000.

In regards to dismantlement rates, on the one hand, those suspicious of Russian statements can argue that most of the public Russian statements that relate to groups of warheads, the numbers of which are deemed to be relatively well understood -- i.e. the nuclear weapons from Ukraine -- point to a low dismantlement rate. In addition, it is clear that there have been continuing economic and social problems in the Minatom nuclear weapons complex. For those that are doubtful, it is logical to assume that dismantlement lines have not been running at full capacity since 1992. Thus, the DOD can say that as of January 1997, the Russian strategic and tactical nuclear stockpile consisted of 25,000 warheads,<sup>59</sup> rather than some 20,000 nuclear weapons, which would be a more probable stockpile estimate had Russia been dismantling 2,000 or more warheads a year.

On the other hand, Russian officials' public statements and their private communications, according to U.S. government officials' testimony, suggest that dismantlement rates have been as high as 2,000 - 3,000 warheads a year. It is obviously plausible that Russian dismantlement facilities are working on more than just disassembling the warheads returned from Ukraine. In addition, a Russian warhead complex that was sized to support an arsenal of 30,000 - 40,000+ nuclear weapons -- i.e. prepared to remanufacture some 7-10% of it a year,<sup>60</sup> plus engage in new production -- could feasibly dismantle at least

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<sup>58</sup> Of course, if the arsenal's size was smaller -- closer to 25,000 warheads, which seems to have been possibility due to the margin of error in a number of the U.S. and Russian estimates -- the warhead storage overloading problem would have been less serious and a lower warhead dismantlement rate should have been able to address this problem. Yet, if the arsenal's size was larger -- 35,000 warheads or more -- the overloading problem would have been more acute and a higher dismantlement rate would have been necessary to solve this problem.

<sup>59</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, November 1997, p. 43.

<sup>60</sup> If Russian warheads have a shelf-life of 10-15 years, about 7-10% or several thousand warheads have to reworked a year. E.g.: "We may assume that the usual guaranteed lifetime [of a nuclear munition] is 10-15 years. Each year 2,000-3,000 have to be taken out of service and dismantled and replaced by an equal number of

1,500 - 2,000 nuclear weapons a year plus do a little new production, even if it was working at half of its capacity due to lack of funds or personnel.

#### **b. Impact on Implementation of Current and Future Strategic Arms Control Agreements**

The range of opinion about dismantlement rates has critical implications for START II deactivation and de-alerting proposals which involve the removal of warheads from launchers. The DOD's skeptical conclusion about the rate of Russian warhead dismantlement implies removing warheads from launchers might add to the warhead storage overloading problem. In fact, DOD's pessimistic perspective suggests the apparent U.S. preference to achieve START II mandated deactivations through the removal of warheads from launchers could add to a warhead overcrowding problems at Russian nuclear weapons storages.

Conversely, Russian officials' optimistic statements about warhead dismantling rates lead to the opposite conclusion. High dismantlement rates imply storages have been emptied and that removing these warheads from launchers would not make the storage overloading problem any worse. Thus, proposals calling for the removal of strategic warheads from launchers should be feasible.

Since there has been no reported discussion of the construction of new warhead storages,<sup>61</sup> the prospects for implementing arms control agreements which call for the removal of warheads from launchers may depend on the warhead dismantlement rate.<sup>62</sup> If Russia has been dismantling warheads at an average rate of 2,000 warheads a year or more

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new ones;" Interview with Gennady Novikov, Chief of the Sector Special Security Laboratory at Chelyabinsk-70, by V. Umnov, "Few Bombs Will Survive Till the Year 2000: In the Past Year the Safety of Our Nuclear Weapons Has Declined Sharply," *Komsomolskaya Pravda*, 12 March 1992, (FBIS-SOV-92-051, 16 March 1992, p. 8).

<sup>61</sup> Although there has been several news accounts about the continued construction of underground facilities in Russia. Much speculation has centered on the function of a large underground facility being built in the southern Urals in Yamantau Mountain near the town of Beloret'sk and south of Zlatoust-36/Yuryuzan. It has been variously described as a mine, a food storage site, a strategic command and control post, a bunker for Russian leaders, or a nuclear waste or storage site; James Hackett, "Underground readiness for war," *The Washington Times*, 16 July 1997; Ben Barber, "Massive military bunker in Urals won't threaten aid; Project declared 'modernization'," *The Washington Times*, 17 April 1996; Michael Gordon, "Despite Cold War's End, Russia Keeps Building a Secret Complex," *The New York Times*, 16 April 1996.

<sup>62</sup> The closing of nuclear weapons storages on Russian territory has ambiguous implications for the warhead overloading problem. It suggests the remaining storages may have adequate space. Yet, also, space may still be at a premium. Many front-line storages were emptied (and maybe closed in the case of Army units) due to the 1991 Presidential initiatives. Some national- and service-level storages may have been closed or emptied due to political unrest or also the Presidential initiatives. Such was the case for the storage at the Mozdok bomber base near Chechnya and this may have been a reason for the closing of the facility at Nalchik which is also near the areas of political turmoil in the Caucasus region. The storage at Prilepy was reportedly shut-down due to strikes by civilian workers at the facility (see Appendix C for discussion). Finally, some older sites may have become too dilapidated to use.

since 1991/1992, there is a higher probability that Russian storages should be able to accommodate further warhead withdrawals required by arms control treaties or de-alerting measures or resulting from economic pressures or a START III agreement. If Russia has been dismantling at a slower rate, warhead storage space could still be and would remain at a premium. The problem could be exacerbated if more storages need to be closed due to lack of funds for maintainance or if Russia shuts down some of the facilities dismantling warheads, as has been announced.<sup>63</sup>

### **c. National- vs. Service-level Storage Space**

Some have suggested the real problem Russia faces with shortage of storage space for implementation of START agreement deactivations is not with the capacity of national-level central storages, but with the capacity of the service-controlled RTB storages associated with ICBM and SSBN/SLBM bases. This may be true. Dismantlement rates may have been sufficiently high to empty central storages, but as the 1993 incident of overloading of warheads at the ICBM base in Ukraine suggests, the ICBM RTB storages are not designed to hold more than a few dozen warheads each. This problem may be particularly acute at the nine ICBM bases which have SS-18, SS-19 and SS-24 MIRVed ICBMs, eight of which each have more than 100 warheads based there (see Table 7). All but 105 SS-19 warheads would be deactivated under START I/II.

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<sup>63</sup> In February 1998, then Minatom Minister Mikhailov said that, as part of the long-term conversion program of the Russian nuclear weapons complex, two out of the four plants producing nuclear weapons and one out of the two plants manufacturing nuclear weapons components would be closed by the year 2000; "Press Conference with Nuclear Energy Minister Victor Mikhailov," Official Kremlin International News Broadcast, 18 February 1998 (Federal News Service).

However, the remaining plants, possibly could handle the future dismantlement workload, if the bulk of dismantlement has taken place. At the same news conference, Mr. Mikhailov said: "We are engaged in the utilization of nuclear warheads in accordance with plan. We have approached the line when it is necessary to start solving question connected with START-2. This implies work with strategic nuclear warheads." This suggests the majority of tactical and strategic nuclear weapons scheduled for dismantlement so far have been dealt with. It is unclear what this means for crowding at storages. Mr. Mikhailov's comments may indicate a relatively high dismantlement rate, or they may just signify that the portion of warheads in storages that are designated for dismantlement are being dealt with relatively expeditiously.

Table 7: Russian MIRVed ICBM Warhead Deployments, July 1998		
MIRVed ICBM Base	Missile System/WHs	Deployed WHs, July 1998
1. Aleysk	SS-18 10	300
2. Bershet	SS-24 10	150
3. Dombrovskiy	SS-18 10	520
4. Kartaly	SS-18 10	460
5. Kostroma	SS-24 10	120
6. Kozelsk	SS-19 6	360
7. Krasnoyarsk	SS-24 10	90
8. Tatishchevo	SS-19/SS-24 6/10	700
9. Uzhur	SS-18 10	520
Total Warheads Deployed		3,220
105 single-warhead SS-19s allowed under START II (Note: more single-warhead SS-27 ICBMs may be deployed by 2004 further reducing the number of warheads needing storage.)		-105
Total MIRVed ICBM Warheads Needing Storage Due to START I/II Deactivations		3,115

Depending on the scenario, the same situation may pertain for storages for SLBM warheads. The problem may be relatively less serious for achieving START II mandated deactivations. Only some 140 - 350 warheads may have to be offloaded from SLBMs (depending on whether warheads removed from submarines not yet declared out of service but no longer operational are considered to be already in storage), to meet the START II limit of 1,750 warheads deployed on SLBMs (see Table 8 below).

A de-alerting proposal, however, that involved removing warheads from all submarines not regularly on patrol -- perhaps from all but 2-6 SSBNs, taking into account current low Russian deployment rates and that some SSBNs would be loaded-up for training and workup purposes prior to a patrol -- may be a bit more problematic. Several hundred additional warheads may have to be removed from some of the Delta III SSBNs (each carries 48 warheads on 16 SS-N-18 SLBMs) based at Rybachy near Petropavlovsk in the Pacific Fleet. This could strain the capacity of local warhead storage(s). As for the Northern Fleet, a thousand or more warheads may have to be removed from the SSBNs based on the Kola Peninsula under this scenario.

Table 8: Russian SLBM Warhead Deployments, July 1998			
Fleet	SLBM	7/98	7/98 Mod
Northern Fleet. Two basing areas on Kola Peninsula. In several fjords NW of Murmansk at Yagelnaya, Olenya, and Nerpichya/Zapadnaya Litsa, and E of Murmansk at Gremikha/Ostrovnoy.	SS-N-20	820	820
	SS-N-23	448	448
	SS-N-18	192	192
	SS-N-17	0	0
	SS-N-8	108	0
	SS-N-6	0	0
<b>Total Northern Fleet</b>		<b>1,568</b>	<b>1,460</b>
Pacific Fleet. Two bases. One at Rybachy near Petropavlovsk-Kamchatskii. Second at Pavlovsk SE of Vladivostok.	SS-N-18	432	432
	SS-N-8	84	0
	SS-N-6	16	0
<b>Total Pacific Fleet</b>		<b>532</b>	<b>432</b>
<b>Total SLBMs</b>		<b>2,100</b>	<b>1,892</b>
Minus START II warhead limits		-1,750	-1,750
<b>Total Warheads Needing Storage</b>		<b>350</b>	<b>142</b>

**Nuclear Weapons Transport** Rather than the limited-capacity of the RTB storages, a lack of funds may mean there may not be enough nuclear weapons transport vehicles or rail-cars to ship away off-loaded warheads in a timely manner from the RTB storages.<sup>64</sup>

Unlike the United States, the Soviet Union seemingly never used air-transport for regular logistical transport of nuclear weapons. Rather, trucks were used for shorter distances and rail was used for long-haul shipping (some naval weapons were also transported by service ships).<sup>65</sup> In late 1996, the 12th Main Directorate noted that by the year 2000, only 362 nuclear-weapons transport rail-cars were anticipated to remain in operation since many were being retired as they reached the end of their service lives. Moreover, the number of new cars entering the fleet was very low. From 1993 to 1996, 38 rail-cars were supplied, but 223 were removed from service. In addition, a sufficient number of upgraded transport vehicles, so called NG-9T-1 cars, which had, "protection against bullets, shell-splinters, fires and overturning" were not being introduced. Only 64 new transport vehicles were provided between 1993 - 1996, much less than was needed to equip military units.<sup>66</sup>

<sup>64</sup> Of course, the lack of funds may be slowing the shipment of nuclear weapons in general.

<sup>65</sup> Dr. Sergei Rogov and Dr. Alexander Kononov, Institute of USA and Canada Studies, eds., *The Soviet Nuclear Legacy Inside and Outside Russia: Problems of Non-Proliferation, Safety, and Security*, (Institute of USA and Canada Studies: Moscow, 1993), p. 40.

<sup>66</sup> Comments by General Igor Valynkin, then First Deputy Head of the 12th Main Directorate before the Duma Committee on Security, "Stenographic Record of the Parliamentary Hearings on the Topic: Issues Concerning the Security of Hazardous Nuclear Facilities," *Yaderny Kontrol Digest*, No. 5, Fall 1997, p. 16. The hearings were held 25 November 1996.

Note: it is not clear where the 100 nuclear-weapons transport rail-cars upgraded through the CTR program fit into this calculus.

Also, the condition of rail-lines may be another issue as General Valynkin noted they need to be repaired at 12th Main Directorate. The average length of railroad at a facility was 11 kilometers and the cost of repair per kilometer was 130 million rubles (i.e., \$22,000 in 1996 rubles).

The Soviet Union should have been shipping at least 4,000 - 6,000 warheads a year in the 1980s, as warheads removed for normal maintenance and recycling purposes were replaced by new ones.<sup>67</sup> An upper bound for the frequency of rail-transport of nuclear weapons perhaps comes from the KGB annual reports to the senior Soviet political leadership for the years 1985, 1986 and 1988. These reports noted that security for 2,500 - 3,000 trains for the transport of nuclear as well as other special military weapons had been provided each

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The lack of transport capacity may exist at several levels: within a military base or service-controlled RTB storage; from the service-controlled RTB storage to a national-level central storage; within a national-level central storage; to a dismantlement plant; and for the transport of operational warheads to and from storage sites and to and from deployment sites. General Valynkin's comments may have referred just to 12th Main Directorate storages. However, a limited transport capacity at 12th Main Directorate storages receiving nuclear weapons shipments from service-controlled RTB storages could still contribute to the limited-storage space problem at RTB storages sites since it could inhibit the timely shipment of warheads to and from national-level storage sites. Also, in any event, presumably, similar financially-induced problems may be causing shortages of transport equipment at every location.

<sup>67</sup> "Each year 2,000-3,000 [nuclear warheads] have to be taken out of service and dismantled and replaced by an equal number of new ones;" Interview with Gennady Novikov, Chief of the Sector Special Security Laboratory at Chelyabinsk-70, by V. Umnov, "Few Bombs Will Survive Till the Year 2000: In the Past Year the Safety of Our Nuclear Weapons Has Declined Sharply," *Komsomolskaya Pravda*, 12 March 1992, (FBIS-SOV-92-051, 16 March 1992, p. 8).

Several reports suggest each rail-car carries two nuclear warheads. Rabinovich claimed the rail-cars for nuclear weapons transport at the Bronnaya Gora arsenal each carried two nuclear warheads. Eugene Marchuk, chairman of Ukraine's National Security Service told the *Washington Post* that no more than two tactical warheads were put in each rail-car for shipment to Russia; Moysey Rabinovich, "Soviet Conventional Arms Transfers to the Third World: Main Missile and Artillery Directorate (1966-1990)," Global Consultants, Inc., Alexandria, VA, 1993, p. 8; R. Jeffrey Smith, "Ukrainian Minimizes West's Nuclear Fears; Precautions in Handling Warheads Are Extraordinary, Security Service Chief Says," *Washington Post*, 25 December 1991.

One Russian specialist noted that an average train carries 50 nuclear weapons; Gennady Novikov, Chief of the RSFSR Ministry of Atomic Energy Sectoral Special Safety Laboratory, "We Say Zero, But What Are We Thinking?" *Novoye Vremya*, No. 15, April 1992, (JPRS-TND-92-014, 14 May 1992, p. 41). But also note, as described in Appendix B, it seems strategic warheads shipped out of Ukraine were shipped 60 at a time.

This implies some 25-30 rail-cars per nuclear weapons transport train. However, it is not clear if trains of this size are in fact typical. In 1991, one report noted a nuclear weapons transport train "consisting of five nuclear cars," broke down near Mecklenburg in Germany because of an overheated axle; Lothar Lowe, "Soviet Still Have 300 Nuclear Weapons in Our Country," *Bild* (Hamburg), 3 July 1991, (JPRS-TND-91-011, 24 July 1991, p. 32). In 1998, a reported Russian army officer supposedly familiar with nuclear weapons said that each nuclear weapons transport train has several regular looking freightcars, but only one or two carry nuclear weapons. The rest are included in the train for camouflage. Twelve to 14 such trains were in transit in Russia on any given day; Alexei Sinelnikov, incorporating account of interview with Russian Army officer identified only as "Valery", "Can a Nuclear Train Be Seized? Chernobyls Carried Past Us Every Day in Freightcars Without Our Even Suspecting," *Komsomolskaya Pravda*, 9-16 January 1998, (FBIS-TOT-98-009, 9 January 1998).

Finally another group of Russian experts claimed that, in the former Soviet Union, the total number of rail-cars used for nuclear weapons transportation was some 120-160. This allowed the transport of approximately 800 nuclear weapons a month, which could be increased to 1,500 weapons in a crisis; Dr. Sergei Rogov and Dr. Alexander Konovalov, Institute of USA and Canada Studies, eds., *The Soviet Nuclear Legacy Inside and Outside Russia: Problems of Non-Proliferation, Safety, and Security*, (Institute of USA and Canada Studies: Moscow, 1993), p. 40.

year.<sup>68</sup>

The transportation requirements over the next few years as the arsenal is being downsized still may be quite heavy, some 2,000 - 4,000 warheads a year.<sup>69</sup> If the number of transport vehicles and cars is declining, nuclear weapons transport capacity may be a bottleneck to the removal of warheads from strategic missile launchers.

#### **d. Implications for U.S. Policy**

**Warhead Transport, Dismantlement and Storage** To insure a START II deactivation or a de-alerting plan that involves the removal of warheads from launchers, the United States may have to pursue expanding Russia's nuclear weapons transport, dismantlement, or storage capacity.

Current or envisioned CTR programs have addressed or will address some of these problems. Transport of nuclear weapons has been assisted by the \$3.3 million spent on armored blankets, the \$34 million for nuclear weapons transport security (including super-containers and emergency support equipment), and the \$21.5 million for security enhancements for rail-cars.<sup>70</sup> Also, the CTR program has suggested to the MOD's 12th Main Directorate that the United States could provide assistance with retired warhead shipments from bases and storages to dismantlement plants.<sup>71</sup>

However, the United States may also wish to explore whether more rail-cars or trucks for nuclear weapons transport are needed.<sup>72</sup> Moreover, to help alleviate a possible warhead dismantlement bottleneck, the United States could pursue paying for warhead

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<sup>68</sup> The KGB had some responsibility for the transport security of nuclear weapons and other special military weapons; Raymond Garthoff, "The KGB Reports to Gorbachev," *Intelligence and National Security*, April 1996, p. 238.

<sup>69</sup> Assuming continued START I implementation, and if START II is ratified soon and warhead removal becomes the preferred mode of deactivation, approximately 3,200 warheads would have to be taken off MIRVed ICBMs and SLBMs by 31 December 2003. This amounts to about 640 warheads a year. To these 640 a year one-way "withdrawal" transfers should be added the 1,000 - 2,000+ one-way inter- and intra-storage facility and plant "warhead dismantlement" transfers commensurate with a dismantlement rate of 1,000 - 2,000 warheads a year, and the 500 - 1,000 round-trip shipments of operational warheads being removed and returned to service if Russia maintains an arsenal of 5,000 - 10,000 strategic and tactical nuclear weapons (i.e., a START II arsenal of 3,000 strategic weapons plus a larger tactical nuclear arsenal or a START III arsenal of 1,500 - 2,000 strategic weapons plus a larger tactical nuclear arsenal).

<sup>70</sup> See CTR program's webpage at: [www.ctr.osd.mil/funding/](http://www.ctr.osd.mil/funding/) for "Congressional Notifications and Corresponding Obligations" as of October 1998.

<sup>71</sup> CTR briefing on "START II/III Related CTR Projects," February 1998.

<sup>72</sup> U.S. officials say Russia has not asked for such assistance, and, moreover, the 100 rail-cars that were provided with security upgrades from the CTR program may not be being fully utilized. However, the 12th Main Directorate's complaints before the Duma committee have some merit and the Russian rail-stock is, of course, aging. Thus, this issue may be worth examining.

dismantlements.<sup>73</sup> Finally, to increase storage capacity, the renovation of an existing closed central storage site or the construction of new nuclear weapons storage site may have to be envisioned.

**Security of Warheads in Storages** Despite Russian economic and social problems, it may be more feasible than ever to improve the security of nuclear weapons storages. In the early days of the CTR program, i.e. fall 1991 to summer 1992, upgrading the security for several hundreds of storages all over the Soviet Union while thousands of weapons were being transferred out of the former Soviet Republics would probably have been a difficult and, in some cases, unnecessary task as some storages were being emptied.<sup>74</sup>

Now it is clear that the number of storages is much smaller, their locations are more well-known, and the possibility of understanding the cost of upgrading their security is much greater. For example, in 1996, the MOD's 12th Main Directorate estimated that around 30 billion rubles -- approximately \$5 million at that time -- were required to fully equip a 12th Main Directorate central storage site with physical protection systems.<sup>75</sup> By this accounting, some \$100 million would suffice to improve security at the 20 or so national-level storage sites and \$300 million or less would cover the remaining 60 service-controlled RTB storage sites.

Over a billion dollars has been allocated for CTR programs since 1991. Yet only some \$63.8 million has been put specifically towards increasing Russian warhead safety and

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<sup>73</sup> This could be managed through a prime-contractor that could sub-contract out warhead dismantlement related services to the Russian organizations involved in warhead dismantlement.

There is a precedent for such an arrangement. The United States has already proposed such a service-providing contractor agreement to Russia in the case of shipping warheads as well as the dismantling of SSBNs; CTR briefing on "START II/III Related CTR Projects," February 1998.

Such a program would have the added benefit of keeping up employment in a few of the Russian closed cities. It also probably would be facilitated if one of the dismantlement plants scheduled to be closed is instead turned into a dedicated dismantlement facility (as has been discussed among Russian and U.S. experts), monitored for the purposes of transparency and irreversibility of warhead reductions. In this case, the United States could provide funds with the assurance they would not be used for producing new nuclear weapons or maintaining the existing arsenal.

<sup>74</sup> The United States was able to do relatively little to improve concretely the security of Soviet nuclear weapons during this period. The first tangible U.S. CTR assistance was the provision of 125 U.S. Army nylon ballistic blankets for the protection of warheads during transport. This shipment arrived in Moscow on 23 June 1992 over a month after the last tactical warheads were withdrawn into Russia from Ukraine and Belarus. On the arrival of the blankets see: Sergei Postanogov, "U.S. Assists in Safe N-Arms Transport, Storage," *ITAR-TASS*, 23 June 1992, (JPRS-TND-92-020, 25 June 1992, p. 20); Foreign Ministry Press Briefing by Sergei Yastrzhembski, Official Kremlin International News Broadcast, 23 June 1992, (Federal News Service).

<sup>75</sup> Comments by General Igor Valynkin, then First Deputy Head of the 12th Main Directorate before the Duma Committee on Security, "Stenographic Record of the Parliamentary Hearings on the Topic: Issues Concerning the Security of Hazardous Nuclear Facilities," *Yaderny Kontrol Digest*, No. 5, Fall 1997, pp. 16-17.

security as of October 1998.<sup>76</sup> In the last year or so, some of this money has begun to pay for the provision of software and computers for warhead control and accounting and 30 miles of security fencing and sensors for use at up to 50 nuclear weapons related sites.<sup>77</sup> The current round of economic and political problems in Russia and the keen concern over the safety of Russian nuclear weapons suggest the United States may want to make this portion of the CTR program more of a priority over the next few years.

**Fissile Material Container Storage** Depending on the circumstances, the currently planned facility at Chelyabinsk may solve this problem, or it may not. In any event, until additional agreements on transparency are made, Russia may be reluctant to put all of its weapons-grade fissile material into a U.S. monitored facility as Russia may want to keep some weapons grade materials in a facility not subject to U.S. irreversibility requirements.<sup>78</sup> Thus, the best the United States can hope for is perhaps the knowledge the Chelyabinsk facility most likely will alleviate a storage problem, even if it does not solve it outright.

The uncertainties over storage space also highlight the need for the HEU deal to succeed, as this certainly will help address a possible lack of secure storage space for fissile material containers. There have been some proposals for accelerating the HEU deal either through making advanced payments to accelerate the blend-down of 90% HEU to at least 20% HEU in Russia or even through shipping all the Russian HEU scheduled for blend-down

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<sup>76</sup> In addition to the \$3.3 million for armored blankets, \$34 million for nuclear weapons transport security (super-containers and emergency support equipment), and \$21.5 million for security enhancements for rail-cars, \$5 million has been put towards nuclear weapons storage security (including storage site enhancements and an automated inventory control/management system). \$56.9 million of the \$63.8 million has already been obligated; CTR program's webpage at: [www.ctr.osd.mil/funding/](http://www.ctr.osd.mil/funding/) for "Congressional Notifications and Corresponding Obligations" as of October 1998.

<sup>77</sup> CTR program's webpage at: [www.ctr.osd.mil](http://www.ctr.osd.mil).

It is not clear the security fencing and sensors are being deployed at 50 sites or at some more limited number of facilities. Nor is it clear whether this is all the security upgrades these facilities may need.

The 50 site number was apparently an arbitrary figure chosen for budgeting and planning purposes to get this part of the CTR program off the ground. It is not necessarily related to the number of nuclear weapons storages in Russia nor the amount of security upgrades needed at the storages.

General Eugene Habiger said he saw this security assistance in evidence during his visit to a national-level nuclear weapons storage site at Krasnoarmeyskoye near Saratov in June 1998; General Eugene Habiger, "Department of Defense News Briefing," 16 June 1998.

Bechtel and its sub-contractor Computer Sciences Corporation have been performing some of the work for this project; "Bechtel National Awarded \$7.2 Million Contract to Provide Enhanced Safety and Security for Nuclear Weapons Stockpile in Russia," *PR Newswire*, 23 December 1997; "CSC Wins Subcontract to Support Bechtel National in Russia," *PR Newswire*, 24 February 1998.

<sup>78</sup> So far, Russia has only been willing to declare 50 metric tons of weapons-grade plutonium as excess to its nuclear weapons stockpile needs, matching the United States declarations. This was most recently confirmed at the September 1998, Clinton-Yeltsin Moscow Summit; Office of the Press Secretary, The White House, "Fact Sheet, Plutonium Disposition Statement," 1 September 1998.

If, as has been proposed by Russia, 4 kgs of plutonium are kept in a container in the form of two 2 kg solid spheres, then 50 metric tons would be stored in 12,500 containers, a number which is one-quarter of the capacity of the planned Mayak storage facility.

to the United States for a substantial advance payment.<sup>79</sup>

Both may be financially attractive to Russia. However, in the case of the first proposal, it appears that accelerating the blend-down of HEU may be technically difficult because Russian blend-down facilities may already be working at capacity. Moreover, the equipment lines would have to be substantially changed to avoid criticality problems to accommodate blend-downs to 20% HEU rather than lower-levels of enrichment. As for the second, it may be hard to find the political will to provide a large amount of money up-front, plus ship such large amounts of HEU. Nonetheless, both proposals underscore that some extra political energy and creativity may be needed to insure the HEU deal succeeds.

**Transparency** The rate of Russian warhead dismantlements also poses dilemmas for creating a transparency regime to insure the irreversibility of the disarmament process. Because of the current lack of Presidential attention and the upcoming Russian and U.S. presidential elections, the earliest such a regime could be fully instituted would probably be by 2001-2002. If Russia has been dismantling 2,000+ warheads a year, by the time such a regime is in place, the majority of Russian warheads scheduled for dismantlement would probably have been dismantled. Thus, there would be little opportunity to verify the irreversible dismantlement of a large portion of the Russian nuclear arsenal.<sup>80</sup>

On the other hand, if Russia has been dismantling around a 1,000 warheads a year, another problem may arise. If START II is ratified soon, by 2001-2002, the United States may have finished dismantling most, if not all, of the warheads scheduled for dismantlement under the 1991 Presidential initiatives and the START I and II agreements. Russia may balk at an intrusive warhead dismantling verification regime where the United States monitors the dismantlement of 1,000s of Russian warheads and Russia only gets to observe the dismantlement of a several hundred U.S. weapons.

**Openness** More openness about the size of the Russian nuclear arsenal, the number and capacity of Russian nuclear weapons storages, Russia's warhead dismantlement rate, and storages for fissile material would answer many of the questions raised in this paper and provide reassurance that further arms control steps are feasible without worsening the Russian warhead storage situation.

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<sup>79</sup> On the latter concept see: Francesco Calogero, "Fast-Track the Uranium Deal; U.S. Purchases from Russia," *The Bulletin of the Atomic Scientists*, November/December 1997, p. 20.

<sup>80</sup> In this a case -- where the dismantlement of a relatively small number of nuclear weapons in proportion to the size of the former Russian arsenal is monitored -- an intrusive regime for the regulation of weapons-grade fissile material stocks to insure that weapons-grade fissile materials will not be used for weapons purposes may be needed. It may be difficult reach agreement on such a regime.

Of course, to alleviate this problem, useful unilateral steps in this direction can be taken by continuing the practice of declaring fissile material stocks excess for weapons purposes and opening such declared amounts to international, multi-lateral, and/or bi-lateral inspection.

Table 9: U.S. Nuclear Weapons Disassembly History at the Pantex Plant: <sup>81</sup>										
Nuclear Weapons Returned to the Pantex Plant for Disassembly, Comparison of Discrepancies in Data Released by DOE in 1997 and 1998										
Fiscal year	Disassembly-Disposed		Evaluation then disposed		TOTAL Disposed		Evaluated then returned to stockpile		Total Disassembled	
	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998
1980	535	535	197	197	732	732	150	150	882	882
1981	1,416	1,416	161	161	1,577	1,577	180	180	1,757	1,757
1982	1,360	1,360	175	175	1,535	1,535	189	189	1,724	1,724
1983	960	960	160	160	1,120	1,120	256	256	1,376	1,376
1984	860	860	134	134	994	994	217	217	1,211	1,211
1985	927	927	148	148	1,075	1,075	251	251	1,326	1,326
1986	574	574	<sup>82</sup>	--	574	574	291	291	865	865
1987	1,068	1,068	121	121	1,189	1,189	220	220	1,409	1,409
1988	510	509	71	72	581	581	234	233	815	814
1989 <sup>83</sup>	1,134	1,134	74	74	1,208	1,208	118	118	1,326	1,326
Total 80s	9,344	9,343	1,241	1,242	10,585	10,585	2,106	2,105	12,691	12,690
1990	1,059	1,059	95	92	1,154	1,151	185	188	1,339	1,339
1991	1,546	1,506	49	89	1,595	1,595	112	72	1,707	1,667
1992	1,274	1,274	29	29	1,303	1,303	46	46	1,349	1,349
1993	1,490	1,508	66	48	1,556	1,556	44	62	1,600	1,618
1994	1,335	1,335	34	34	1,369	1,369	61	64	1,430	1,433
1995	1,335	1,339	58	54	1,393	1,393	48	53	1,441	1,446
1996	992	992	72	72	1,064	1,064	36	39	1,100	1,103
Total	9,031	9,013	403	418	9,434	9,431	532	524	9,966	9,955
Grand Total	18,375	18,356	1,644	1,660	20,019	20,016	2,638	2,629	22,657	22,645
1997	NA	445	NA	53	NA	498	NA	59	NA	557
Total 90s		445		53		498		59		557
		445		53		498		59		557
Grand Total		18,801		1,713		20,514		2,688		23,202

<sup>81</sup> 1997 data from the Department of Energy, Albuquerque Operations office, 18 March 1997, released in response to a Freedom of Information Act (FOIA) to Center for Energy and Environmental Studies, Princeton University. 1998 data from the Department of Energy, Albuquerque Operations office, 6 March 1998, released under the FOIA to same.

<sup>82</sup> Breakdown between nuclear weapons sent to the plant for disposal and those returned for evaluation that were subsequently disposed of is not available.

<sup>83</sup> This is the last year any new weapons were assembled at Pantex.

The United States has been willing to release its warhead dismantling rate information, although, as Table 9 shows, the U.S. information is not without problems. There are inconsistencies in the numbers, which, according to the Department of Energy, are due to accounting errors rather than lost warheads. The release of similar information by Russia could lead to some reassurance about the loading of Russian nuclear storages. It also could lead to a greater understanding of the Russian warhead accounting system through the discussion of the data discrepancies that would undoubtedly arise.

The United States also has released warhead stockpile information from 1945-1961 (see Table 10). The U.S. information needs to be updated, but absent the release of current information, the provision of similar historical information by Russia could lead to a discussion about the size and management of the early Russian nuclear stockpile. Such a historical discussion could prove helpful for understanding the basis of Russian warhead management and storage practices today.

Table 10: Total Nuclear Weapons in the U.S. Stockpile, Warheads Built per Year and Warheads Disassembled a Year, 1945-1961 <sup>84</sup>			
Year	Total WHs	WHs Built	WHs Dis- assembled
1945	2	2	0
1946	9	7	0
1947	13	4	0
1948	50	43	6
1949	170	123	3
1950	299	264	135
1951	438	284	145
1952	841	644	241
1953	1169	345	17
1954	1703	535	1
1955	2422	806	87
1956	3692	1379	109
1957	5543	2232	381
1958	7345	2619	817
1959	12298	7088	2135
1960	18638	7178	838
1961	22229	5162	1571

<sup>84</sup> From: Documents Provided at the Secretary of Energy's 27 June 1994, Openness Press Conference, Fact Sheets, (Revision 1, Dated 6/27/94), "Declassification of Certain Characteristics of the United States Nuclear Weapon Stockpile, Declassified Stockpile Data 1945 to 1994," available at the Energy Department's website at: [www.doe.gov](http://www.doe.gov).

Neither United States nor Russia regularly publish information about the deployments of nuclear weapons or nuclear weapons storages, except for information about strategic warhead deployments which is contained in the START I MOU data exchange. However, during 1997-1998, there were some unprecedented openness initiatives as Russian and U.S. military officers exchanged visits to each others' nuclear weapons storages.

In April 1997, General Eugene Habiger, then-Commander-in-Chief of U.S. Strategic Command, on his own initiative, took General Sergeyev, the then-Commander of the Strategic Rocket Forces, into a nuclear weapons storage space for ICBM warheads at F. E. Warren Air Force Base (AFB), Wyoming. In response, when General Habiger was in Russia in October 1997, General Sergeyev took him to a nuclear weapons storage facility at the Kostroma ICBM base. These visits were historic. They were the first time either side had had a chance to visit an operational nuclear weapons storage facility of the other side.

In March 1998, General Habiger took his initiative several steps further when the new chief of the Strategic Rocket Forces, General Vladimir Yakovlev visited the United States. General Yakovlev was taken to the weapons storage area at F.E. Warren AFB and the weapons storage area near the Trident strategic nuclear submarine base at Bangor, Washington. Accompanying General Yakovlev was General Mikhail Oparin, commander of the Russian bomber forces. General Oparin was showed how bomber nuclear weapons were guarded at the B-2 bomber base at Whiteman AFB, Missouri. He was also taken to Kirtland AFB, New Mexico, where there is a storage area for tactical nuclear weapons.

On General Habiger's return trip to Russia in June 1998, he and member's of his delegation, visited a national-level nuclear weapons storage site at Krasnoarmeyskoye near Saratov; the Engels bomber base's nuclear weapons storage site, also near Saratov; the nuclear weapons storage facility at the Irkutsk ICBM base; and a naval nuclear weapons storage facility near Severomorsk near Murmansk.<sup>85</sup>

These exchanges provided some reassurance to U.S. military officers about the status of Russian nuclear weapons storages. However, these visits should be encouraged and expanded. A program of exchanges should be developed in the next several years, with the goal of opening all U.S. military-controlled nuclear weapons storages and similar Russian storages to at least informal inspections by each sides' military officers on a regular basis. These visits should be accompanied by discussions of nuclear weapons safety, security and accounting by military officers and specialists involved in these problems. Such visits would be an important confidence building measure, and could lead to formal inspections and exchanges of information, which would show whether warheads could be removed from launchers under START II and future arms control agreements without decreasing the safety or security of Russian warheads.

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<sup>85</sup> General Eugene Habiger, Commander in Chief, U.S. Strategic Command, "Interview with Defense Writer's Group," Washington, D.C., 31 March 1998; General Eugene Habiger, "Department of Defense News Briefing," 16 June 1998.

## Appendix A: Dates and Pace of Warhead Withdrawals and Reductions

The political upheavals in Eastern Europe and the Soviet Union during 1989-1991 created concerns about the security and safety of Soviet nuclear warheads. The August 1991 coup attempt led to a major U.S. initiative to address this concern. On 27 September 1991, President George Bush announced a series of unilateral initiatives for de-alerting, consolidating, and eliminating some U.S. nuclear weapons with the expectation that President Mikhail Gorbachev would follow-suit.<sup>86</sup> On 5 October 1991, President Gorbachev announced his own set of initiatives, which paralleled President Bush's proposals.<sup>87</sup>

Gorbachev's response was part of a series of events that led to the entire Soviet nuclear stockpile being consolidated in Russia, with a large fraction in storage. Due to Gorbachev's announcement, thousands of tactical warheads were taken from front-line storages or off deployment and removed to central storages. These steps came on top of the withdrawal of several thousand Soviet tactical nuclear weapons from Eastern Europe and most former Soviet Republics to Russia during 1989-1991.<sup>88</sup> The break-up of the Soviet Union led to several thousand more tactical and then strategic warheads being transferred from Ukraine, Kazakhstan, and Belarus into Russia. Finally, the START I treaty and aging strategic systems have led to over 1,800 strategic nuclear warheads being taken off launchers

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<sup>86</sup> President George Bush, "Address to the Nation: New Initiatives to Reduce U.S. Nuclear Forces," *U.S. Department of State Dispatch*, 30 September 1991, Vol. 2, No. 39.

For accounts of the genesis of President Bush's 27 September proposals in the aftermath of the August coup attempt see: John E. Yang, "Bush Plan Emerged After Failed Coup: White House Wanted to Take Advantage of Timing, Officials Say," *The Washington Post*, 28 September 1991; Andrew Rosenthal, "Bush's Arms Plan: Arms Plan Germinated in Back-Porch Session," *The New York Times*, 29 September 1991; Doyle McManus, "Bush Acted to Help Gorbachev Control A-Arms," *The Los Angeles Times*, 29 September 1991; Michael Beschloss and Strobe Talbott, *At the Highest Levels: The Inside Story of the End of the Cold War*, (Boston: Little Brown and Co., 1993), pp. 445-446; Colin L. Powell, *My American Journey*, (New York: Ballantine Books, 1995), pp. 526-527; James A. Baker III, *The Politics of Diplomacy: Revolution, War and Peace, 1989-92*, (New York: G.P. Putnam's and Sons, 1995), p. 526; George Bush and Brent Scowcroft, *A World Transformed*, (New York: Knopf, 1998), pp. 536-547.

<sup>87</sup> Text of statement by M.S. Gorbachev, "Gorbachev Proposals on Nuclear Arms Control," *Central Television, First All Union Programme* 2040 gmt 5 October 1991, (BBC Summary of World Broadcasts, 7 October 1991).

For Gorbachev's initial favorable but reserved reaction see: A.S. Grachev's interview with President Gorbachev, "Gorbachev-Bush Proposals 'A Serious Advance Towards a Nonnuclear World'," *Central Television, First All Union Programme*, 28 September 1991, (BBC Summary of World Broadcasts, 30 September 1991). For some background on Gorbachev's reaction, see Gorbachev translator Pavel Palazchenko's description of the initial response of Gorbachev and his advisors; Pavel Palazchenko, *My Years with Gorbachev and Shevardnadze: The Memoir of a Soviet Interpreter*, (University Park, PA: The Pennsylvania State University Press, 1997), pp. 329-330.

<sup>88</sup> The U.S. government was not unaware of these steps. CIA Director Robert Gates told Congress in January 1992, that the Russians were: "engaged in a major effort in consolidating the storage of these tactical nuclear weapons. They have, for several years [emphasis added], been consolidating these weapons and withdrawing them into fewer and fewer areas of the Soviet Union, and now they are working to bring all of them back into Russia where they can be controlled prior to their dismantlement;" Robert Gates, DCI, testimony before SGAC hearing on "Weapons Proliferation in the New World Order," 15 January 1992, S. Hrg. 102-720, p. 18.

in Russia. This section details the timing and pace of these withdrawals, in so far they can be determined, to understand when groups of warheads would have been moved into storages in Russia.

## 1. Eastern Europe

Possibly several thousand Soviet nuclear weapons were kept at approximately two dozen storage sites in Eastern Europe in the mid- to late 1980s.<sup>89</sup> The removal of these weapons from Eastern Europe spanned at some four years -- 1987-1991 -- and was completed by the end of July 1991, several months before the Soviet Union dissolved in December 1991. In 1986-1990, reductions in nuclear weapons in Eastern Europe were anticipated, planned, and implemented as a result of the change to a defensive military strategy, Soviet arms control initiatives, aging weapons systems, and political developments.

The Soviet Union's adoption of the new defensive military doctrine and concept of "reasonable sufficiency" occurred during 1986-1987. It paved the way for new Soviet arms-control proposals, unilateral reductions in conventional and nuclear forces in Eastern Europe, and the INF Treaty (signed on 7 December 1987).<sup>90</sup> During 1988-1989, Eastern European

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<sup>89</sup> E.g., in 1979, the CIA had estimated there were 23 Soviet nuclear weapons storage sites in Eastern Europe, which could store 2,070 to 3,970 tactical nuclear bombs and FROG and SCUD missile warheads; CIA, *Warsaw Pact Forces Opposite NATO*, NIE 11-14-79, (Top Secret; partially declassified), 31 January 1979, p. 45. See Appendix C for discussion of Soviet/Russian nuclear weapons storages. Declassified NIEs are kept at the National Archives in Record Group 263.

<sup>90</sup> For the discussion of the adoption of a new defensive doctrine see: Robert Norris, et al, "Nuclear Weapons," in *SIPRI Yearbook 1989*, pp. 24-26. The adoption of this doctrine implied that nuclear weapons in Eastern Europe that were for offensive operations could be withdrawn. For an interesting recent Russian analysis of the mid-1980s Soviet move towards a more defensive military doctrine in the context of the debate over offense vs. defense in Soviet military thinking, see: Andrei Kokoshin, *Soviet Strategic Thought 1917-91*, (Cambridge, MA: The MIT Press, 1998), pp. 184-192.

The Chernobyl accident also affected the Soviet military's thinking about the desirability of keeping nuclear weapons in Eastern Europe. Former U.S. ambassador to Moscow Jack Matlock recounts: Mathias Rust's antic of landing his plane in Red Square in May 1987 gave President Gorbachev the opportunity to appoint a new defense minister, General Dmitri Yazov. Yazov told western visitors that the Chernobyl incident had had a profound influence on his thinking about nuclear war. Prior to April 1986, he had thought a nuclear war could be fought and won. Chernobyl, however, had demonstrated the impossibility of this. The accident showed to him that a nation could be ruined even by a conventional attack on nuclear power plants; Jack Matlock, *Autopsy on an Empire: The American Ambassador's Account of the Collapse of the Soviet Union*, (New York: Random House, 1995), pp. 136-137.

Garthoff relates that the Chernobyl accident overall had a major, "impact on Soviet politico-military thinking," adding support to Gorbachev's nuclear arms control efforts; Raymond Garthoff, *Deterrence and the Revolution in Soviet Military Doctrine*, (Washington, DC: Brookings, 1990), p. 129.

For a discussion of some of the reductions in Soviet non-strategic forces and the removal of older FROG and Scud missiles in Eastern Europe see: Robert Norris, et al, "Nuclear Weapons," in *SIPRI Yearbook*

countries took steps towards political independence and President Gorbachev continued his arms-control offensive, announcing unilateral reductions in nuclear and conventional forces in Europe, and making proposals for removing all U.S. and Soviet nuclear weapons from the region.<sup>91</sup>

After the fall of the Berlin wall in November 1989, all Eastern European countries where Soviet nuclear weapons were deployed moved to negotiate the removal of Soviet troops. On 26 February 1990, the Soviet Union and Czechoslovakia agreed that Soviet troops would begin to depart immediately and would finish withdrawing by July 1991. On 11 March 1990, Soviet troops began to leave Hungary with the understanding all would depart by July 1991. On 24 September 1990, East Germany withdrew from the Warsaw Pact.<sup>92</sup> There were Polish-Russian talks on withdrawal of Soviet forces on 25 February 1991 and the Soviet Union began withdrawing troops from Poland on 9 April 1991. By 6 June 1991, Soviet troops were completely out of Czechoslovakia and by 19 June 1991, Soviet troops were completely out of Hungary. On 1 July 1991, the Warsaw Pact disbanded.<sup>93</sup>

Nuclear weapons were not the last pieces of Soviet military equipment to be withdrawn from the Eastern European countries. Some tactical nuclear weapons had been returned to Russia by the end of 1989 and all were back in the Soviet Union by the summer

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1990, pp. 29-31.

<sup>91</sup> E.g. on 27 February 1988, 30 SS-12 medium-range nuclear missiles were removed from bases at Waren and Bischofswerda, East Germany.

On 7 December 1988, President Gorbachev announced plans at the United Nations to reduce Soviet forces by 500,000 men, and forces in eastern Soviet Union and Eastern Europe by 10,000 tanks, 8,500 artillery pieces and 800 combat aircraft.

On 11 February 1989, the Hungarian Party Central Committee approved the formation of independent political parties.

On 11 May 1989, Gorbachev announced the Soviet Union would unilaterally reduce nuclear forces in Eastern Europe by 500 warheads (166 aviation systems, 50 artillery and 284 missiles), and he announced further conventional reductions.

On 4 July 1989, Gorbachev offered, while visiting Paris, to remove all short-range nuclear weapons from Eastern Europe if the United States did the same with its weapons in NATO;

In August 1989, Poland appointed a non-Communist Prime Minister. In October 1989, Hungary abandoned the leading role of the Communist Party; Chronology 1988, *Foreign Affairs*, Vol. 68, No. 1, pp. 232-232; Chronology 1989, *Foreign Affairs*, Vol. 69, No. 1, pp. 219-231; Carol Giacomo, "U.S. Official Says Soviets Plan to Cut 500 Nuclear Missiles, *Reuters*, 11 May 1989; David Fouquet, "East and West Move Closer on Arms Talks," *Jane's Defence Weekly*, 2 May 1989, p. 908.

For an overview of Soviet arms control initiatives and reductions see: Robert Norris, et al, "Nuclear Weapons," in *SIPRI Yearbook 1989*, pp. 24-26; Robert Norris, et al, "Nuclear Weapons," in *SIPRI Yearbook 1990*, pp. 29-36.

<sup>92</sup> Chronology 1990, *Foreign Affairs*, Vol. 70, No. 1, pp. 214 and 225.

<sup>93</sup> Chronology 1991, *Foreign Affairs*, Vol. 71, No. 1, pp. 206-207.

of 1991.<sup>94</sup> The last nuclear weapons were withdrawn from Czechoslovakia in March

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<sup>94</sup> The 500 weapons scheduled for withdrawal per Gorbachev's unilateral May 1989 announcement were returned to the Soviet Union by 20 December 1989; Interview with Marshal of the Soviet Union D.T. Yazov, Soviet Minister of Defence, "Interview before the 28th CPSU Congress - responsibility for the homeland's fate," *Pravda*, 27 June 1990, (BBC Summary of World Broadcasts, 2 July 1990).

In June 1990, in a speech at CSCE human rights conference in Copenhagen, Soviet Foreign Minister Shevardnadze announced that the Soviet Union would withdraw 60 tactical missile launchers, more than 250 nuclear artillery pieces, and 1,500 nuclear warheads from Central Europe. By the end of the year, reductions would total 140 launchers and 3,200 nuclear artillery pieces; "Soviet Arms Reductions in Central Europe Announced," BBC Summary of World Broadcasts, 7 June 1990; Carol Giacomo, "Soviet Union Surprises United States with Arms Cut Pledge," *Reuters*, 5 June 1990.

Soviet Foreign Ministry spokesperson Gennady Gerasimov elaborated that 60 tactical missiles launchers (short range missiles not covered by the INF treaty, Scud Bs, SS-21s, and FROGs) located in East Germany, Czechoslovakia, Hungary and Poland would be removed by the end of the year. Also, more than 250 nuclear-capable artillery units and 1,500 nuclear warheads, including the warheads of the missiles being cut, nuclear artillery shells and nuclear bombs, would be withdrawn. He said, moreover, "The Soviet Union does not restrict the unilateral reductions area in Central Europe. By the end of this year the Soviet Union will reduce in the area of Europe a total of 140 tactical missile launchers and 3,200 artillery pieces capable of firing nuclear shells," 13th June Briefing by Gennady Gerasimov, Chief of the Russian Foreign Ministry's Information Directorate, Official Kremlin International News Broadcast, 14 June 1990 (Federal News Service); Soviet Foreign Ministry Briefing on 13th June, *TASS*, 13 June 1990, (BBC Summary of World Broadcasts, 15 June 1990).

In October 1990, during a visit to Washington, DC, Chief of the Soviet General Staff General Mikhail Moiseyev repeated that these reductions would occur by the end of 1990; Stanislav Lunev and Oleg Moskovsky, "Chief of the Soviet General Staff General Mikhail Moiseyev on Monday Began His Official Visit to the United States," *TASS*, 1 October 1990.

Later in October, Moiseyev told the press that some short-range nuclear arms had already been withdrawn from East Germany and Czechoslovakia; Nicholas Doughty, "Soviet Commander Warns Rebel Republics on Defence," *Reuters*, 26 October 1990.

**Bulgaria:** There seemingly was some infrastructure for the storage of nuclear weapons, but whether and when nuclear weapons were deployed in Bulgaria remains unclear. Unofficial sources claim there were nuclear weapons in Bulgaria, which were removed by the late 1980s, but official information to this effect seems to be lacking.

Rabinovich claims in 1977 missile bases (RTB) were set up in Bulgaria near the Turkish border, which contained no missiles, only nuclear warheads for Scud and FROG-5 missiles. He estimated 146 nuclear warheads were in Bulgaria. He claimed a RTB was still operational as of 1989; Moysey Rabinovich, "Soviet Conventional Arms Transfers to the Third World: Main Missile and Artillery Directorate (1966-1990)," Global Consultants, Inc., Alexandria, VA, 1993, pp. 44-45.

In addition, the CIA estimated in 1979, that there were three nuclear warhead storage sites in Bulgaria (see Map 5 in Appendix F); CIA, *Warsaw Pact Forces Opposite NATO*, NIE 11-14-79, (Top Secret; partially declassified), 31 January 1979, pp. 45-46.

Finally, *Komsomolskaya Pravda* reported in 1996, that there were three 12th Main Directorate controlled nuclear weapons storages in Bulgaria. They were emptied and closed in 1988. According to a purported officer who had served at one of the bases, about 70 nuclear warheads were kept underground at the storage; Yelena Ardabatskaya, "The USSR Could Have Delivered a Nuclear Strike Against the West From Sofia...; 'Sensational' disclosures of a retired Soviet Army captain who served at a 'top-secret' base close to the Bulgarian capital," *Komsomolskaya Pravda*, 11 September 1996, (FBIS-SOV-96-209-S, 11 September 1996).

1990;<sup>95</sup> from Poland in the first half of 1990;<sup>96</sup> and from Hungary in the summer of 1990.<sup>97</sup> The last Soviet nuclear weapons were removed from East Germany a year later during June-July 1991, completing the denuclearization of Eastern Europe.<sup>98</sup>

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In a follow-up story, *Komsomolskaya Pravda* wrote that in retaliation for the 1979 NATO "dual-track" decision to proceed with the deployment of U.S. nuclear missiles in Europe, the Soviet Union deployed nuclear artillery shells, and seemingly short-range nuclear missiles, to Bulgaria. *Komsomolskaya Pravda* was skeptical of official Bulgarian denials that nuclear weapons had not been deployed in Bulgaria; Olesya Nosova, "Returning to a Previous Article: Nuclear Missiles Could Have Flown Up Over Bulgaria," *Komsomolskaya Pravda*, 23 October 1996, (FBIS-UMA-96-235-S, 23 October 1996).

In March-April 1990, there was a scandal over the revelation that Bulgaria had 72 operational-tactical missiles, including eight SS-23 Scaleboards which it purchased from the Soviet Union in 1986. However, the Soviet Foreign Ministry said that there was and never had been a plan to deploy nuclear weapons on the missiles; Robert Toth, "Soviet Also Sent Banned Missiles to Bulgaria; Arms Control: The Move, Revealed in a Note to the White House, Calls Moscow's 'Good Faith' into Question," *Los Angeles Times*, 27 March 1990; Bulgarian Telegraph Agency, "Soviet Spokesman Denies Presence of Nuclear Weapons in Bulgaria," 30 March 1990, (BBC Summary of World Broadcasts, 6 April 1990).

<sup>95</sup> Soviet Foreign Ministry spokesman Yuri Gremitskikh announced this at a briefing; Sergei Postanogov, Sergei Nikisov, and Sergei Ryabikin, "On Nuclear Ammo Withdrawal from CSFR," *TASS*, 18 April 1991, (FBIS-SOV-91-076, 19 April 1991, pp. 2-3).

<sup>96</sup> General Victor Dubinin commander of the Soviet troops in Poland said warheads were removed in the first half of 1990; "Soviets Quit Poland by 1993," *Jane's Defence Weekly*, 2 April 1991, p. 631; Patricia Clough, "Red Army Starts to Leave Poland in Its Own Time," *The Independent* (London), 10 April 1991.

One press report said bunkers were near Pniewo, a few kilometers from Borne-Sulinowo; "Dubinin Confirms Nuclear Weapons Withdrawn," *Warsaw Domestic Service*, 9 April 1991, (JPRS-TND-91-006, 23 April 1991, p. 12).

<sup>97</sup> There was a flap in the Hungarian press in 1991 about Soviet nuclear weapons deployments in Hungary. The Soviet Ministry of Defense and a retired Hungarian general, billed as a former commander of the Hungarian missile unit, said the nuclear weapons had been removed in the summer of 1990; "Soviet Spokesman Confirms Past Presence," *Budapest Domestic Radio Service*, 24 April 1991, (JPRS-TND-91-007, 20 May 1991, p. 15); Peter Vajda, Fifteen Years with Missiles, "Nepszabadsag" (Budapest), 23 April 1991, (JPRS-TND-91-007-15, 20 May 1991, p. 15); "USSR Nuclear Weapons Formerly Stored in Country: Antall, Nemeth Statements," *Budapest MTI*, 23 April 1991, (JPRS-TND-91-007, 20 May 1991, p. 14).

The latter reports say the last weapon was removed on 30 June 1990, the date of the withdrawal of the Soviet missiles. Nuclear-capable missile units were stationed near the villages of Dombovar and Baj in western Hungary, and warheads were presumably kept at the separate but associated front-line storage nearby. Nuclear weapons were also seemingly deployed in the Bakony Hills, near Nagyvazsony, in western Hungary. Also weapons could have been associated with the Soviet military airfield in Debrecen.

<sup>98</sup> Seemingly, the last weapons were withdrawn from East Germany between 13 June and 31 July 1991.

On 13 June 1991, Soviet Foreign Minister Alexander Bessmertnykh said there were still Soviet nuclear weapons at bases in East Germany; Tom Heneghan, "Moscow Admits it Still Has Nuclear Arms in Eastern Germany," *Reuters*, 13 June 1991.

While on 31 August 1991, Soviet Defense Minister Yevgeny Shaposhnikov announced that all Soviet nuclear weapons had been withdrawn from eastern Germany; Reuters, "Moscow Says it Has Removed Nuclear Arms from Germany," *The New York Times*, 1 September 1991.

German Social Democratic Party chairman Bjoern Engholm said after meeting Soviet military commander General Matvei Burlakov in October 1991 that "The Western Group had [nuclear] missiles until the

## 2. The Soviet Republics

As in Eastern Europe, political events in the Soviet Republics in 1988-1990, gave the Soviet military reasons to withdraw nuclear weapons from the Baltic, Transcaucasian and Central Asian republics. A key incident that caught western attention was the supposed attack on a nuclear weapons storage site south of Baku, Azerbaijan, by Moslem fundamentalist separatists during an outbreak of ethnic fighting in mid-January 1990.<sup>99</sup> Indeed, the western press reported numerous times in 1990 that Moscow's worry over political unrest and moves towards independence in several republics led Moscow to the withdrawal of nuclear weapons

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end of 1990 but those under central command were stationed in Germany until June 1991;"Soviet Army Had Nuclear Weapons in Germany Until June," *Reuters*, 1 October 1991.

Also note: On 3 July 1991, *Bild* reported that the Soviet Union had accelerated the removal of some 300 nuclear warheads still stored in Eastern Germany; Lothar Loewe, "Soviet Still Have 300 Nuclear Weapons in Our Country," *Bild* (Hamburg), 3 July 1991, (JPRS-TND-91-011, 24 July 1991, p. 32).

On 13 July 1991, ADN reported 12 more missiles with nuclear warheads were withdrawn, *ADN* (Berlin), "12 Nuclear Missiles Withdrawn from Germany," 13 July 1991, (JPRS-TND-91-012, 8 August 1991, p. 26).

General Yakovlev reported that from 1990 to 1991, all tactical nuclear weapons were removed from the former Warsaw Treaty Pact countries. "The last train loaded by tactical warheads left the Federal Republic of Germany during the summer of 1991;" General Vitalii Yakovlev, "Realization of Reduction and Limitation Programs for Nuclear Weapons and the Opportunity of an Information Exchange on Amount of Produced Fissile Materials and Their Localization," Talk prepared for the U.S.-Russian Workshop on CTB, Fissile Material Cutoff and Plutonium Disposal," 15-17 December 1993, Washington, DC, Natural Resources Defense Council, Federation of American Scientists, Moscow Physical-Technical Institute.

<sup>99</sup> On 13 January anti-Armenian riots broke out in Azerbaijan and on 15 January President Gorbachev approved the deployment of 11,000 troops to restore order. On 20 January, Soviet troops entered Baku and some 50 people were killed; Chronology 1990, *Foreign Affairs*, Vol. 70, No. 1, p. 213.

In February 1990, CIA Director William Webster told *The Washington Times* that additional Soviet troops were sent to the area during the fighting between Azerbaijanis and Armenians to protect the storage site. One unnamed U.S. intelligence official told the newspaper that "Armed dissidents almost captured a nuclear weapon." Their attack was repulsed by Soviet troops; Bill Gertz, "Soviet arms safe from civil strife, CIA director says," *The Washington Times*, 14 February 1990; Bill Gertz, "Soviet rebels storm an A-bomb facility," *The Washington Times*, 19 February 1990.

However, in March 1990, Yevgeny Velikhov, vice president of the Soviet Academy of Sciences, was interviewed about the Baku situation. He said, "the capture of nuclear ammo was in fact impossible," that as far as he knew, "during the recent riots in Baku the extremists didn't make any attempt to capture such projects," and that, "they are all securely guarded." Yet he did note that he thought "the existence of these strategic objects in the Baku area was part of the reason it was decided to send the troops there;" Alexander Makhov, "USA -- The Baku Syndrome," *Moscow News*, 11-18 March 1990. (Velikhov's comments were paraphrased widely in subsequent reporting on the security of Russian storages sites.)

Thus, whether the attackers posed a threat to any nuclear weapons in the area remains a question. It is unclear whether they attacked a nuclear weapons storage or one of the other military facilities in the area. Or, if the correct facility was attacked, perhaps the nuclear weapons in the storage facility had been removed prior to January 1990.

from these republics.<sup>100</sup>

Moscow denied all these reports.<sup>101</sup> Yet, Russian tactical nuclear forces were being redeployed or withdrawn. The early removal of some nuclear weapons from the Baltic area was hinted at in an October 1989 speech in Finland by President Gorbachev, who announced that, "Our tactical nuclear weapons are now deployed in such a way that they cannot reach

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<sup>100</sup> Bill Gertz, "Soviet rebels storm an A-bomb facility," *The Washington Times*, 19 February 1990; Randall Mikkelsen, "Soviet Union Removes Nuclear Weapons From Baltic Republics," *Reuters*, 21 May 1990; John J. Fialka, "Internal Threat: Soviets Begin Moving Nuclear Warheads Out of Volatile Republics," *The Wall Street Journal*, 22 June 1990; R. Jeffrey Smith, "Soviets Remove Some Nuclear Arms From Areas Marked by Ethnic Strife," *The Washington Post*, 23 June 1990; Michael Wines, "Evolution in Europe; Soviets Are Said to Pull Nuclear Arms From Some Restive," *The New York Times*, 23 June 1990; Reuters, "Kremlin Said to Give Assurances on Nuclear Arms Safety," 23 June 1990; Michael Dobbs, reporting on an interview with General Mikhail Moiseyev, Chief of the Soviet General Staff, "Soviet Says Warheads Moved From Ethnic Sore Spots," *The Washington Post*, 28 September 1990.

These reports continued into 1991; Bill Gertz, "Status of Soviet weapons concerns CIA director," *The Washington Times*, 31 May 1991; George Lardner, "Soviets Are Concerned About Security Of Their Nuclear Arms, Webster Says; In Face of Unrest, Officials Reportedly Tighten Control Over Missiles," *The Washington Post*, 31 May 1991.

Also in 1991: "Yet it does appear that the Ministry of Defense was still not satisfied with the security of many tactical nuclear storage sites in 'troublesome' republics. Consequently, a large number of these facilities were emptied and their weapons were consolidated in Russian storage facilities," Dr. Stephen Meyer, statement before the Senate Foreign Relations Committee (SFRC), Subcommittee on European Affairs, Hearings on "The Soviet Crisis and the U.S. Interest: Future of the Soviet Military and Future of the Soviet Economy," 6 June 1991, S. Hrg. 102-283, pp. 37-38.

Questions about the security of the Soviet nuclear arsenal, however, had been raised before 1990. E.g. see: Robert C. Toth, "U.S. Worried by Nuclear Security in Unstable Soviet Empire," *The Los Angeles Times*, 15 December 1989.

Also, *The Washington Post* reported that, according to western diplomats, the United States began to express quiet concerns to Moscow about the safety of Soviet nuclear weapons due to worries about poor construction practices in the aftermath of the major earthquake in Armenia in December 1988; Michael Dobbs, "Soviet Says Warheads Moved From Ethnic Sore Spots," *The Washington Post*, 28 September 1990.

For other overviews of possible withdrawals see: George Lewis, "The Future of U.S. Nonstrategic Weapons," Chapter 4 in Michele Flournoy, ed., *Nuclear Weapons After the Cold War: Guidelines for U.S. Policy*, (New York: HarperCollins, 1993), pp. 110-113; David Morrison, "Loose Soviet Nukes: A Mountain or Molehill?" *Arms Control Today*, April 1991, pp. 15-19; Bruce Blair, *The Logic of Accidental Nuclear War*, (Washington, DC: Brookings, 1993), pp. 101-106.

<sup>101</sup> "Soviets Deny Arms Shift," *The Washington Post*, 27 June 1990; Reuters, "Moscow Denies It Is Moving Nuclear Arms From Regions," *The New York Times*, 27 June 1990; Soviet Ministry Denies Missiles Moved From Trouble Spots," *Reuters*, 3 October 1990; "Defence Ministry Denies Withdrawing Nukes to Russia," *ITAR-TASS*, 3 October 1990, which is based on a Defence Ministry statement in *Krasnaya Zvezda* denying a report on the Soviet television program *Vremya* which quoted foreign news reports as saying nuclear weapons had been moved out of ethnic trouble spots.

the countries of Northern Europe from any point on Soviet territory."<sup>102</sup> Other withdrawals were subsequently confirmed by later statements. In 1992, Russian military officials reported that all nuclear weapons were moved out the Transcaucasian Military District, which included Georgia, Armenia, Azerbaijan before the summer of 1990.<sup>103</sup> Also, Russian military

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<sup>102</sup> "Speech by M. S. Gorbachev," in *Pravda and Izvestia*, 27 October 1989, excerpts in *Current Digest of the Soviet Press*, 22 November 1989.

Also: Foreign Ministry spokesman Gennady Gerasimov quoting the remarks made by Army General Mikhail Moiseyev, Chief of the General Staff, during his recent visit to a military airfield in Kuopio (Finland) said the "The USSR's nuclear ammunition has been removed from border areas and is now unable to reach the territory of Finland;" Foreign Ministry Briefing on 16th February," *TASS*, 16 February 1990, (BBC Summary of World Broadcasts, 22 February 1990).

On this and the possible denuclearization of the Baltic Fleet and possibly the Black Sea fleet in the 1989-1990 timeframe see: William M. Arkin, Joshua Handler, and Hans Kristensen, "Soviets Disarm Mysteriously," *Bulletin of the Atomic Scientists*, May 1990, pp. 7 and 54.

<sup>103</sup> *Krasnaya Zvezda*: One other question on weapons. Vice-President Alexander Rutskoy recently stated that nuclear weapons were still present on Transcaucasian territory, contrary to all previous assurances. How do you assess this?

Gen. Samsonov: That statement by the vice-president was a clear mistake [Russian *zabluzhdeniye*]. All nuclear weapons were withdrawn from Transcaucasian territory back when I was chief of the Transcaucasus Military District - that is, before summer 1990.

*ITAR-TASS*: Can you say that with total confidence? After all, a statement from the Russian vice-president does mean something -

Gen. Samsonov: Yes I can. When the statement was made, I checked things out again -- who knew what might have happened! -- Just to see if anything had been left behind anywhere. No, nothing was left behind anywhere. Maybe he was talking about dual-based launch vehicles, but the vice-president is a military man - he should not make mistakes about such things; Text of Capt O. Odnokolenko's account of interview with Col. General Victor Samsonov, the Chief of the General Staff of the CIS Joint Armed Forces, by *ITAR-TASS*, *Izvestia* and *Krasnaya Zvezda*, "Everyone suffers from legal vagueness, but the army in particular," *Krasnaya Zvezda* 18 March 1992, (BBC Summary of World Broadcasts, 20 March 1992).

Lt. General Vladimir Korotkov, deputy chief of the Main Department of the Commonwealth Joint Armed Forces, said all nuclear weapons were removed from the Transcaucasian republics in the summer of 1990; "General: No Nuclear Arms in Caucasus," *Interfax*, 12 March 1992, (JPRS-TND-92-007, 20 March 1992, p. 23); T. Elaine Carey, "Ukraine reneges on nuclear disarmament deal Republic halts return of weapons to Russia," *The Atlanta Journal and Constitution*, 13 March 1992.

He added in another news report that in fact weapons began to be removed from the Caucasus due to seismic concerns. The Russian military "feared a repetition of the earthquake there e.g., [a major earthquake struck Armenia on 7 December 1988];" Interview with Lt. General Vladimir Korotkov, "Defense Official Explains Nuclear Safeguards," *Moscow Radio World Service*, 6 January 1992, (JPRS-TND-92-002, 31 January 1992, p. 39).

Interestingly, *The Washington Post* reported in 1990 that, according to western diplomats, the United States began to express quiet concerns to Moscow about the safety of Soviet nuclear weapons due to worries about poor construction practices in the aftermath of the earthquake; Michael Dobbs, "Soviet Says Warheads Moved From Ethnic Sore Spots," *The Washington Post*, 28 September 1990.

Lt. General Sergei Zelentsov said that nuclear weapons had been withdrawn from the Transcaucasian region long before the beginnings of ethnic strife in the area because the Russian military had advance

officials claimed all nuclear weapons had been removed from the Central Asian republics by the end of 1991.<sup>104</sup> According to Russian Ministry of Defense officials, all remaining tactical nuclear weapons were removed from other CIS states in 1991. By the end of 1991, according to Lt. General Sergei Zelentsov of the MOD's 12th Main Directorate, only Russia, Ukraine and Belarus had tactical nuclear weapons on their territories.<sup>105</sup>

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information about possibility of widespread violence in the area; Interview with Lt. General Sergei Zelentsov, *Moscow Radio Moscow World Service*, 13 March 1992, (JPRS-TND-92-009, 3 April 1992, p. 16).

Also: In fall 1990, the Commander of the Transcaucasus Military District, Col. General. V. Patrikeyev, denied there were any nuclear or chemical weapons in the Transcaucasus Military District; Reprint of letter from Col. General. V. Patrikeyev to the Tbilisi *Zarya Vostoka* publication, in *Izvestia*, 3 October 1990, (FBIS-SOV-90-194, 5 October 1990, p. 81).

<sup>104</sup> Also note: in December 1991, Kirgizstan President Askar Akayev reportedly told visiting Secretary of State James Baker that Kirgizstan did not and never had had any nuclear weapons deployed on its territory; Alexander Mirtov, "Akayev Comments on Nuclear Weapons," *Moscow All-Union Radio First Program Radio-1 Network*, 17 December 1991, (FBIS-SOV-91-243, 18 December 1991, p. 73).

<sup>105</sup> Replying to a question about a March 1992 western news report that some nuclear weapons from Kazakhstan had been "taken abroad," General Zelentsov said there were "no tactical nuclear weapons in the Central Asian republics or in Kazakhstan. The last warhead had been withdrawn from their territories last year;" Victor Litovkin, "Generals in Moscow Categorically Deny Sales of Nuclear Weapons," *Izvestia*, 17 March 1992, (FBIS-SOV-92-095, 17 March 1992, p. 4). See also: "Zelentsov Assures No Warheads Sent to Iran," *Moscow Radio World Service*, 17 March 1992 and Vladimir Desyatov and Pavel Felgengauer, "Missiles are in Place, Only a Canard has Flown Away," *Nezavisimaya Gazeta*, 18 March 1992, (FBIS-SOV-92-054, 19 March 1992, pp. 3-5).

He later noted that, "The process of the transfer of tactical nuclear weapons from other CIS states began as early as last year [1991]. Gradually their numbers were reduced and they were evacuated first from the states which are the farthest from Russia. Their number has gradually decreased as they were withdrawn first from the countries that are geographically most distant from Russia, and then from the countries that are closer to it;" "Press Conference on Withdrawal of Tactical Nuclear Weapons from the Ukraine by Members of CIS and Ukraine Military," Official Kremlin International News Broadcast, 6 May 1992, (Federal News Service). Taking part were Air Force Lt. General Sergei Zelentsov, deputy chief of the Main Directorate of the CIS Joint Armed Forces and Maj. General Vitaly Yakovlev, Deputy Chief of Staff of the CIS Joint Armed Forces.

See also: Lt. General James Clapper, USAF, Director, Defense Intelligence Agency (DIA), testimony before U.S. Senate Armed Services Committee (SASC) hearing on "Threat Assessment, Military Strategy, and Defense Planning," 22 January 1992, S. Hrg. 102-755, pp. 24 and 32.

Note: General Gely Batenin, an advisor to the Russian Foreign Ministry, told the Radio Free Europe/Radio Liberty on 11 December 1991 that all tactical nuclear weapons had been removed from the Baltic States, Transcaucasia, and Central Asia; Alexander Rahr, "Batenin on Nuclear Weapons," *RFE/RL*, No. 236, 13 December 1991.

However, he was also quoted in December 1991, saying that all the tactical nuclear weapons in Kazakhstan would be gone by 1992; Daniel Sneider, "Security Issues on Agenda For Commonwealth Talks," *The Christian Science Monitor*, 24 December 1991.

Finally: Reiss claims tactical nuclear weapons were removed from Kazakhstan by the end of January 1992; Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), p. 143.

The seemingly contradictory nature of the last two stories perhaps is due to 1) confusing the withdrawn

### 3. Ukraine, Kazakhstan and Belarus<sup>106</sup>

#### a. Tactical Weapons

As noted, by the end of 1991, tactical nuclear weapons remained outside of Russia only in Ukraine and Belarus. On 21 December 1991, Russia, Ukraine, Kazakhstan, and Belarus agreed in Alma-Ata, Kazakhstan, that:

By July 1, 1992 Byelorussia, Kazakhstan and Ukraine will insure the withdrawal of tactical nuclear weapons to central factory premises for dismantling under joint supervision.<sup>107</sup>

In January 1992, the movement of tactical nuclear weapons to Russia under the auspices of the agreement commenced.<sup>108</sup> On 24 January, Ukrainian President Leonid

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tactical nuclear weapons with the strategic nuclear weapons which were kept in Kazakhstan after December 1991 and/or 2) some reports that said at least some of the strategic air-launched nuclear weapons in Kazakhstan were removed by the end of January 1992.

In regards to other Central Asian republics: Turkmen President Saparmurad Niyazov told then-Secretary of State James Baker during the latter's 12 February 1992 visit to Turkmenistan that Turkmenistan had, "three sets of tactical nuclear weapons from the former Soviet Army." Baker recounts the United States knew about the existence of the tactical nuclear weapons, but that the CIA and DOD had learned that, "Moscow had disarmed and deactivated the weapons -- but hadn't told the Turkmen;" James A. Baker III, *The Politics of Diplomacy: Revolution, War and Peace, 1989-92*, (New York: G.P. Putnam's and Sons, 1995), p. 630.

<sup>106</sup> For a good overview of the politics and the removal of tactical and strategic weapons from Ukraine, Kazakhstan, and Belarus see: Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), "Chapter 4, The Former Soviet Union: Managing the Nuclear Inheritance," pp. 89-182.

<sup>107</sup> Article 6 of "Agreement on Joint Measures with Regard to Nuclear Weapons," signed by Belarus, Kazakhstan, Russia and Ukraine; "Alma-Ata Press Conference," *Central Television, First All Union Programme* 21 December 1991, (BBC Summary of World Broadcasts, 23 December 1991); "Text of Accords by Former Soviet Republics Setting Up a Commonwealth," *The New York Times*, 23 December 1991; James Rupert, "Yeltsin to Control Most Nuclear Arms; 11 Former Soviet Republics Declare Formation of Commonwealth," *The Washington Post*, 22 December 1991. This was subsequently ratified in the Minsk agreement. See below.

<sup>108</sup> N. Zaika, "Ukraine Begins Withdrawal of Tactical Nuclear Weapons," *TASS*, 10 January 1992, (BBC Summary of World Broadcasts, 13 January 1992); "First Lot of Nuclear Weapons Taken Out of Belarus and Sent to Russia," *Krasnaya Zvezda*, 28 January 1992, (FBIS-SOV-92-020, 30 January 1992, p. 5).

By 26 January warheads were being removed from Belarus, according to Leonid Privalov, deputy chairman of the national security commission of the Byelorussian parliament; Vladimir Glod and Alexander Kryzhanovsky, "Belarus Nuclear Weapons Moved to Russia," *TASS*, 26 January 1992, (JPRS-TND-92-003, 14 February 1992, p. 29).

The withdrawals were probably a continuation of ongoing shipments of weapons requiring maintenance or being retired. Some warheads were reportedly being shipped back to Russia in 1991; R. Jeffrey Smith, "Ukrainian Minimizes West's Nuclear Fears," *The Washington Post*, 25 December 1991.

Also note: Lt. General Sergei Zelentsov said that withdrawals of tactical weapons from Ukraine and

Kravchuk announced that 35 percent of the tactical nuclear weapons in Ukraine had been withdrawn.<sup>109</sup> Two weeks later, on 6 February he said that half of the tactical nuclear weapons had been withdrawn.<sup>110</sup> On 23 February,<sup>111</sup> however, Kravchuk suspended the removal of tactical nuclear weapons from Ukraine, because Ukraine lacked assurances that the weapons were actually being dismantled in Russia.<sup>112</sup> This action was announced on 12 March.<sup>113</sup> After a tense month of western and Russian pressure and additional Russian-Ukrainian spats over the Black Sea Fleet, President Yeltsin and President Kravchuk signed an accord accompanied by a protocol detailing the control of the destruction of the weapons on 16 April.<sup>114</sup> Finally, on the night of 5/6 May 1992 the last tactical nuclear weapons were withdrawn from Ukraine into Russia.<sup>115</sup> According to Russian statements, the last tactical

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Belarus had been ongoing since late 1991; Interview with Lt. General Sergei Zelentsov, *Moscow Radio Moscow World Service*, 13 March 1992, (JPRS-TND-92-009, 3 April 1992, p. 16).

<sup>109</sup> He announced this during a visit by French Foreign Minister Roland Dumas; Alexei Petrunya, "Kravchuk on Nuclear Arms," *TASS*, 24 January 1992 and *INTERFAX*, "Dumas News Conference," 24 January 1992, (JPRS-TND-92-003, 14 February 1992, p. 35).

<sup>110</sup> Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), p. 94.

<sup>111</sup> Interview with Lt. General Sergei Zelentsov, *Moscow Radio Moscow World Service*, 14 March 1992, (JPRS-TND-92-009, 3 April 1992, p. 10).

<sup>112</sup> Reiss claims a backlog at the Russian production facilities had caused the delays in dismantlement; Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), p. 94.

<sup>113</sup> "Ukraine Suspends Transfer to Russia of Tactical Nuclear Arms," *Reuters*, 12 March 1992; Victor Litovkin, "No more tactical nuclear weapons on Ukrainian and Byelorussian territory. Russia continues to destroy them," *Izvestia*, 7 May 1992, (BBC Summary of World Broadcasts, 8 May 1992); Victor Litovkin, "Tactical nuclear weapons in Ukraine, L. Kravchuk and CIS Joint Armed Forces Command contradict each other," *Izvestia*, 8 May 1992, (BBC Summary of World Broadcasts, 9 May 1992).

Apparently the Russian military's schedule for moving the warheads back to Russia called for a break of a few weeks in any event after 23 February. Thus, Kravchuk attempted to stop Russia from resuming shipments; Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), p. 94.

<sup>114</sup> "Yeltsin, Kravchuk sign accord on transfer of nuclear weapons," *Agence France Press*, 16 April 1992.

See: "Agreement between Ukraine and the Russian Federation Concerning the Procedure for Movement of Nuclear Munitions from the Territory of Ukraine to Central Pre-Factory Bases of the Russian Federation for the Purpose of Dismantling and Destroying Them," and Protocols (translated by the U.S. Department of State, Language Services), printed in SASC, Hearings on "The Military Implications of START I and START II," 4 August 1992, S. Hrg. 102-953, pp. 264-265.

<sup>115</sup> Reiss claims the remaining half of the warheads seemingly could be removed so quickly from Ukraine between mid-April and early May because Russia had ignored Kravchuk and started to remove additional warheads in late March as originally planned. The Ukrainian military only had a "rudimentary ability to monitor the withdrawals" and so did not realize all the weapons were gone until Russia announced this in early May; Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), p. 97.

weapons in Belarus were withdrawn sometime earlier in 1992.<sup>116</sup> On 24 April 1992, a news report quoted Byelorussian Defense Minister Lt. General P. Kozlovsky as saying they had in fact already been removed from Belarus.<sup>117</sup>

Thus, all the tactical nuclear weapons which had previously been dispersed over the former Soviet Union and Eastern Europe had been returned to Russia by early May 1992, ending one phase of the warhead consolidation process.

### **b. Strategic Weapons**

Withdrawing the strategic weapons from the three republics proved to be even more politically onerous than removing the tactical nuclear weapons. A complex mixture of political tensions with Russia, domestic politics, and economic motivations led to the delays in the transfer of strategic weapons. A series of meetings, summits, and agreements between the republics, between the United States and Russia, and between the United States and

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<sup>116</sup> Lt. General Sergei Zelentsov said, "They [tactical nuclear weapons] were withdrawn from Belarus some time ago, and from Ukrainian territory they were pulled out, in fact, yesterday. To be more exact, it happened last night." General Yakovlev added that in the "course of the last transfer, some 1,000 nuclear units have been evacuated -- tactical nuclear weapons." These were mostly air defense weapons, tactical aviation bombs, and naval tactical weapons; "Press Conference on Withdrawal of Tactical Nuclear Weapons from the Ukraine by Members of CIS and Ukraine Military," Official Kremlin International News Broadcast, 6 May 1992, (Federal News Service).

As for the types of tactical weapons withdrawn: Maj. General Vitalii Yakovlev of the MOD's 12th Main Directorate said anti-aircraft warheads, aircraft bombs for tactical aviation, sea-launched cruise missile warheads, artillery shell warheads and nuclear mines were withdrawn from Ukraine and Belarus; K. Belyaninov, "Kravchuk Probably Did Not Know Everything," *Komsomolskaya Pravda*, 8 May 1992, (JPRS-TND-92-014, 14 May 1992, p. 21). Also: "Aerial bombs for front-line aviation, nuclear anti-aircraft missile pods, sea-launched nuclear munitions (torpedo and tactical cruise missile warheads), and air-launched cruise missiles;" were withdrawn from Ukraine. The same tactical nuclear weapons types aside from sea-launched weapons were withdrawn from Belarus; Victor Litovkin, "No more tactical nuclear weapons on Ukrainian and Byelorussian territory. Russia continues to destroy them," *Izvestia*, 7 May 1992, (BBC Summary of World Broadcasts, 8 May 1992).

As of May 1992, the CIA estimated: "Byelarus has 50 to 100 weapons left, which ought to be out within the month;" Lawrence Gershwin, NIO for Strategic Program, CIA, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, p. 495.

<sup>117</sup> Mikhail Shimansky, "First Interview with First Defense Minister of Byelarus," *Izvestia*, 24 April 1992, (JPRS-TND-92-013, 29 April 1992, p. 18).

Note: one report said warheads for tactical missiles were removed in early May, but other tactical weapons would be removed in mid-May; *INTERFAX*, "Strategic Arms to Follow," 4 May 1992, (JPRS-TND-92-014, 14 May 1992, p. 18). While another cited Leonid Privalov, deputy chairman of the national security commission of the Byelorussian parliament, who said, "The last train with tactical nuclear weapons left Byelorussian territory back on 27 April;" T. Khryapina, "Republic of Byelarus Will Need Seven Years to Rid Itself of Strategic Nuclear Weapons Is Deputy L. Privalov's Opinion," *Krasnaya Zvezda*, 17 June 1992, (JPRS-TND-92-019, 19 June 1992, p. 25).

various republics during 1991-1994 eventually smoothed the way for the weapons to be returned to Russia. However, an active and intense diplomatic effort, particularly on the part of the United States, was needed to achieve this result.

Agreements reached in late December 1991 in Alma-Ata and Minsk called for Ukrainian-based strategic nuclear weapons to be dismantled by the end of 1994.<sup>118</sup> However, continuing controversy over control of the nuclear weapons and Ukraine, Belarus and Kazakhstan's participation in the START I treaty, led the United States and the four FSU Republics still holding nuclear weapons to sign another agreement -- the Lisbon Protocol -- on 23 May 1992 that was supposed to pave the way for the three republics to return the nuclear weapons on their soil.

The Protocol provided that all four republics assumed the obligations of the START I Treaty, and that the treaty would go into effect when all four FSU republics with nuclear weapons ratified it. In addition, it called upon the Ukraine, Kazakhstan, and Belarus to join the Nuclear Non-Proliferation Treaty as non-nuclear states, acceding to the treaty in "the shortest possible time."<sup>119</sup> However, further political tussles between Russia and Ukraine,

<sup>118</sup> In addition, the destruction of warheads from Belarus and Ukraine was to be monitored by those countries: Article 4: ... Until their destruction in full, nuclear weapons located on the territory of Ukraine shall be under the control of the Combined Strategic Forces Command, with the aim that they not be used and be dismantled by the end of 1994, including tactical nuclear weapons by 1st July 1992.

The process of destruction of nuclear weapons located on the territory of the Republic of Belarus and Ukraine shall take place with the participation of the Republic of Belarus, the Russian Federation and Ukraine under the joint control of the commonwealth states; Text of Minsk "Agreement on strategic forces", TASS, 31 December 1991, (BBC Summary of World Broadcasts, 1 January 1992); "Strategic and Conventional Protocol Details from Minsk," *Agence France Presse*, 31 December 1991.

Reiss says the reason Belarus did have to pledge to remove the strategic weapons on its territory was because Russia was not worried about Belarus' commitment to denuclearize. Kazakhstan was not mentioned because Kazakh President Nazarbayev refused to make such a commitment; Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), pp. 131 and 141.

<sup>119</sup> Barbara Crossette, "4 Ex-Soviet States and U.S. in Accord on 1991 Arms Pact," *The New York Times*, 24 May 1992; "Partial Text of START Protocol," *Reuters*, 23 May 1992.

The Protocol was frequently interpreted to mean the nuclear weapons had to be eliminated within seven years of the signing of the Lisbon Protocol. However, since the START I treaty reductions were to be implemented over seven years, the Protocol allowed the destruction of the launch vehicles on Ukrainian, Belarus, Kazakh territory to be "delayed" until: a) START I went into effect and b) then the seven-year implementation phase was carried out. Nonetheless, the dates that Ukraine, Kazakhstan, or Belarus ratified or acceded to the NPT were seen as way-posts marking political steps towards denuclearization.

	<u>Ratified START I</u>	<u>Formally acceded to NPT</u>
Ukraine	3 February 1994	5 December 1994
Kazakhstan	2 July 1992	14 February 1994
Belarus	4 February 1993	22 July 1993

Kazakhstan, and Belarus over compensation and other bilateral issues led to a break in warhead shipments until further agreements were reached with Russia.

### (1) Ukraine

During 1992, amidst generally strained Ukrainian-Russian political relations over several issues, Ukraine began to insist on some compensation for the removal of the strategic warheads on its territory and security guarantees before it would return any warheads to Russia.<sup>120</sup> Although in 1993, some Ukrainian missiles were deactivated, no warheads were shipped to Russia, except a few needing repair.<sup>121</sup>

The logjam was only broken on 14 January 1994, when the United States, Russia and Ukraine signed a Trilateral Statement in which: Ukraine promised to ship at least 200 nuclear weapons from SS-19 and SS-24 ICBMs to Russia within 10 months and the rest within "the shortest possible time;" all SS-24 missiles would be deactivated by removing their warheads over a 10-month period; Ukrainian representatives would "supervise" the dismantling of the warheads; Russia would send 100 tons of LEU reactor fuel for Ukrainian nuclear reactors within 10 months; and the United States would provide the initial \$60 million to get the process started, which, however, would be deducted from payments Russia was to receive for

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Information from: Arms Control and Disarmament Agency, "START I: Lisbon Protocol and the Nuclear Nonproliferation Treaty," factsheet, 21 May 1996, at [www.acda.gov](http://www.acda.gov).

<sup>120</sup> See discussion in: Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), pp. 97-114 and Ron Popeski, "Ukraine Seeks START Guarantees, Aid - President," *Reuters*, November 1992.

<sup>121</sup> The first of the five SS-19 strategic missile regiments stationed at Pervomaysk, reportedly began "being removed from combat alert on 15th July [1993]." The nose cones were to be taken off 10 missiles and stored until the resolution of the shipping stand-off with Russia. The decommissioning was to take until 15 September; Victor Litovkin, "Strategic Missiles Start Leaving Ukraine. Warheads Remaining Behind for the Moment," *Izvestia*, 16 July 1993, (BBC Summary of World Broadcasts, 17 July 1993); R. Jeffrey Smith, "Ukraine Begins to Dismantle Nuclear Missiles Aimed at U.S.; In Response, Clinton Administration Pledges Funds to Aid Effort," *The Washington Post*, 28 July 1993.

On 20 December Ukrainian Vice-Premier Valery Shmarov announced that 17 SS-24 ICBMs had been taken off combat duty. Also, more than 100 warheads had been removed from the missiles but the missiles themselves were still in their silos. Shmarov said warheads would be removed from three more SS-24 missiles by the end of 1993; Pavel Felgengauer, "Ukraine Has Started Dismantling Its Nuclear Missile Potential," *Segodnya*, 22 December 1993, (Russian Press Digest, Russica Information, Inc.); Robert Seely, "Ukraine Deactivates 17 Missiles in Goodwill Gesture Toward U.S. and Russia," *The Washington Post*, 21 December 1993.

Two strategic missile warheads needing repair "because there was a change in the gas environment inside the warhead body," were shipped to Russia from Ukraine in October 1993, although even this shipment was held up due to political wrangling; Victor Litovkin, "The First Two Nuclear Warheads Have Been Moved from Ukrainian Territory to Russia. Defective Ones," *Izvestia*, 26 October 1993, (JPRS-TND-93-035, 10 November 1993).

the supplying of blended-down HEU to the United States, under the 1993 HEU deal.<sup>122</sup>

Pairs of secret letters concerning the implementation of the Trilateral Agreement were also exchanged among Yeltsin, Clinton, and Kravchuk. President Kravchuk's letters to President Clinton and President Yeltsin said Ukraine would return all warheads on its territory to Russia within three years and contained a schedule for their removal.<sup>123</sup>

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<sup>122</sup> "Appendix to the Tripartite Statement between the Ukrainian, U.S., and Russian presidents, dated 14 January 1994," (FBIS-SOV-94-012, 19 January 1994, p. 50). See also: Ann Devroy and Margaret Shapiro, "Clinton Pledges U.S. Support for Russia's Revival; Yeltsin, Kravchuk Join in Accord To End Ukraine's Nuclear Force," *The Washington Post*, 15 January 1994; Serge Schmemann, "Accords Signed on Ukraine's Atom Arms," *The New York Times*, 15 January 1994; "Background Briefing by Senior Administration Officials, Moscow, Russia Topic: Documents Signed by Heads of State," 14 January 1994, (Federal News Service).

At a subsequent 10 May 1994 Russian-Ukrainian meeting the details of the agreement were elaborated further: Russia would supply Ukraine with, "1,800 plus/minus 100 units of fuel assemblies with a 4.4 percent content of uranium-235 isotope, after taking into account adjusted data on utilization." Four consignments of 25 tons each were to be delivered in 1994, no later than in March, April, June and September; Article 1 of "Text of the Russian-Ukrainian Agreement on the Implementation of the Trilateral START Accord [Trilateral Agreement]," *Diplomaticheskyy Vestnik*, No. 11-12, June 1994, (FBIS-USR-94-102, 20 September 1994).

Seemingly this was all the fuel rods that were shipped under the 1994 agreement. In August 1997, a Ukrainian press report said under the 1994 agreement, Ukraine received 1,800 fuel "charges" for its VVER-1000 reactors; that the agreement expired in the summer of 1997; and a new agreement for payment of additional shipments of reactor fuel was being negotiated with Russia; "Ukraine, Russia Sign Accord on Nuclear Fuel Supply Payment," *Lvov Infobank*, 21 August 1997, (FBIS-SOV-97-233, 21 August 1997).

It does not appear that the fuel rods shipped to Ukraine needed to contain uranium-235 from weapons removed from Ukraine and dismantled in Russia.

Some elements of the Trilateral Agreement were contained in previous Ukrainian-Russian agreements which had fallen through: At the Russian-Ukrainian presidential summit at Massandra, Ukraine, in September 1993 Presidents Yeltsin and Kravchuk had agreed that warheads in Ukraine would be exchanged for reactor fuel from Russia. However, Ukrainian statements suggest the Massandra agreement called for the use of HEU from dismantled warheads from Ukraine in the reactor fuel that was sent back. President Kravchuk noted the agreement said that: "Russia will ensure that highly-enriched uranium [contained in] warheads, will be processed [to produce] uranium with a lower degree of enrichment which will be used to make fuel for Ukrainian AESs [nuclear power plants];" "President Kravchuk discusses Black Sea Fleet at press conference," *Radio Ukraine World Service*, Kiev, 1200 gmt 6 September 1993, (BBC Summary of World Broadcasts, 8 September 1993).

See also: Celestine Bohlen, "Ukraine Agrees to Allow Russians To Buy Fleet and Destroy Arsenal," *The New York Times*, 4 September 1993; "Russia cancels Massandra deal on withdrawal of nuclear warheads," *UNIAN news agency*, Kiev, 22 September 1993, (BBC Summary of World Broadcasts, 27 September 1993).

<sup>123</sup> Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), p. 117.

The letters from Yeltsin to Kravchuk and Clinton discussed the question of compensation for the tactical warheads. These warheads were removed without any Russian promises that Ukraine would receive compensation. However, Ukraine subsequently raised this issue in the discussions surrounding the removal of strategic nuclear weapons, and the January 1994 meeting, Russia said it would compensate Ukraine in the form of debt forgiveness for previously supplied oil and gas; Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), p. 117.

After some more posturing and delay, the first strategic warheads were loaded on a special train in the last days of February and shipped out of Ukraine in early March 1994.<sup>124</sup> By November 1994, Russia had taken 400 strategic nuclear warheads from Ukraine.<sup>125</sup> By 1 June 1996 all strategic nuclear weapons had been removed from Ukraine.<sup>126</sup>

## (2) Kazakhstan

During 1992-1993, debates about keeping nuclear weapons were held in Kazakhstan which were similar to those held in Belarus and Ukraine. On 13 December 1993, however, the Kazakh Parliament ratified the Nuclear Non-Proliferation Treaty, politically clearing the

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President Kravchuk of Ukraine said, "As regards stationary nuclear weapons [seemingly tactical ones], experts from Ukraine, Russia and the United States will determine the value of such weapons, their price, and Ukraine will be compensated. Compensation can be in the form of compensation of debts Ukraine has accumulated for energy;" "Press Conference by Ukrainian President Leonid Kravchuk," 14 January 1994, Federal New Service.

The issue of an accelerated withdrawal of the strategic nuclear weapons and compensation for the tactical nuclear weapons already withdrawn came up again in May 1994. The accords signed by Ukrainian Prime Minister Yefim Zvyagilsky and Russian Victor Chernomyrdin reportedly contained a protocol which said the warheads would be shipped out within three years, by the end of 1997. The protocol also said Ukraine would receive \$500 million for the tactical nuclear warheads transferred to Russia in 1992, which would be used to pay off Ukraine's energy debt to Russia; "Ukraine Said Ready to Speed Nuclear Disarmament," *Reuters*, 19 May 1994; Rostislav Khotin, "Ukraine Pledges to Double Speed of Disarmament," *Reuters*, 19 May 1994.

It appears the amount of compensation involved has remained an open question. On 16 September 1997, Ukrainian Prime Minister Valery Pustovoytenko met with Russian Prime Minister Victor Chernomyrdin in Moscow. During his visit an agreement was prepared on compensation for the tactical nuclear weapons; "Ukrainian premier gives interview on his visit to Moscow," 16 September 1997, (Federal News Service).

A Ukrainian diplomat reportedly said the value amounts to \$450 million; "Moscow, Ukraine Reach Nuclear Weapons Compensation Accord," *Kiev Intelnews*, (FBIS-SOV-97-260, 17 September 1997).

However, whatever compensation has been discussed seemingly has not necessitated any transfer of down-blended HEU to Ukraine in the form of LEU reactor fuel rods.

<sup>124</sup> The shipments seemingly encompassed groups of 60 warheads; Pavel Felgengauer, "Disarmament: evacuation of warheads from Ukraine begins. The first tangible result of Russian-American partnership," *Segodnya*, 2 March 1994, (BBC Summary of World Broadcasts, 3 March 1994); Reuters, "60 Warheads Leave Ukraine To Be Dismantled in Russia," *The New York Times*, 6 March 1994; Ashton Carter, ASD (ASD), Nuclear Security and Counterproliferation, testimony on "Nuclear Disarmament of the Former Soviet Union," before the HAC "DOD Appropriations for 1995, Part 4," 9 March 1994, p. 513.

<sup>125</sup> David Storey, "Unhappy Ukraine seeks more direct U.S. aid," *Reuters*, 16 November 1994.

<sup>126</sup> "Kuchma Issues Statement on Removal of Nuclear Weapons," *Kiev UT-1 Television Network*, 1 June 1996, (FBIS-SOV-96-107, 1 June 1996); Interfax, "Kuchma Says All Nuclear Weapons Removed From Ukraine," 1 June 1996, (FBIS-TAC-96-007, 1 June 1996); President William Clinton, Statement By The President, The White House Office of Press Secretary, "Statement By The President: Removal of Nuclear Warheads from Ukraine and White House Press Release," 1 June 1996.

way for the removal of the strategic weapons.<sup>127</sup>

During January - February 1994, the 40 Tu-95MS Bear bombers left in Kazakhstan at the break-up of the Soviet Union were returned to Russia.<sup>128</sup> Seemingly also during this period, 12 SS-18 missiles and perhaps their 120 warheads were transferred to Russia.<sup>129</sup> However, after these initial steps, further Kazakh concerns about the transfer of warheads arose. On 28 March 1994, Russia and Kazakhstan signed a series of bilateral agreements settling outstanding differences, including one on the status of the strategic nuclear forces in Kazakhstan.<sup>130</sup> Reportedly, the agreement called for the removal of all nuclear warheads in

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<sup>127</sup> John Broder, "Kazakhs Ratify Non-Proliferation Treaty; Weapons: Parliament Vote Comes During Visit By Gore, Who Immediately Pledges Aid for Destruction of Nuclear Arsenal," *The Los Angeles Times*, 14 December 1993; Richard Berke, "Prodded by Gore, Kazakhstan Signs Arms Accord," *The New York Times*, 14 December 1993.

In October 1993, Kazakh president Nursultan Nazarbayev promised the United States, that Kazakhstan would ratify the Nuclear Non-Proliferation Treaty; Doyle McManus, "Kazakh Leader Vows To Ratify Arms Proliferation Pact; Nuclear Weapons: He Makes Pledge to U.S. Secretary of State. Clinton May Visit Early Next Year," *The Los Angeles Times*, 25 October 1993.

Kazakhstan formally acceded to the NPT on 14 February 1994.

<sup>128</sup> On 28 February 1994, Russia stated that the last of four of the 40 Tu-95MS Bear bombers in Kazakhstan had been returned to Russia; "Russia Pulls Out Strategic Bombers From Kazakhstan," *Reuters*, 28 February 1994. It is unclear whether the nuclear weapons associated with the bombers were removed during this time. However, the source of the story, an unnamed Air Force official, told Reuters that the bombers were armed with cruise missiles.

<sup>129</sup> Richard Balmforth, "Kazakh Nuclear Arms In Dangerous State," *Reuters*, 12 February 1994.

In response to an *Izvestia* newspaper article reporting on the supposed poor conditions at Kazakh nuclear storages, Kazakh State Adviser Tulegen Zhukeyev said: "It seems the forces are dissatisfied with the Kazakh suspension of withdrawal of intercontinental ballistic missiles that has begun on Kazakh goodwill. A total of 12 missiles have been withdrawn. Now the work is stopped because of the unsettled problem of compensation for highly-enriched uranium half of which was extracted in Kazakhstan;" Gennady Kulagin, "Kazakh State Adviser on Nuclear Arms Storage," *ITAR-TASS*, 12 February 1994; Victor Litovkin, "Nuclear Magazines In Kazakhstan on the Verge Of an Accident," *Izvestia*, 12 February 1994, (JPRS-TND-94-006, 16 March 1994, p. 38).

Reiss claims that the 12 missile and their associated 120 warheads were shipped back to Russia; Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), p. 149.

In any event, the U.S. DOD claimed that all Bear H bombers had been returned to Russia and 12 SS-18s with 120 warheads had left Kazakhstan by April 1994; Ashton Carter, ASD, International Security Policy, testimony before the HASC on "National Defense Authorization Act for Fiscal Year 1995, Authorization and Oversight," 28 April 1994, HASC, No. 103-32, p. 1132; Harold Smith, ASD, Atomic Energy, testimony before the HASC on "National Defense Authorization Act for Fiscal Year 1995, Authorization and Oversight," 28 April 1994, HASC, No. 103-32, p. 1154.

<sup>130</sup> Some 18 agreements including ones covering the control of the Baikonur Cosmodrome and the status of Russian citizens in Kazakhstan and Kazakh citizens living in Russia were signed; Anna Melnikova, "Russia and Kazakhstan Sign Record Number of Agreements," *ITAR-TASS*, 28 March 1994; Ivan Ivanov, "Russian and Kazakh Premiers Sign Agreements," *ITAR-TASS*, 28 March 1994; Fred Hiatt, "Russia Leases Back Cosmodrome: Kazakhstan to Receive \$115 Million Annually for Baikonur," *The Washington Post*, 29 March 1994.

Kazakhstan to Russia for elimination by 1 May 1995<sup>131</sup> and the destruction of the silos within three years.<sup>132</sup> This eliminated the last major political hurdle to the withdrawal of the strategic weapons and by April 1995, all the strategic nuclear warheads in Kazakhstan had been returned to Russia.<sup>133</sup>

### (3) Belarus

In Belarus there also was break between the last shipments of tactical nuclear warheads and the first shipments of strategic nuclear warheads.<sup>134</sup> Byelorussian and Russian discussions over and preparations for removal of the missiles and warheads took place during the 1992 and into 1993.<sup>135</sup> The first nine SS-25s were withdrawn in July 1993.<sup>136</sup> By 22 December 1993, 27 of the 81 SS-25 ICBMs stationed in Belarus were reported to have been removed.<sup>137</sup> On 17 March 1994, shipment of further SS-25s commenced, with the withdrawal of nine more missiles, and withdrawals were expected to be finished in 1995.<sup>138</sup> By December 1994, only 36 SS-25s remained in Belarus, and by July

<sup>131</sup> Anatoly Yurkin, "Russia Objects Elimination of Kazakh Missiles by US Experts," *ITAR-TASS*, 17 May 1994.

<sup>132</sup> Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), p. 149.

<sup>133</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, April 1996, pp. 31-32.

A Russian Strategic Rocket Forces spokesperson said that the transfer of SS-18 ICBM nuclear warheads from Kazakhstan to Russia was completed on 24 April 1995; Interfax, "Russia completes withdrawal of nuclear warheads from Kazakhstan," 25 April 1995, (BBC Summary of World Broadcasts, 27 April 1995).

Other press reports indicate that the last warhead may have been removed in May 1995: "The last warhead left after the break-up of the Soviet Union was sent back to Russia for dismantling on May 21, [Kazakh] Science and Advanced Technology Minister Vladimir Shkolnik said;" Andre Grabot, "Kazakhstan Officially Non-Nuclear But Legacy Remains, *Agence France Presse*, 6 June 1995. Also: According to Kazakh radio, the Kazakh Foreign Ministry said in May 1995 all nuclear warheads from missiles deployed in Kazakhstan had been removed; "Kazakhstan announces it has no more nuclear warheads," (BBC Summary of World Broadcasts, 26 May 1995).

<sup>134</sup> It is difficult to determine if extra SS-25 warheads stored in Belarus or warheads on missiles removed from Belarus were shipped during 1992-1993.

<sup>135</sup> Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), pp. 132-134; Interfax, "Belarus Approves Schedule for Withdrawal of Nuclear Missiles," 26 October 1992, (FBIS-SOV-92-208, 27 October 1992, p. 3).

<sup>136</sup> The first regiment of nine SS-25s stationed at Postavy was withdrawn in mid-1993; Victor Litovkin, "Belarus gives up strategic nuclear systems forever. Now only Russia will have them," *Izvestia*, 17 March 1994, (BBC Summary of World Broadcasts, 21 March 1994). "Withdrawal of Nuclear Weapons from Belarus and Ukraine," *Jane's Intelligence Review - Pointer*, 1 April 1994.

<sup>137</sup> "Belarus withdraws 27 of its 81 strategic missiles," *Agence France Presse*, 22 December 1993.

<sup>138</sup> Victor Litovkin, "Belarus gives up strategic nuclear systems forever. Now only Russia will have them," *Izvestia*, 17 March 1994, (BBC Summary of World Broadcasts, 21 March 1994); "Withdrawal of Nuclear Weapons from Belarus and Ukraine," *Jane's Intelligence Review - Pointer*, 1 April 1994; Ashton Carter, ASD, International Security Policy, testimony before the HASC on "National Defense Authorization Act for Fiscal

1995 only 18 remained, according to the START I Memorandum of Understanding (MOU) data exchange. However, rather abruptly at the beginning of July 1995, the new Byelorussian President Alexander Lukashenko suspended the withdrawal of the remaining 18 SS-25 missiles.<sup>139</sup> The ensuing political wrangling between Russia and Belarus delayed the withdrawal of the missiles until 23-27 November 1996.<sup>140</sup>

#### 4. Russia

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Year 1995, Authorization and Oversight," 28 April 1994, HASC, No. 103-32, p. 1132.

<sup>139</sup> Victor Litovkin, "President Lukashenko Halts Russian Strategic Forces Pull-Out From Belarus," *Izvestia*, 6 July 1995, (Russian Press Digest).

<sup>140</sup> The White House, Office of the Press Secretary, Statement by the Press Secretary, "Removal of Nuclear Weapons from Belarus, Kazakhstan and Ukraine," 27 November 1996; Alexander Zhilin, "Belarus Gives Up All Nuclear Rockets to Russia," *Moscow News*, 5 December 1996.

Some of the missiles may have been removed earlier, during the period of dispute. The START MOU listed 16 SS-25s in Belarus as of 1 July 1996. Also, by November 1995, the DOD said 72 out of 81 SS-25s were removed from Belarus, but only 63 of 81 launchers returned; Harold Smith, ASD, Atomic Energy, testimony to the House International Relations Committee (HIRC) hearings on "Newly Independent States of the Former Soviet Union: U.S. Policy and Assistance," 14 November 1995, pp. 124 and 402.

It was unclear whether the nuclear warheads were removed in advance of the missiles. Several news reports suggested that warheads were moved prior to the transfer of the missiles:

- "The nuclear warheads, separated in advance from their carriers, are delivered to Russia by special trains;" "SS-25 regiment withdraws from Belarus; post withdrawal situation analyzed," *NTV* (Moscow), 15 May 1994, (BBC Summary of World Broadcasts, 17 May 1994).
- "U.S. experts said last week indications are that Minsk already may have shipped all the warheads back;" Umit Enginsoy, "Belarus Holds Russian Nukes; Desire To Cancel Debt for Natural Gas May Disrupt START," *Defense News*, 21 August 1995.

However, the DOD reported that: "18 SS-25 missiles and warheads remained in Belarus" as of December 1995; U.S. Department of Defense, *Proliferation: Threat and Response*, April 1996, p. 32.

And: by February 1996, there were only 18 warheads in Belarus; Susan Koch, Deputy ASD, Threat Reduction Policy, testimony before the SASC, FY 1997, Strategic Forces, 29 March 1996, S. Hrg. 104-532, Pt. 7, p. 462.

Also: "Government officials said that Belarus had shipped the last 18 of its 81 SS-25 warheads to Russia on 23 November. One missile was retained for the symbolic withdrawal ceremony;" Ian Kemp, "Russia: NATO expansion may prompt retargeting," *Jane's Defence Weekly*, 4 December 1996.

Finally: General Yevgeny Maslin wrote that Russia and Belarus had reached agreement on "transferring 18 SS-25s and warheads [emphasis added] remaining on Byelorussian territory by the end of 1996;" General Yevgeny Maslin, Russian-U.S. Cooperation on Nuclear Weapons Safety," in John Shields and William Potter, *Dismantling the Cold War: U.S. and NIS Perspectives on the Nunn-Lugar Cooperative Threat Reduction Program*, (Cambridge, MA: Center for Science and International Affairs, 1997), p. 142.

Reiss says that in September 1993, Belarus and Russia had made a secret agreement which said all the SS-25s would be removed by the end of 1996; Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), p. 133. In the interim, it seemed that Belarus could be nuclear free by the end of 1995, thus Lukashenko's actions created an unexpected delay.

In addition to the weapons entering Russian storages from Eastern Europe and the former Soviet Republics, Russian based nuclear weapons were also being removed from operational deployments or front-line storages and placed into national- or service-level central storages due to the 1991-1992 Presidential unilateral initiatives, arms control treaties, and aging systems.

In response to President Bush's 27 September 1991 initiatives, on 5 October 1991, President Gorbachev announced his own set of measures to further de-alert, reduce, and centralize Soviet nuclear forces. In regards to measures affecting the removal of warheads, he announced that: strategic bombers would not be kept on combat alert and their weapons would be stored at "military depots,"<sup>141</sup> and that 503 ICBMs were to be removed from combat duty, including 134 multiple-warhead ICBMs, as well as an additional three SSBNs.<sup>142</sup>

In terms of tactical nuclear weapons, Gorbachev said the Soviet Union would eliminate all nuclear warheads for tactical missiles, all nuclear artillery munitions, and all nuclear "mines." In addition, tactical naval nuclear weapons from ships, submarines and aircraft were to be removed and stored in centralized storages and some were also to be eliminated. He proposed that all such weapons could be eliminated if the United States agreed to do this on a reciprocal basis. Anti-aircraft nuclear weapons were to be removed from operational forces, concentrated at central bases and some were to be eliminated. Finally, it was proposed that tactical aviation weapons (bombs) would be transferred to central storage sites if the United States agreed to do the same.<sup>143</sup>

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<sup>141</sup> Since service-controlled nuclear weapons storages are associated with strategic airfields, this statement implies that whatever warheads were kept near or on the aircraft were moved to these or national- or service-level central storages.

<sup>142</sup> Text of statement by M.S. Gorbachev, "Gorbachev Proposals on Nuclear Arms Control," *Central Television, First All Union Programme*, 5 October 1991, (BBC Summary of World Broadcasts, 7 October 1991).

Then Commander of the USSR's Strategic Defence Forces, General Yury Maximov, said 1,094 warheads were being removed from the 503 missiles taken out of service; Victor Litovkin, interview with General Yury Maximov, "Army General Yu. Maximov: 'Our Nuclear Weapons are Under USSR Presidential Control,'" *Izvestia*, 11 December 1991, (FBIS-SOV-91-238, 11 December 1991, p. 30).

In January 1992, Russian President Boris Yeltsin said about 600 land and sea-based strategic missiles with almost 1,250 nuclear warheads had been removed from "operational readiness;" Statement on Disarmament by Russian Federation President Boris Yeltsin on 29 January 1992, *Moscow Teleradiokompaniya Ostankino Television First Program Network*, 29 January 1992, (FBIS-SOV-92-019, 29 January 1992, p. 1). See further discussion of Yeltsin's speech below.

<sup>143</sup> Text of statement by M.S. Gorbachev, "Gorbachev Proposals on Nuclear Arms Control," *Central Television, First All Union Programme*, 5 October 1991, (BBC Summary of World Broadcasts, 7 October 1991).

President Bush in his 27 September statement had underscored the United States planned to keep nuclear weapons in NATO for tactical aircraft in Europe; President George Bush, "Address to the Nation: New Initiatives to Reduce U.S. Nuclear Forces," *U.S. Department of Defense Dispatch*, 30 September 1991, Vol. 2,

In January 1992, shortly after President Yeltsin assumed control of Russian nuclear policy, Yeltsin added more unilateral initiatives and made additional arms control proposals. In terms of measures that involve the removal of nuclear warheads he said: SSBN patrols had been cut in half<sup>144</sup> and further reductions would occur; Russia would meet its START I limits in three years rather than in the permitted seven and; he proposed a new strategic arms

No. 39. Gorbachev's offer was attempt to go one step beyond Bush's proposals.

Since the United States did not formally respond to Gorbachev's offer to withdraw all tactical aviation bombs to central sites, i.e. many U.S. weapons were withdrawn, but some remain in Western Europe, analysts have suggested it is possible some Russian tactical aviation bombs are still kept at storages associated with airfields rather than at central storages.

However, when Gorbachev made his October 1991 speech, the Soviet Union existed and the Soviet military may have wished to keep frontal/tactical aviation weapons deployed close to nuclear-capable aircraft in border republics and regions (e.g. Ukraine, Belarus, and the Transcaucasus).

Now due to the independence of the republics, the number of airfields in border areas with storages has been reduced. Overall, General Petr Deynekin, Commander-in-Chief of the Russian Air Forces noted that, "After the USSR's disintegration, Russia inherited around 60 percent of combat aircraft and around 40 percent of military airfields. Inasmuch as the western axis was the main strategic axis for the former Union, a significant portion of the newest aircraft and the best airfields remained outside of Russia;" General Petr Deynekin, "Where We Are Directing the Flight of Our Birds: On Air Force Status and Development Prospects," *Armeyskiy Sbornik*, August 1996, (FBIS-UMA-96-234-S, 1 August 1996).

Also, it seems as if one storage may have served several frontal/tactical aviation units. Thus, today's lesser number of nuclear-capable frontal/tactical aviation units in Russia may be served by more "centralized" Air Force-controlled facilities in any event.

<sup>144</sup> He also proposed ending combat patrolling of SSBNs on a reciprocal basis.

Overall, Russian SSBN patrols have been cut in half and then some. Whether this is due to Yeltsin's orders, a change in strategy, a lack of financing, or a combination of these and other factors is unclear.

Russian SSBN and SSN/SSGN Patrols per Year 1991-1997							
Patrols	1991	1992	1993	1994	1995	1996	1997
SSBNs	37	28	19	19	14	12	13
SSN/SSGNs	18	9	13	14	13	14	11
TOTALs	55	37	32	33	27	26	24

From: U.S. Navy, Office of Naval Intelligence, "Russian Strategic and General Purpose Nuclear Submarine Patrols, 1991-1996," letter 26 March 1997 and U.S. Navy, Office of Naval Intelligence, "Russian Strategic and General Purpose Nuclear Submarine Patrols, 1997," letter 11 March 1998, both released under the Freedom of Information Act to Center for Energy and Environmental Studies, Princeton University.

Yet, it seems for a period the remaining SSBNs may have gone on longer patrols because in 1995, General Sheehan, CINACOM, said "... but the curious piece is the SSBNs have increased their patrol length. They have gone from 52 or 55 days, to 72 days on patrol; General John Sheehan, Commander-in-Chief, U.S. Atlantic Command, testimony before the HAC, "DOD Appropriations for 1996, Part 3," 7 March 1995, p. 335.

By 1997, however, the Director of the Office of Naval Intelligence, Admiral Michael Cramer told Congress that in order to save money the Russian Navy: "changed their operational tempo; for example, reducing the number of days that SSBNs spend at sea," in order to save money; Rear Admiral, Michael Cramer, Director of Naval Intelligence, testimony before the SASC, FY 1998 DOD Authorization, Part 6, Seapower, S. Hrg. 105-37, 8 April 1997, p. 57.

treaty (i.e. START II) with limits of 2,000 - 2,500 strategic nuclear weapons in each country.<sup>145</sup>

As for tactical weapons, he reconfirmed that all nuclear weapons for tactical missiles, all nuclear artillery shells and all nuclear mines would be eliminated. He added that their production had recently been terminated. He provided details on the fractional sizes of the other services' dismantlements by noting that one third of sea-based tactical nuclear weapons and one-half of nuclear anti-aircraft warheads were to be eliminated. And, he went a step further than Gorbachev and said that one-half of tactical nuclear weapons for aviation would be eliminated altogether. But, he repeated Gorbachev's proposal that the remaining tactical aviation nuclear weapons could be removed from front-line tactical aviation units and put into centralized storages if the United States agreed to do the same.<sup>146</sup>

Finally, the START I Treaty, signed in 1991, went into force in December 1994. It called for reduction of the numbers of ICBMs, SLBMs and bombers to 1,600 launchers deployed with 6,000 "accountable" nuclear warheads, only 4,900 of which could be deployed on ICBMs and SLBMs within seven years of entry into force, i.e. by December 2001.<sup>147</sup>

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<sup>145</sup> Statement on disarmament by Russian Federation President Boris Yeltsin on 29 January 1992, *Moscow Teleradiokompaniya Ostankino Television First Program Network*, 29 January 1992, (FBIS-SOV-92-019, 29 January 1992, pp. 1-3); "Boris Yeltsin's Statement on Arms Control," *ITAR-TASS*, 29 January 1992.

This limit is now being considered as the basis for a START III agreement, per the March 1997 Helsinki accords.

Also, see discussion of Yeltsin's initiatives by Alexei Obukhov of the Russian Ministry of Foreign Affairs and Maj. General Victor Koltunov, of the General Staff of the Armed Forces of the Commonwealth of Independent States, in: "A Briefing on Russian-American Initiatives in the Field of Disarmament Moderated by Yuri Gremitskikh, Deputy Chief, Information Directorate, the Ministry of Foreign Affairs of the Russian Federation," Official Kremlin International News Broadcast, 30 January 1992, (Federal News Service).

In terms of achieving START I implementation earlier than called for by the treaty, this was only partially achieved. In terms of warheads, START I calls for a limit of 6,000 strategic warheads on deployed ICBMs, SLBMs, and bombers. Sublimits include: 4,900 warheads on ICBMs and SLBMs, 1,100 warheads on mobile missiles, 1,540 warheads on heavy ICBMs.

As of mid-1998, 3 1/2 years after the ratification of START I and 6 1/2 years after Yeltsin's speech, Russia still has not reached any of these warhead limits under the START I counting rules, except having less than 1,100 warheads on mobile missiles; START I Treaty and subsequent MOU data exchanges available from Department of State and the Arms Control and Disarmament Agencies Public Affairs offices. In terms of launchers, Russia was, however, below the 1,600 deployed ICBM, SLBM, and bomber launcher limit.

<sup>146</sup> Statement on disarmament by Russian Federation President Boris Yeltsin on 29 January 1992, *Moscow Teleradiokompaniya Ostankino Television First Program Network*, 29 January 1992, (FBIS-SOV-92-019, 29 January 1992, pp. 1-3); "Boris Yeltsin's Statement on Arms Control," *ITAR-TASS*, 29 January 1992.

<sup>147</sup> The START I Treaty, its Protocols, and the first Memorandum of Understanding (MOU) database is reprinted in the *Department of State Dispatch Supplement*, October 1991, Vol. 2, Supplement No. 5.

The START I treaty attributed an agreed upon number of warheads to launching systems. Under the START I counting rules, warheads are counted as deployed until the launcher has been eliminated (for silo-based

### a. Tactical Weapons

In November 1991, Chief of the Soviet General Staff, General Vladimir Lobov provided a time schedule for Gorbachev's announced eliminations of tactical nuclear warheads:

- nuclear warheads for tactical missiles would be retired by the year 2000;
- nuclear artillery warheads would be retired by the year 2000;
- nuclear mines would be retired by 1998;
- naval weapons would be retired by 1995; and
- nuclear anti-aircraft missile warheads would be retired by 1996.<sup>148</sup>

In late 1993, General Vitaly Yakovlev, deputy chief of the 12th Main Directorate provided further details, stating the initiatives would result in:

- All nuclear warheads on three types of shorter-range missiles being eliminated by the year 2000;
- All nuclear warheads for six types of artillery guns of 152mm, 203mm, and 240mm caliber being eliminated by the year 2000;
- All nuclear "mines" being eliminated by 1998;
- Half of the Air Forces' tactical nuclear weapons being eliminated by 1996;
- A third of the Navy's tactical nuclear weapons being eliminated by 1995, and;
- A half of the nuclear anti-aircraft warheads being eliminated by 1996.<sup>149</sup>

However, in November 1997, the U.S. Department of Defense provided a slightly different schedule of Russian tactical nuclear warhead eliminations. Apparently based on information provided by Russian government officials, it notes that:

- Ground-launched tactical nuclear warheads would be consolidated and all would be eliminated by 2000;

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ICBMs, the silo must be destroyed; for mobile ICBMs, the launcher and missile must be eliminated; for SLBMs the missile compartment from the submarine must be removed and eliminated; for bombers, the aircraft must be dismembered; see: "Protocol on Procedures Governing the Conversion or Elimination of the Items Subject to the Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Reduction and Limitation of Strategic Offensive Arms."

<sup>148</sup> Vladimir Lobov, General of the Army, "The Motherland's Armed Forces Today and Tomorrow," *Krasnaya Zvezda*, 29 November 1991, pp. 1-2.

<sup>149</sup> General Vitaly Yakovlev, "Realization of Reduction and Limitation Programs for Nuclear Weapons and the Opportunity of an Information Exchange on Amount of Produced Fissile Materials and Their Localization," Talk Prepared for the U.S.-Russian Workshop of CTB, Fissile Material Cutoff and Plutonium Disposal," 15-17 December 1993, Washington, DC.

- All nuclear mines would be eliminated by 1998;
- Half of the Air Force's tactical nuclear warheads would be eliminated by the end of 1997 [rather than by 1996];
- Naval tactical nuclear warheads would be consolidated and one-third would be eliminated by the end of 1996 [rather than by 1995] and;
- Nuclear anti-aircraft warheads would be consolidated and a half would be eliminated by the end of 1996, [i.e., by 1997 rather than by 1996].<sup>150</sup>

The pace of withdrawals from front-line units seemed to be relatively rapid. In the case of the Navy, all weapons in the Pacific Fleet were reportedly withdrawn by the end of September 1992.<sup>151</sup> By October 1992, the Commander of the Northern Fleet was saying that tactical nuclear weapons had been removed from the ships of the Northern Fleet.<sup>152</sup> In February 1993, the Russian Navy announced the removal of tactical nuclear weapons from submarines, ships and aircraft had been completed. They had all been placed in land depots and seemingly disabled.<sup>153</sup> The withdrawal of tactical nuclear weapons from other services to centralized storages, according to one Russian source, was "largely completed by the end of 1993."<sup>154</sup>

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<sup>150</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, November 1997, p. 44.

Based on an interview with an unnamed Strategic Rocket Forces officer, Blair reported that the Russian General Staff's plan was the following as of early 1992:

- All ground-launched tactical nuclear warheads including nuclear mines would be removed from deployment by 1995. The nuclear mines would be eliminated by 1998 and the rest by 2000.
- Half of the Air Force's tactical nuclear warheads would be eliminated, although no schedule was given.
- Naval tactical nuclear warheads would be removed from ships and submarines by October 1992 and naval aviation units by 1996. One-third of these inventories would be eliminated by 1996.
- Nuclear anti-aircraft warheads would be removed by 1996 and one-half would be eliminated by 1997; Bruce Blair, *The Logic of Accidental Nuclear War*, (Washington, DC: Brookings, 1993), pp. 105-106.

<sup>151</sup> Kyodo, "Russian Navy Removes N-Missiles From Pacific Fleet," 6 November 1992, (JPRS-TND-92-042, 13 November 1992, p. 27).

<sup>152</sup> Vasily Belousov, "Russian Northern Fleet Removes Tactical N-Arms," *ITAR-TASS*, 20 October 1992, (JPRS-TND-92-039, 28 October 1992, p. 20).

<sup>153</sup> Several news reports said the weapons had been dismantled and placed in depots or centralized storage. Most likely this means they were disabled when they were placed in storage; Margaret Shapiro, "Russian Navy Rids Itself of Tactical Nuclear Arms," *The Washington Post*, 5 February 1993; Vadim Byrkin, "Tactical Nuclear Arms Removed from Vessels," *ITAR-TASS*, 4 February 1993, (FBIS-SOV-93-022, 4 February 1993, p. 1); Reuters, "Russian Navy Dismantles Tactical Nuclear Missiles," 4 February 1993.

Note: Over the past few years, questions have been raised in the United States whether tactical nuclear weapons are still being deployed on Russian SSBNs. A Russian Navy source recently stated that the Russian Navy would prefer to keep tactical nuclear weapons on SSBNs for self-defense purposes, noting that, after all, SSBNs already carry nuclear weapons. Nonetheless, the Russian Navy implemented the political decision to remove tactical nuclear weapons from naval vessels. Thus, Russian SSBNs do not deploy with tactical nuclear weapons onboard, although the Russian Navy regular practices the capability to redeploy them.

<sup>154</sup> Pavel Podvig, ed., *Russian Strategic Nuclear Weapons*, (Moscow: Izdat, 1998).

In June 1996, General Maslin, Chief of the 12th Main Directorate, said that Russia had "eliminated half of the nuclear warheads in its tactical weapon and air defense systems, and has reduced by one-third its tactical sea-based complexes."<sup>155</sup> While, in September 1996, Foreign Ministry spokesman Mikhail Demurin reportedly said that, "All nuclear warheads from tactical and medium-range missiles of the land force as well as nuclear ammunition are being scrapped in keeping with the plan. All nuclear mines are being destroyed. The nuclear warheads of anti-aircraft missiles have been withdrawn. These warheads and naval medium-range missiles have been partly scrapped."<sup>156</sup>

By September 1997, according to his General Maslin's successor, General Valynkin, the ground forces had been denuclearized.<sup>157</sup> According to Alexei Arbatov, Deputy Chairman of the State Duma's Defence Committee, by 1997, 17,900 of the 21,700 tactical nuclear weapons in the Soviet arsenal in 1991 had been withdrawn from service due to political or technical reasons, considerably more than had been pledged in the fall 1991 Presidential initiatives (see Appendix B).<sup>158</sup>

In April 1998, at a NATO-Russian Permanent Joint Council meeting, the ambassadors, "exchanged views and information on nuclear weapons issues."<sup>159</sup> At the meeting, the Russians said that in regards to the tactical weapons reductions proposed in the fall 1991 Presidential nuclear initiatives, 80 per cent of the weapons proposed for elimination had been destroyed and they all would be eliminated by the year 2000. A breakdown of the categories of weapons eliminated was also provided: the Russians claimed that all of the anti-ballistic missile warheads; 80 per cent of the artillery shells, tactical missiles and land mines; half of the anti-air missile warheads; and one-third of the naval tactical missile warheads had been

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<sup>155</sup> Col. General Yevgeny Maslin remarks on U.S. and Russian Perspectives on the Cooperative Threat Reduction Program, made at the U.S. Defense Special Weapons Agency conference, "Walking the Walk: Controlling Arms in the 1990s," in "Summary of the Fifth Annual International Conference on Controlling Arms, 3-6 June 1996, Norfolk, VA.

<sup>156</sup> "Disarmament Initiatives to be Fulfilled by Year 2000," *INTERFAX*, 26 September 1996, (FBIS-SOV-96-189, 26 September 1996).

He added, in discussion with the United States, Moscow had offered further cuts, in particular in tactical aviation weapons, but "the U.S. side did not agree."

<sup>157</sup> "All the warheads of the ground forces, artillery shells and tactical nuclear warheads, have been removed and the units which maintained nuclear warheads have been disbanded;" Press Conference with Lt. General Igor Valynkin, Chief of the 12th Main Directorate of the Russian Ministry of Defense, regarding the nuclear security in Russian Federation armed forces, Russian Ministry of Defense, Official Kremlin International News Broadcast, 25 September 1997, (Federal News Service).

<sup>158</sup> Alexei Arbatov, chapter on Russian perspectives on future nuclear reductions, in Harold Feiveson, Bruce Blair and Frank von Hippel, *The Nuclear Turning Point*, (to be published by the Brookings Institution).

<sup>159</sup> "NATO-Russian Statement on the 29 April 1998 Permanent Joint Council Meeting at Ambassadorial Level," Press Release (98)50, 29 April 1998, available at: [www.nato.int/doc](http://www.nato.int/doc).

destroyed.<sup>160</sup>

Finally, in October 1998, General Valynkin, said that Russia was implementing the agreements on the destruction of tactical nuclear weapons and that nuclear mines and shells were being destroyed according to plan.<sup>161</sup> In November 1998, Lt. General Nikolay Mukhin, Deputy Chief of the Missile and Artillery Troops of the RF Armed Forces, stated the missile and artillery troops no longer had tactical nuclear weapons in storage due to their elimination.<sup>162</sup>

## b. Strategic Weapons

Russia has been fulfilling its START I reduction commitments. However, as of July 1998, Russian START I reductions had mainly been achieved by the deactivation, elimination, and withdrawal of ICBM and bomber warheads in Belarus, Kazakhstan, and Ukraine. The numbers and pace of withdrawal are discussed the stockpile section below.

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<sup>160</sup> Jorgen Dragsdahl, "NATO-Russia Cooperation Stuck in Neutral," BASIC Reports, 4 June 1998, No. 64, p. 4.

U.S. officials also confirmed that the Russians had mentioned 80 per cent of their warheads had been dismantled.

Note: it is not clear, however, when the Russians referred to weapons other than the ground force weapons, all of which were to be eliminated, whether they were suggesting the dismantlements had been completed, or only a portion of the designated group of warheads to be eliminated had been dismantled.

Other less precise reports of the meeting are: "Moscow, NATO Tally Their Shrinking Nuclear Arsenals," *Reuters*, 29 April 1998, which claims NATO had estimated Russia had destroyed half of its arsenal, "down from 10,000 to 12,000 warheads;" "NATO and Russia Talk About Nuclear Weapons," *Associated Press*, 29 April 1998, which also claims NATO said that the Russians said they had destroyed half of their weapons, and that the Russians were believed to have up to 12,000 tactical nuclear weapons; "NATO-Russia Council Discusses Nuclear Weapons for the First Time," *Agence France Presse*, 29 April 1998 and; "NATO Works on Detailed Plan for Post-SFOR Force," *Xinhau*, 29 April 1998.

<sup>161</sup> Mikhail Shevtsov, "Russia Strictly Fulfilling Nuclear Test Ban Treaty," *ITAR-TASS*, 9 October 1998.

General Valynkin added that, "When there is an agreement with the United States on destroying the remaining part of tactical weapons, Russia will embark on their destruction."

<sup>162</sup> [Sokut] Do the Missile and Artillery Troops remain a means of employing tactical nuclear weapons?

[Mukhin] The Missile and Artillery Troops still remain a means of employing them. But in today's conditions, when there is a gradual elimination of tactical nuclear weapons going on, we no longer have them in storage;

Sergey Sokut, Interview with Lt. General Nikolay Mukhin, Deputy Chief of the Missile and Artillery Troops of the RF Armed Forces, "The Primary Weapon to Defeat the Enemy: That Is How Lt-Gen Nikolay Mukhin, Deputy Chief of the Missile and Artillery Troops of the RF Armed Forces Characterizes the Role of the 'God of War'," *Nezavisimoye Voyennoye Obozreniye*, 13-19 November 1998 (FBIS-UMA-98-336, 2 December 1998).

## Appendix B: Stockpile Sizes and Numbers of Warheads Withdrawn

### 1. Overall Nuclear Weapons Stockpile Estimates

**a. Russian information:** In 1992-1993, then Minatom Minister Victor Mikhailov made a series of public comments, which suggested the Russian arsenal contained some 30,000 nuclear weapons in the 1991-1992 timeframe. In February 1992, the *Washington Post* reported that Mr. Mikhailov said that the common estimate of the Soviet arsenal of some 27,000 warheads was "the lowest estimate." He was not more specific but added this estimate was accurate "within 15 to 20 percent," which the *Post* calculated could mean the arsenal was "as high as 32,000 warheads."<sup>163</sup> In July 1992, Mr. Mikhailov told *Komsomolskaya Pravda* that Russia had over "25,000 nuclear munitions: warheads, mines and shells."<sup>164</sup> While in December 1992, he told the Russian Duma and press that if Russia had to stop dismantling warheads, at "the end of this century," the United States would have 10,000 nuclear warheads, while Russia would have 35,000.<sup>165</sup> In May 1993, Mr. Mikhailov told *Rossiyskie Vesti* that about 13,000 nuclear munitions had been dismantled since 1987.<sup>166</sup> In June 1993, however, Mr. Mikhailov told Russian television that Russia had over 40,000 nuclear weapons at the beginning of 1986 and that the number had been reduced by "virtually 15,000" weapons,<sup>167</sup> suggesting an arsenal of greater than 25,000 nuclear weapons.

In September 1993, in a widely cited story, *The New York Times*, basing its story on a report by the Natural Resources Defense Council (NRDC), reported Mr. Mikhailov had said that Russia had some 45,000 nuclear weapons in its arsenal in 1986.<sup>168</sup> Taking into account the reports of Russian warhead dismantlements since the mid-1980s, particularly the *Rossiyskie Vesti* story, NRDC noted that this implied an arsenal of some 32,000 weapons in

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<sup>163</sup> i.e., 32,400 warheads; Fred Hiatt, "A-Arms Chief Says Russia Needs Help," *The Washington Post*, 5 February 1992.

<sup>164</sup> O. Volkov and A. Khokhlov, "Nuclear Danger is No More Than a Myth. That is What Russian Nuclear Minister Victor Mikhailov Believes," *Komsomolskaya Pravda*, 22 July 1992, (JPRS-TND-92-026, 31 July 1992, p. 21).

<sup>165</sup> Minatom Minister Victor Mikhailov's speech to the Seventh Congress of People's Deputies," Kremlin, Moscow, 9 December 1992, (JPRS-TAC-92-037, 30 December 1992, p. 13; Yevgeny Panov, interview with Minatom Minister Victor Mikhailov, "Mikhailov: Such Agreements Can Only Be Welcomed," *Rossiyskaya Gazeta*, 11 December 1992, (FBIS-SOV-92-239, 11 December 1992, p. 3).

<sup>166</sup> Sergei Ovsienko, "Melting of Weapons-Grade Plutonium Stockpile," *Rossiyskie Vesti*, 19 May 1993.

<sup>167</sup> Interview with Victor Mikhailov by Alexander Peslyak, *Russian Television Network*, 3 June 1993, (JPRS-TND-93-017, 7 June 1993, p. 19).

<sup>168</sup> William J. Broad, "Russian Says Soviet Atom Arsenal Was Larger Than West Estimated," *The New York Times*, 26 September 1993 reporting on Thomas Cochran and Robert Norris, *Russian/Soviet Nuclear Warhead Production*, NWD-93-1, Natural Resources Defense Council, Washington, DC, 8 September 1993, p. 22.

The quotation of Mr. Mikhailov's information apparently came from a talk he made while in the United States.

1993.<sup>169</sup> Although statements about the size of the Russian arsenal have become less frequent, in March 1997, Mr. Mikhailov reportedly said 50% of Russia's nuclear arsenal had been scrapped.<sup>170</sup> Assuming he was using the 1991-1992 timeframe as his baseline, then some 15,000 nuclear weapons may remain in the Russian arsenal today.<sup>171</sup>

In regards to other Russian estimates of the Russian stockpile, one Russian specialist from the nuclear weapons laboratory Chelyabinsk-70 said in 1992 that the 30,000 warhead number for the size of the Russian arsenal, although not official, "is the most reliable."<sup>172</sup> While, Alexei Arbatov, Deputy Chairman of the State Duma's Defence Committee has estimated that there were some 21,700 tactical nuclear weapons in the Soviet arsenal in 1991 (see Table B7 in Appendix B).<sup>173</sup> According to START treaty information, in September 1990, the Soviet Union had some 10,779 deployed strategic nuclear weapons.<sup>174</sup> This methodology yields an estimate of a total arsenal of some 32,479 warheads in the 1990-1991 timeframe.<sup>175</sup>

**b. U.S. estimates:** In early 1993, the CIA stated that although it had a good understanding of Russian nuclear weapons locations, the U.S. intelligence community did not have a complete accounting database of nuclear weapons in the former Soviet Union. Thus, the CIA, "estimate of the total number in the inventory [was] subject to considerable

<sup>169</sup> See discussion in: Thomas Cochran and Robert Norris, *Russian/Soviet Nuclear Warhead Production*, NWD-93-1, Natural Resources Defense Council, Washington, DC, 8 September 1993, p. 22.

Note also: a year earlier, in spring 1992, Mr. Mikhailov told a visiting IPPNW delegation that Russia had decreased its arsenal by 15-20% since 1986; International Physicians for Prevention of Nuclear War, interview with Victor Mikhailov, Minister of Atomic Energy, in *Nuclear Weapons in the Commonwealth of Independent States: A Report of the International Physicians for Prevention of Nuclear War* (Cambridge, MA), 24 April 1992, p. 14.

<sup>170</sup> Anton Trofimov, "Russia Has Rid CIS Of Her Nuclear Warheads," *Segodnya*, 11 March 1997, (Russian Press Digest, RUSSICA Information Inc.)

<sup>171</sup> Estimates of the size of the Russian arsenal vary. But by this accounting, if some 6,000 of the 15,000 were deployed on strategic weapons as of 1998, then some 9,000 tactical weapons may remain in the arsenal, although many of the latter may be awaiting for dismantlement. For another recent estimate see: William M. Arkin, Robert Norris, and Joshua Handler, *Taking Stock: Worldwide Nuclear Deployments 1998*, (Washington, DC: Natural Resources Defense Council, March 1998).

<sup>172</sup> Interview with Gennady Novikov, Chief of the Sector Special Security Laboratory at Chelyabinsk-70, by V. Umnov, "Few Bombs Will Survive Till the Year 2000: In the Past Year the Safety of Our Nuclear Weapons Has Declined Sharply," *Komsomolskaya Pravda*, 12 March 1992, (FBIS-SOV-92-051, 16 March 1992, p. 7).

<sup>173</sup> Alexei Arbatov, chapter on Russian perspectives on future nuclear reductions, in Harold Feiveson, Bruce Blair and Frank von Hippel, *The Nuclear Turning Point*, (to be published by the Brookings Institution).

<sup>174</sup> Total utilizes numbers of launchers from START I MOU data exchange of September 1990 and the warhead loadings under START II.

<sup>175</sup> Note: although it appears that Mr. Arbatov's estimate comes from independent sources, it is also possible it was backed out of the START I MOU data exchange and the 32,000 warhead total mentioned in the above *Washington Post* story.

uncertainty."<sup>176</sup> However, this uncertainty has not stopped U.S. officials from making regular statements about the size of the Soviet/Russian arsenal.

As the Soviet Union was beginning to break up in December 1991 and January 1992, the CIA stated the Soviet arsenal had some 30,000 nuclear weapons.<sup>177</sup> Two-thirds of these weapons were estimated to be in Russia.<sup>178</sup> According to the Defense Intelligence Agency (DIA), some 21,000 nuclear weapons were estimated to be in storages in Russia, Belarus, Ukraine and Kazakhstan, while 9,000 strategic weapons were thought to be available for use against the United States.<sup>179</sup>

In January 1992, Chairman of the Joint Chiefs of Staff General Colin Powell was saying, some 27,000 nuclear weapons were stockpiled in the Commonwealth of Independent states.<sup>180</sup> Although the CIA stated in May 1992 that its official estimate was that Russia has 30,000 nuclear weapons, plus or minus 5,000 warheads.<sup>181</sup>

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<sup>176</sup> Lawrence Gershwin, National Intelligence Officer (NIO) for Strategic Programs, testimony before SASC hearing on "Current Developments in the Former Soviet Union," 3 February 1993, S. Hrg, 103-242, p. 42.

<sup>177</sup> Robert Gates, Director of Central Intelligence (DCI), "Statement before the House Armed Services Committee Defense Policy Panel," 10 December 1991, p. 15.

Gates also said in January 1992, that the Russians had said they would dismantle some 15,000 weapons which was about half of the Russian stockpile; Robert Gates, DCI, testimony before SGAC hearing on "Weapons Proliferation in the New World Order," 15 January 1992, S. Hrg, 102-720, pp. 17 and 19. Also see: Robert Gates, DCI, testimony before SASC hearing on "Threat Assessment, Military Strategy, and Defense Planning," 22 January 1992, S. Hrg, 102-755, pp. 9 and 16.

But this estimate was previously being bandied about see: Edward L. Warner III, statement before the SFRC, Subcommittee on European Affairs, Hearings on "The Soviet Crisis and the U.S. Interest: Future of the Soviet Military and Future of the Soviet Economy," 6 June 1991, S. Hrg. 102-283, pp. 25-26.

Also: NRDC estimated the Soviet nuclear stockpile to contain 30,000 nuclear weapons as of July 1990, and 27,000 as of July 1991; NRDC Nuclear Notebook, *Bulletin of the Atomic Scientists*, July/August 1990, p. 49 and July/August 1991, p. 48.

<sup>178</sup> Robert Gates, DCI, "Statement before the House Armed Services Committee Defense Policy Panel," 10 December 1991, p. 15.

<sup>179</sup> Lt. General James Clapper, USAF, Director, DIA, testimony before SASC hearing on "Threat Assessment, Military Strategy, and Defense Planning," 22 January 1992, S. Hrg, 102-755, pp. 24 and 32.

<sup>180</sup> Gen. Colin L. Powell, Chairman of the Joint Chiefs of Staff, testimony before the SASC on "DOD Authorization for Appropriations for FY 1993 and The Future Years Defense Program, Part 1," 31 January 1992, S. Hrg, 102-833 pp. 79-80.

Same in his "Testimony before U.S. Senate Committee on the Budget" hearing on "Concurrent Resolution on the Budget for Fiscal Year 1993," 3 February 1992, S. Hrg, 102-596 p. 121.

<sup>181</sup> "The uncertainty is plus or minus 5,000, which gives you a sense of how uncertain it is;" Lawrence Gershwin, NIO for Strategic Programs, CIA, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, p. 499.

Also see: Robert Gates, DCI, testimony before the SFRC, Hearings on "The START Treaty," 30 June 1992, S. Hrg. 102-607, Pt. 2, pp. 158 and 162.

In 1993, the CIA continued to refer to some 30,000 tactical and strategic weapons within the former Soviet Union.<sup>182</sup> However, it also noted that it counted 27,000 in Russia, and 3,000 strategic weapons outside of Russia.<sup>183</sup>

In January 1994, the CIA and DIA mentioned there were approximately 27,000 nuclear weapons in Russia.<sup>184</sup> However, in March 1994, the newly appointed Secretary of Defense William Perry said, 25,000 nuclear weapons were in the "hands of the former Soviet Union."<sup>185</sup> This number was repeated at the time of the release of the Nuclear Posture Review (NPR) in September 1994,<sup>186</sup> and into 1995.<sup>187</sup> In regards to tactical nuclear weapons, at the time the NPR was released, DOD estimated that Russia had "between 6,000 and 13,000 non-strategic nuclear weapons."<sup>188</sup>

However, in May 1995, the then head of U.S. Strategic Command (STRATCOM), Admiral Chiles said there were 20,000 nuclear weapons in Russia.<sup>189</sup> In October 1995, Secretary Perry told NBC's *Meet the Press* that Russia had approximately 20,000 nuclear weapons, although DOD Public Affairs subsequently clarified this was plus or minus 3,000 nuclear warheads.<sup>190</sup>

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<sup>182</sup> Lawrence Gershwin, NIO for Strategic Programs, testimony before SASC hearing on "Current Developments in the Former Soviet Union," 3 February 1993, S. Hrg. 103-242, p. 9.

See also: R. James Woolsey, DCI, testimony before SGAC hearing on "Proliferation Threats of the 1990s," 24 February 1993, S. Hrg. 103-208, pp. 12 and 52.

<sup>183</sup> R. James Woolsey, DCI, testimony before SGAC hearing on "Proliferation Threats of the 1990s," 24 February 1993, S. Hrg. 103-208, p. 52.

Also see: R. James Woolsey, DCI, testimony before the House Foreign Affairs Committee (HFAC), Subcommittee on International Security, International Organizations and Human Rights, Hearings on "U.S. Security Policy Toward Rogue Regimes," 28 July 1993, pp. 11 and 83.

<sup>184</sup> R. James Woolsey, DCI, "Statement before the Senate Select Committee on Intelligence, Hearing on 'Current and Projected National Security Threats to the United States and Its Interests Abroad,'" 25 January 1994, S. Hrg. 103-630, pp. 7 and 15; Lt. General James Clapper, USAF, Director, DIA, statement before the Senate Select Committee on Intelligence, Hearing on "Current and Projected National Security Threats to the United States and Its Interests Abroad," 25 January 1994, S. Hrg. 103-630, p. 22.

<sup>185</sup> Secretary of Defense William Perry, "United States Relationship With Russia," speech at George Washington University, 14 March 1994.

<sup>186</sup> Barbara Starr, "Perry Wants Speedier Russian Disarmament," *Jane's Defence Weekly*, 1 October 1994, p. 6.

<sup>187</sup> Secretary of Defense William Perry, "Pursuing a Strategy of Mutual Assured Safety," Remarks at the National Press Club, Washington, 5 January 1995; Office of the Assistant Secretary of Defense for Public Affairs, Department of Defense, "FY 1996-97 Defense Budget," Press Release No. 033-95, 6 February 1995.

<sup>188</sup> Office of the Assistant Secretary of Defense (Public Affairs), Department of Defense, "Press Conference with Secretary of Defense William Perry and Chairman of the Joint Chiefs of Staff Gen. Shalikashvili," Press Release No. 546-94, 22 September 1994.

<sup>189</sup> Admiral Hank Chiles, CINC STRATCOM, speech outline to the Navy League Convention, St. Louis, Missouri, 31 May 1995, received from STRATCOM Public Affairs, 6 November 1995.

<sup>190</sup> Author's conversation with DOD Public Affairs at the time of the interview.

In March 1996, a DOD Cooperative Threat Reduction (CTR) briefing listed 14,967 warheads in the four nuclear weapons republics in its "Overview of Threat; 1990 MOU Levels:" 11,296 warheads in Russia, 1,984 warheads in Ukraine, 1,462 warheads in Kazakhstan, and 225 warheads in Belarus.<sup>191</sup> By April 1996, DOD once again was saying that Russia had inherited 27,000 tactical and strategic warheads from the Soviet Union.<sup>192</sup> While in June 1996, the State Department said Russia's total inventory (deployed and non-deployed warheads) was thought to have decreased to "roughly 25,000" warheads from the 1990 total.<sup>193</sup>

In March 1997, DOD estimated that Russia had around 6,000 strategic weapons.<sup>194</sup> While General Eugene Habiger, then-Commander-in-Chief, U.S. Strategic Command said, "by most estimates, Russia retains some 20,000-25,000 nuclear weapons..., "<sup>195</sup> including 7,000 to more than 12,000 non-strategic warheads.<sup>196</sup> However, in November 1997, DOD said as of January 1997, the Russian strategic and tactical nuclear stockpile consisted of 25,000 warheads. This was "a reduction of more than 5,000 warheads since a major elimination program began in 1992."<sup>197</sup>

Finally, in March 1998, General Habiger increased his estimate of Russian tactical nuclear weapons, stating, "The gross number of tactical nuclear weapons in Russia today is estimated to fall in the range of 17,000 - 22,000."<sup>198</sup> With a little over 6,000 nuclear weapons estimated to be in the operational Russian strategic nuclear arsenal,<sup>199</sup> this suggests some 23,000 - 28,000 nuclear weapons remained in the Russian nuclear arsenal.

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<sup>191</sup> CTR briefing in SGAC, Permanent Subcommittee on Investigations, hearing on "Global Proliferation of Weapons of Mass Destruction," Part II, 22 March 1996, S. Hrg. 104-422, Pt. 2, p. 568.

<sup>192</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, April 1996, p. 31.

<sup>193</sup> Richard Morningstar, Special Advisor to the President and the Secretary of State on Assistance to the NIS, Department of State, "Answers to Questions for the Record" for his testimony to the HCIR hearing on "Effectiveness of U.S. Assistance Programs in Russia, Ukraine, Armenia, and the Other Newly Independent States," 13 June 1996, p. 212.

<sup>194</sup> Franklin Miller, Acting ASD, International Security Policy, testimony before the SASC, FY 1998, Strategic Forces, 5 March 1997, S. Hrg. 105-37, Pt. 7, p. 87.

<sup>195</sup> Statement of General Eugene Habiger, Commander-in-Chief (CINC), U.S. Strategic Command (STRATCOM), before the SASC, 13 March 1997, p. 4.

<sup>196</sup> One on One, Gen. Eugene Habiger (Interview), *Defense News*, 10-16 March 1997, p. 70.

<sup>197</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, November 1997, p. 43.

<sup>198</sup> General Eugene Habiger, testimony before the SASC, FY 1999, Strategic Forces, 31 March 1998, S. Hrg. 105-605, Pt. 7, p. 492 and 534.

<sup>199</sup> Estimate modified from START I MOU data exchange.

Table B1: Summary of U.S. Government Estimates of FSU/Russian Nuclear Weapons Arsenal 1991-1998		
Date	Number of Warheads	Comments
1991	30,000	2/3 of warheads in Russia; 15,000 strategic?
1992	30,000 or 27,000	30,000 +/- 5,000 warheads
1993	30,000	27,000 warheads in Russia
1994	27,000 or 25,000	6,000-13,000 tactical warheads
1995	20,000	+/- 3,000 warheads
1996	27,000 or 25,000	
1997	20,000 - 25,000	Includes 7,000-12,000+ tactical warheads. Reduced by 5,000+ warheads since 1992.
1998	23,000 - 28,000	17,000-22,000 tactical warheads

## 2. Numbers of Warheads Consolidated into Russian Storages

The estimates of the amounts of warheads withdrawn from service that were consolidated into Russian storages also vary.

### a. Overall Estimates of Strategic and Tactical Warheads Returned to Russia

In terms of the numbers of warheads outside Russia, which were subsequently returned, as noted, the CIA estimated one-third of the some 30,000 plus or minus 5,000 nuclear weapons in the former Soviet Union were outside Russia.<sup>200</sup> In 1993, the CIA said that in the fall of 1991, the CIA estimated that 6,000 - 9,000 nuclear weapons were outside of Russia, 3,000 of which were strategic, and the rest were tactical.<sup>201</sup> Thus, by this accounting, 3,000 - 6,000 tactical nuclear weapons were returned to Russia prior to May 1992. In 1994, DOD stated that over 4,000 tactical nuclear weapons were returned from Ukraine, Kazakhstan, and Belarus to Russia.<sup>202</sup> In November 1996, the White House

<sup>200</sup> Robert Gates, DCI, "Statement before the House Armed Services Committee Defense Policy Panel," 10 December 1991, p. 15.

<sup>201</sup> Lawrence Gershwin, NIO for Strategic Programs, CIA, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, p. 495.

<sup>202</sup> Ashton Carter, ASD, International Security Policy, testimony before the HASC on "National Defense Authorization Act for Fiscal Year 1995, Authorization and Oversight," 28 April 1994, HASC, No. 103-32, pp. 1132-1133.

announced that "over 6,000" strategic and tactical nuclear weapons were removed from Kazakhstan, Ukraine, Belarus over the past five years.<sup>203</sup> Finally, in March 1997, the DOD said that, "3,300 strategic nuclear warheads and roughly 2,600 tactical nuclear warheads," were in Ukraine, Kazakhstan, and Belarus in 1991.<sup>204</sup>

U.S. and Russian officials have variously referred to "some," "nearly," or "over" 3,000,<sup>205</sup> 3,200,<sup>206</sup> 3,300<sup>207</sup>, 3,400<sup>208</sup> and 3,600<sup>209</sup> strategic nuclear weapons as being in Ukraine, Kazakhstan, and Belarus when the Soviet Union broke up. The variation seems to come from using different permutations of START I MOU data exchanges and START I and II warhead counting rules. After the START I September 1990 data exchange, another 27 SS-25s were deployed to Belarus and an net additional 10 bombers were deployed to Ukraine. Also, START II counting rules attribute more weapons to bombers than the START

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<sup>203</sup> The White House, Office of the Press Secretary, Statement by the Press Secretary, "Removal of Nuclear Weapons from Belarus, Kazakhstan and Ukraine," 27 November 1996.

<sup>204</sup> Franklin Miller, Acting ASD, International Security Policy, testimony before the SASC, FY 1998, Strategic Forces, 5 March 1997, S. Hrg. 105-37, Pt. 7, pp. 61 and 72.

<sup>205</sup> Lawrence Gershwin, NIO for Strategic Programs, testimony before SASC hearing on "Current Developments in the Former Soviet Union," 3 February 1993, S. Hrg. 103-242, p. 9; R. James Woolsey, DCI, testimony before the HFAC, Subcommittee on International Security, International Organizations and Human Rights, Hearings on "U.S. Security Policy Toward Rogue Regimes," 28 July 1993, pp. 11 and 83; Colonel Oleg Falichev, Interview with Col. General Yevgeny Maslin, "Who Has the Keys to the Nuclear Arsenal," *Krasnaya Zvezda*, 26 November 1993, (FBIS-SOV-93-228); Ashton Carter, ASD, Nuclear Security and Counterproliferation, testimony on "Nuclear Disarmament of the Former Soviet Union," before the HAC "DOD Appropriations for 1995, Part 4," 9 March 1994, p. 521; John V. Ruberto, Deputy Assistant Secretary of Defense (DASD) for Nuclear, Chemical and Biological Defense Programs, testimony to the HCIR hearing on "Effectiveness of U.S. Assistance Programs in Russia, Ukraine, Armenia, and the Other Newly Independent States," 13 June 1996, p. 93.

<sup>206</sup> Harold Smith, ASD, Atomic Energy, testimony to the HIRC hearings on "Newly Independent States of the Former Soviet Union: U.S. Policy and Assistance," 14 November 1995, p. 123.

<sup>207</sup> John Holum, Director, Arms Control and Disarmament Agency, 31 January 1995 and Douglas MacEachin, Deputy Director of Intelligence, CIA, 28 February 1995, testimony before the SFRC, Hearings on "Consideration of Ratification of the Treaty Between the U.S. and the Russian Federation on Further Reduction and Limitations of Strategic Offensive Arms (The START Treaty) Treaty Doc. 103-1," S. Hrg. 104-30, p. 23; Harold Smith, "Cooperative Threat Reduction: Defense by Other Means," *Defense* 97, Issue 3, pp. 44-45; Franklin Miller, Acting ASD, International Security Policy, testimony before the SASC, FY 1998, Strategic Forces, 5 March 1997, S. Hrg. 105-37, Pt. 7, pp. 61 and 72.

<sup>208</sup> Susan Koch, DASD, Threat Reduction Policy, testimony before the SASC, FY 1997, Strategic Forces, 29 March 1996, S. Hrg. 104-532, Pt. 7, p. 481; Anthony Lake, Assistant to the President for National Security Affairs, "Remarks To The Institute For The Study Of Diplomacy Georgetown University Washington, D.C.," 8 October 1996.

<sup>209</sup> 3,671 nuclear weapons are listed in CTR briefing in SGAC, Permanent Subcommittee on Investigations, hearing on "Global Proliferation of Weapons of Mass Destruction," Part II, 22 March 1996, S. Hrg. 104-422, Pt. 2, p. 568.

I counting rules.<sup>210</sup> Thus, using START II counting rules and some modifications to the START I September 1990 MOU baseline, some 3,311 strategic nuclear warheads may have been outside of Russia when the Soviet Union dissolved rather than the 2,928 counted in the START I September 1990 MOU.

Table B2: Five Estimates of Strategic Nuclear Warheads in Ukraine, Kazakhstan and Belarus at the end of 1991 based on the September 1990 and December 1994 START I MOU Data Exchanges and CTR estimates					
	START I <sup>211</sup>	START I mod <sup>212</sup>	START I w/ START II Loadings <sup>213</sup>	START I mod w/START II Loadings <sup>214</sup>	CTR 1996
<b>Ukraine</b>					
ICBMs	1240	1240	1240	1240	
Bombers	274	354	494	580	
<b>Total</b>	<b>1,514</b>	<b>1,594</b>	<b>1,734</b>	<b>1,820</b>	<b>1,984<sup>215</sup></b>
<b>Kazakhstan</b>					
ICBMs	1040	1040	1040	1040	
Bombers	320	320	370	370	
<b>Total</b>	<b>1,360</b>	<b>1,360</b>	<b>1,410</b>	<b>1,410</b>	<b>1,462</b>
<b>Belarus</b>					
ICBMs	54	81	54	81	
<b>Total</b>	<b>54</b>	<b>81</b>	<b>54</b>	<b>81</b>	<b>225</b>
<b>GRAND TOTAL</b>	<b>2,928</b>	<b>3,035</b>	<b>3,198</b>	<b>3,311</b>	<b>3,671</b>

By January 1995, after a year of strategic warhead shipments to Russia from Ukraine, Kazakhstan, and Belarus, the U.S. claimed "almost 900" warheads from Ukraine, Kazakhstan, and Belarus had been removed to Russia.<sup>216</sup> By March 1995, U.S. officials said, "over 1,000" warheads from these three countries had been taken to Russia,<sup>217</sup> and by May 1995, they claimed over 2,100 had been returned to Russia, some 700 from Ukraine, and over 1,400

<sup>210</sup> Russian ALCM carrying bombers were counted with eight warheads and non-ALCM bombers with one warhead under START I. Under START II bombers were attributed with a more accurate load and Bear H bombers carry 6 or 16 warheads and Blackjack bombers carry 12 warheads.

<sup>211</sup> Uses September 1990 MOU data with START I counting rules.

<sup>212</sup> Uses September 1990 MOU modified with December 1994 MOU and additional information, and START I counting rules.

<sup>213</sup> Uses September 1990 MOU data with START II counting rules.

<sup>214</sup> Uses September 1990 MOU modified with December 1994 MOU and additional information, and START II counting rules.

<sup>215</sup> Note: A White House statement also claimed there were 1,900 strategic warheads in Ukraine; White House Press Release, The White House Office of the Press Secretary, "Fact Sheet: Removal of Nuclear Warheads from Ukraine," 1 June 1996.

<sup>216</sup> Secretary of Defense William Perry, "Pursuing a Strategy of Mutual Assured Safety," Remarks at the National Press Club, Washington, 5 January 1995.

<sup>217</sup> Harold Smith, ASD, Atomic Energy, testimony on "Counterproliferation of Weapons," before the HAC "DOD Appropriations for 1995, Part 5," 1 March 1995, p. 252.

from Kazakhstan.<sup>218</sup> In November 1995, Harold Smith, Assistant to the Secretary of Defense for Atomic Energy, first said that 2,000 nuclear weapons had been shipped to Russia, but corrected this later in his congressional testimony, saying that in fact 2,800 had been transferred.<sup>219</sup> By early March 1996, the DOD officials said that over 2,800 warheads had been returned.<sup>220</sup> By late March 1996, they reported that total of 2,883 strategic warheads had been returned to Russia from Ukraine, Kazakhstan and Belarus.<sup>221</sup> By 1 June 1996, all nuclear weapons were withdrawn from Ukraine, and by late November 1996, the last few SS-25 ICBMs were withdrawn from Belarus.

### b. From Ukraine

In terms of the numbers of nuclear weapons located in the Ukraine when the Soviet Union dissolved: in December 1991, Russian and Ukrainian officials claimed some of the 4,000 nuclear weapons in Ukraine had been removed.<sup>222</sup> In January 1992, *Krasnaya Zvezda* reported that according to "experts' figures" 1,408 strategic warheads and 2,605 tactical warheads were in Ukraine.<sup>223</sup> In March 1992, one report claimed 2,390 tactical nuclear weapons were on Ukrainian territory, even after 57% of the tactical nuclear weapons had been removed.<sup>224</sup> Also, in May 1992, Marshal Shaposhnikov of the CIS repeated that

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<sup>218</sup> Walter Slocombe, Under Secretary of Defense for Policy, "Prepared Statement to the SASC," hearing on "National Security Implications of U.S. Ratification of the Strategic Arms Reduction Treaty -- START II," S. Hrg. 104-362, 17 May 1995, p. 15.

<sup>219</sup> Harold Smith, ASD, Atomic Energy, testimony to the HIRC hearings on "Newly Independent States of the Former Soviet Union: U.S. Policy and Assistance," 14 November 1995, pp. 13, 124, and 402.

<sup>220</sup> William Perry, Secretary of Defense, testimony before the SASC, FY 1997, 5 March 1996, S. Hrg. 104-532, Pt. 1, p. 117.

Although CTR information from February 1996, listed 3,571 warheads in Ukraine, Kazakhstan, and Belarus as of 1990, it counted 1,218 warheads as still remaining in Ukraine and Belarus, suggesting some 2,453 warheads had been removed; CTR briefing in SGAC, Permanent Subcommittee on Investigations, hearing on "Global Proliferation of Weapons of Mass Destruction," Part II, 22 March 1996, S. Hrg. 104-422, Pt. 2, pp. 568-569.

<sup>221</sup> Susan Koch, DASD, Threat Reduction Policy, testimony before the SASC, FY 1997, Strategic Forces, 29 March 1996, S. Hrg. 104-532, Pt. 7, p. 462.

<sup>222</sup> William J. Broad, "Moscow Begins Withdrawal of Its Nuclear Weapons From Ukraine," *The New York Times*, 21 December 1991.

<sup>223</sup> Lt. Col. D. Anatolyev, "Withdrawal of Nuclear Weapons from Ukrainian Territory Has Begun," *Krasnaya Zvezda*, 14 January 1992, (JPRS-TND-92-002, 31 January 1992, p. 40).

<sup>224</sup> I.e., some 5,560 tactical warheads may have been in Ukraine; K. Belyaninov, "43 Percent of Tactical Weapons Remain in the Ukraine," *Komsomolskaya Pravda*, 26 March 1992, (JPRS-TND-92-010, 8 April 1992, p. 4).

Several sources reported that 57 percent of tactical nuclear weapons in the Ukraine had been removed by this point in time: *ITAR-TASS* World Service cited General Zelentsov of the MOD's 12th Main Directorate as telling a press conference on 17 March 1992 that "57% of the nuclear weapons, slated for destruction, have already been moved out of Ukraine;" BBC Summary of World Broadcasts, editorial report, "Officials Deny

some 2,000 nuclear weapons were in Ukraine, roughly a third of what was there in late 1991.<sup>225</sup> In November 1993, General Yevgeny Maslin commented that 600 warheads for bombers and 1,200 warheads on ICBMs were in Ukraine.<sup>226</sup> In October 1994, U.S. Assistant Secretary of Defense Ashton Carter told Congress that 610 of the 1,734 warheads on Ukrainian territory had been removed from deployment.<sup>227</sup> In June 1996, General Maslin said that "in the last three years, [sic] 3,500 nuclear weapons," were removed from Ukraine, "including approximately 2,000 tactical nuclear warheads."<sup>228</sup> In June 1996, the White House, remarking on the Ukrainian declaration that all nuclear weapons had been removed from the territory of the Ukraine, said that, "In 1991, there were more than 4,000 strategic and tactical nuclear warheads in Ukraine."<sup>229</sup> The White House fact sheet on the announcement said there were some 1,900 strategic nuclear weapons in Ukraine as of January 1994, and in addition some 2,500 tactical nuclear weapons were transferred to Russia during 1991-1992.<sup>230</sup>

In late February 1994, the first strategic warheads to be removed were loaded on a special train, which left for Russia in early March.<sup>231</sup> By May 1994, Ukraine had deactivated all of its 46 SS-24 ICBMs and removed the 460 warheads from the missiles to

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Reported Thefts of Nuclear Weapons and Materials," BBC Summary of World Broadcasts, 20 March 1992. See also: R. Jeffrey Smith and David Hoffman, "U.S. Protests Interruption In Moving Ukrainian Arms; Kiev Cites Russian Stance on Destruction," *The Washington Post*, 14 March 1992.

<sup>225</sup> *Agence France Presse*, "Ukraine Transfers All Tactical Nuclear Arms to Russia: CIS Command," 6 May 1992.

<sup>226</sup> Colonel Oleg Falichev, Interview with Col. General Yevgeny Maslin, "Who Has the Keys to the Nuclear Arsenal," *Krasnaya Zvezda*, 26 November 1993, (FBIS-SOV-93-228).

Note: Ukrainian people's deputy Col. Valery Izmalkov claimed that the warheads for the bombers in Ukraine were removed along with the tactical weapons in the spring of 1992; Col. Valery Izmalkov, "A Nuclear Missile is Not a Stone Axe," *Holos Ukrayiny*, 22 December 1992, (JPRS-TND-93-002, 15 January 1993, p. 26).

<sup>227</sup> Ashton Carter, ASD, International Security Policy, testimony before the SFRC, hearing on "Aid to Russia and Other Former Soviet Republics, 4 October 1994, p. 3.

<sup>228</sup> Col. General Yevgeny Maslin, remarks on U.S. and Russian Perspectives on the Cooperative Threat Reduction Program, made at the U.S. Defense Special Weapons Agency conference, "Walking the Walk: Controlling Arms in the 1990s," in "Summary of the Fifth Annual International Conference on Controlling Arms, 3-6 June 1996, Norfolk, VA.

<sup>229</sup> President William Clinton, The White House Office of Press Secretary, "Statement By The President: Removal of Nuclear Warheads from Ukraine and White House Press Release," 1 June 1996.

<sup>230</sup> White House Press Release, The White House Office of the Press Secretary, "Fact Sheet: Removal of Nuclear Warheads from Ukraine," 1 June 1996.

<sup>231</sup> The shipments seemingly encompassed groups of 60 warheads; Pavel Felgengauer, "Disarmament: evacuation of warheads from Ukraine begins. The first tangible result of Russian-American partnership," *Sogodnya*, 2 March 1994, (BBC Summary of World Broadcasts, 3 March 1994); Reuters, "60 Warheads Leave Ukraine To Be Dismantled in Russia," *The New York Times*, 6 March 1994; Ashton Carter, ASD, Nuclear Security and Counterproliferation, testimony on "Nuclear Disarmament of the Former Soviet Union," before the HAC "DOD Appropriations for 1995, Part 4," 9 March 1994, p. 513.

storages.<sup>232</sup> At least 30 of the 130 SS-19s with 180 warheads were also removed from service.<sup>233</sup> By 11 August, 300 strategic warheads reportedly had been shipped to Russia,<sup>234</sup> and by 4 October, 360 had been sent to Russia for dismantlement.<sup>235</sup> By November 1994, Ukrainian Defense Minister Valery Shmarov said about 400 warheads had transferred to Russia.<sup>236</sup> Overall, according to a December 1994 report from the Gore-Chernomyrdin Commission, 422 warheads seemingly were to be removed to Russia in 1994.<sup>237</sup>

In February 1995, then Commander of the Strategic Rocket Forces Col. General Igor Sergeyev said 420 warheads had been returned to Russia from Ukraine.<sup>238</sup> By May 1995, U.S. officials claimed "roughly 700" warheads had been transferred to Russia.<sup>239</sup> As of December 1995, according to the DOD, "Ukrainian officials said that about 1,410 ICBM and air-launched cruise missile (ALCM) warheads had been returned to Russia."<sup>240</sup> As of February 1996, Susan Koch, Deputy Assistant Secretary of Defense, Threat Reduction Policy, told Congress in her written testimony that there were "fewer than 500 warheads left on Ukrainian soil." She elaborated in response to questioning that the number was "slightly over

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<sup>232</sup> "Politics," *Moscow News*, 6 May 1994, reporting on Col. General Igor Sergeyev's, the Strategic Rocket Forces Commander-in-Chief, comments to a meeting of foreign military attaches.

<sup>233</sup> According to Ashton Carter's, ASD, International Security Policy, testimony before the HASC on "National Defense Authorization Act for Fiscal Year 1995, Authorization and Oversight," 28 April 1994, HASC, No. 103-32, p. 1132.

Note: However, the warhead overcrowding problem in a Ukraine nuclear weapons storage in fall 1993 was seemingly due to the deactivation of some or all of the 40 SS-19 ICBMs at Pervomaysk.

<sup>234</sup> Then Ukrainian Defense Minister Vitaly Radetsky said in an interview with the *Kievskiy Vedomosti* newspaper that 300 warheads had been withdrawn by 11 August; *Interfax*, "Ministry Reports 300 Nuclear Warheads Withdrawn," 11 August 1994, (FBIS-SOV-94-156, 11 August 1994); *Reuters*, "Ukraine to Take Time Over Signing NPT -- Deputy," 1 September 1994.

<sup>235</sup> Ashton Carter, ASD, International Security Policy, testimony before the SFRC, hearing on "Aid to Russia and Other Former Soviet Republics, 4 October 1994, p. 3.

<sup>236</sup> David Storey, "Unhappy Ukraine seeks more direct U.S. aid," *Reuters*, 16 November 1994.

<sup>237</sup> "As of December 15, 1994, the Russian side had removed from the territory of Ukraine and had dismantled 333 nuclear warheads out of a total of 422 to be removed according to the schedule;" Joint Russian-American Commission on Economic and Technological Cooperation, "Report of the Nuclear Energy Committee," Moscow, 14-16 December 1994, p. 2.

Per the Ukrainian Defense Minister's statement above, it seems as if more warheads were removed (some 400) than dismantled (333).

<sup>238</sup> Gennady Miranovich and Alexander Dolinin, interview with Col. General Igor Sergeyev, "Colonel General Igor Sergeyev: Missilemen Have Launch Keys, President has Nuclear Attache Case," *Krasnaya Zvezda*, (FBIS-SOV-95-027, 9 February 1995, p. 14).

<sup>239</sup> Walter Slocombe, Under Secretary of Defense for Policy, "Prepared Statement to the SASC," hearing on "National Security Implications of U.S. Ratification of the Strategic Arms Reduction Treaty -- START II," S. Hrg. 104-362, 17 May 1995, p. 15.

<sup>240</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, April 1996, p. 33.

300," including 18 warheads in Belarus.<sup>241</sup> By 1 June 1996 all strategic nuclear weapons had been removed from Ukraine.<sup>242</sup>

### c. From Kazakhstan

Shipments of strategic nuclear warheads from Russia to Kazakhstan started in January - February 1994, when strategic bombers and perhaps 12 SS-18 missiles with their 120 warheads were returned to Russia,<sup>243</sup> but only after March 1994 did they begin in earnest. By early February 1995, then Commander of the Strategic Rocket Forces Col. General Igor Sergeyev said that 632 warheads had been withdrawn from Kazakhstan and 266 remained.<sup>244</sup> The remaining nuclear weapons, however, were transferred over the next several weeks, and by April 1995, all the strategic nuclear warheads in Kazakhstan had been returned to Russia.

### d. From Belarus

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<sup>241</sup> Susan Koch, DASD, Threat Reduction Policy, testimony before the SASC, FY 1997, Strategic Forces, 29 March 1996, S. Hrg. 104-532, Pt. 7, pp. 462 and 481.

<sup>242</sup> "Kuchma Issues Statement on Removal of Nuclear Weapons," *Kiev UT-1 Television Network*, 1 June 1996, (FBIS-SOV-96-107, 1 June 1996); *Interfax*, "Kuchma Says All Nuclear Weapons Removed From Ukraine," 1 June 1996, (FBIS-TAC-96-007, 1 June 1996); President William Clinton, The White House Office of Press Secretary, "Statement By The President: Removal of Nuclear Warheads from Ukraine and White House Press Release," 1 June 1996.

<sup>243</sup> On 28 February 1994, Russia stated that the last of four of the 40 Tu-95MS Bear bombers in Kazakhstan had been returned to Russia; "Russia Pulls Out Strategic Bombers From Kazakhstan," *Reuters*, 28 February 1994. It is unclear whether the nuclear weapons associated with the bombers were removed during this time. However, the source of the story, an unnamed Air Force official, told Reuters that the bombers were armed with cruise missiles.

Reiss claims that 12 missile and their associated 120 warheads were shipped back to Russia; Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities*, (Washington, DC: Woodrow Wilson Center Press, 1995), p. 149.

In any event, the U.S. DOD claimed that all Bear H bombers had been returned to Russia and 12 SS-18s with 120 warheads had left Kazakhstan by April 1994; Ashton Carter, ASD, International Security Policy, testimony before the HASC on "National Defense Authorization Act for Fiscal Year 1995, Authorization and Oversight," 28 April 1994, HASC, No. 103-32, p. 1132; Harold Smith, ASD, Atomic Energy, testimony before the HASC on "National Defense Authorization Act for Fiscal Year 1995, Authorization and Oversight," 28 April 1994, HASC, No. 103-32, p. 1154. See also the above discussion on when weapons were withdrawn from Kazakhstan.

<sup>244</sup> Gennady Miranovich and Alexander Dolinin, interview with Col. General Igor Sergeyev, "Colonel General Igor Sergeyev: Missilemen Have Launch Keys, President has 'Nuclear Attache Case,'" *Krasnaya Zvezda*, (FBIS-SOV-95-027, 9 February 1995, p. 14).

These numbers seemingly referred to warheads which were deployed on the 104 SS-18 ICBMs in Kazakhstan. If so only 898 ICBM warheads may have been in Kazakhstan. This suggests some of the SS-18s were mods which did not carry the 10 warheads assigned to the SS-18s under the START treaty or that perhaps some warheads were removed prior to the collapse of the Soviet Union.

Appendix B: Stockpile Sizes and Numbers of Warheads Withdrawn

The first nine SS-25s were withdrawn from Belarus in July 1993.<sup>245</sup> After this, withdrawals proceeded more or less regularly until July 1995, when the new Byelorussian President Alexander Lukashenko suspended the withdrawal of the remaining 18 SS-25 missiles.<sup>246</sup> The ensuing political wrangling between Russia and Belarus delayed the withdrawal of the missiles until 23-27 November 1996 (see Belarus section above). In November 1996, the White House announced that more than 500 strategic and tactical nuclear warheads were in Belarus in 1991.<sup>247</sup> Some 81 - 225 were strategic nuclear weapons and the rest tactical.<sup>248</sup> Thus, perhaps 275 - 419 tactical nuclear weapons were withdrawn by spring 1992.

Table B3: Summary of Estimates of Dates of Nuclear Warhead Withdrawals into Russian Central Storages		
	Tactical Nuclear Warheads Withdrawn (start-finish)	Strategic Nuclear Warheads Withdrawn
Poland	1988/89?-1st half 1990	-
Czechoslovakia	1988/89?-3/90	-
Hungary	1988/89-summer 1990	-
E. Germany	1988/89-7/91	-
Transcaucasus	1989?- before summer 1990	-
Central Asia	1989/90?-by 12/91	-
Baltics	1989/90?-by 12/91	-
Ukraine	1990/91?-5/6 May 1992	3/94-5/96
Kazakhstan	1990?-by 12/91	1/94-4/95
Belarus	1990/91-early/Spring 1992	mid-1993-11/96

<sup>245</sup> The first regiment of nine SS-25s stationed at Postavy was withdrawn in mid-1993; Victor Litovkin, "Belarus gives up strategic nuclear systems forever. Now only Russia will have them," *Izvestia*, 17 March 1994, (BBC Summary of World Broadcasts, 21 March 1994). "Withdrawal of Nuclear Weapons from Belarus and Ukraine," *Jane's Intelligence Review - Pointer*, 1 April 1994.

<sup>246</sup> Victor Litovkin, "President Lukashenko Halts Russian Strategic Forces Pull-Out From Belarus," *Izvestia*, 6 July 1995, (Russian Press Digest).

<sup>247</sup> The White House, Office of the Press Secretary, Statement by the Press Secretary, "Removal of Nuclear Weapons from Belarus, Kazakhstan and Ukraine," 27 November 1996.

<sup>248</sup> Also note: Aerial bombs for front-line aviation, nuclear anti-aircraft missile pods, and air-launched cruise missiles, "have been totally withdrawn from Belarus. In the last month roughly 200 warheads and bombs have been withdrawn from there," Victor Litovkin, "No more tactical nuclear weapons on Ukrainian and Byelorussian territory. Russia continues to destroy them," *Izvestia*, 7 May 1992, (BBC Summary of World Broadcasts, 8 May 1992).

### e. From Russia

Since the question to be addressed is the filling or overfilling of nuclear weapons storages in Russia, some estimate of the numbers of Russian-based nuclear weapons withdrawn from operational deployments to storages is needed.

#### (1) Strategic Weapons in Russia

From September 1990 until July 1998, Russia officially declared in the START I MOUs that 731 ICBMs and SLBMs which carried 1,130 warheads were removed from service. However, some MIRVed ICBMs and a number of older SSBNs (Yankees and Delta Is) are probably not in service and their warheads have been removed to storages. Also, at least two Typhoon submarines have been retired and have had their missiles removed.<sup>249</sup>

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<sup>249</sup> According to one retired senior Admiral, 23 SSBNs, including two Typhoons, have been retired from the navy before their time in the last five years; L. Belyshev, Rear Admiral (Ret.), candidate of technical sciences, "Ship-Building and the Development of the Navy," *Morskoy Sbornik*, No. 11, 1996, pp. 63-67.

A third Typhoon also seems to be out of service; A.D. Baker, "International Navies Survey," *U.S. Naval Institute Proceedings*, March 1998, p. 82.

If the level of financing seen during 1990-1995 continues, the Russian Navy says all the Typhoons will be retired by 2003; Admiral A.M. Ovcharenko, "Russia's Strategic Naval Forces. Problems and Prospects," *Vooruzheniye, Politika, Konversiya*, No. 2 (13), 1996, pp. 38-40, (FBIS-UMA-96-245-S, 26 December 1996).

In 1996-1997, the Russian Navy conducted three sets of launchings from Typhoon submarines to eliminate retired SS-N-20 SLBMs, destroying approximately 40 missiles, the equivalent to the load-out of two Typhoon submarines (each submarine can carry 20 SS-N-20 SLBMs). As of 1 July 1998, although six Typhoon SSBNs were still counted in service, the 1 July 1998 START I MOU data exchange lists only 82 SS-N-20 SLBMs as being deployed.

The first launching, which involved one missile, occurred in 1996 and proved the feasibility of eliminating the SS-N-20s through a launch-and-destruct method. The second launching occurred on 27-28 March 1997 and involved 19 missiles. The third took place on 3-4 December 1997 and apparently destroyed 20 missiles; Vladimir Novikov, "Twenty ballistic missiles destroyed in Barents Sea under START-1 treaty," *ITAR-TASS*, 2 April 1997; "Russian Navy destroys SS-N-20s by low-level launches," *Aerospace Daily*, 7 April 1997; "Northern Fleet destroys Sea-launched ballistic missiles," *ITAR-TASS*, 4 December 1997; "Moscow Files Complaint With U.S. Over Sub Incident," *The Washington Post*, 5 May 1998.

It appears Russia will begin to start scrapping the Typhoon SSBNs which are out of service in 1999. U.S. Senator Richard Lugar learned about the Russian plans to dismantle the Typhoons during his November 1998 trip to Russia. It seems as if three or more Typhoons may be dismantled. Senator Lugar said, "If we're going to dismantle the Typhoons, we ought not to quit after the third, if all six are available;" "News Conference with Senator Richard Lugar (R-IN), Subject: Trip to Russia and Ukraine," 24 November 1998, Senate Radio/TV Gallery, The Capitol, Washington, D.C. (Federal News Service); Sen. Dick Lugar, "Press Conference Statement," News Release, 24 November 1998.

Prior to this visit, it was unclear whether Russia had the facilities to scrap the Typhoon SSBNs in a timely manner and thus it was not certain that Russia would be able to count them out of service under the START I counting rules (a SSBN declared out of service needs to be scrapped, depending on the method, within 180 or 270 days after initiating the process of eliminating the SLBM launchers on the SSBN; see: "Protocol on

Thus, an additional 704 warheads from 272 missiles are in storages. In total, some 1,003 missiles and 1,834 warheads have been taken-off deployment and removed to central storages.

During this time, a net of 77 new warheads were deployed on three SS-24s, 45 SS-25s and 2 SS-27 ICBMs (the 81 SS-25s brought back from Belarus are counted as redeployed and thus are not in the totals withdrawn or newly deployed). Assuming some recycling of withdrawn warheads to produce new ones, overall, then some 1,757 Russian strategic warheads may have been removed from launchers and placed in storages (in line with traditional practice, some parts of newly or older retired warheads would be used in production of new warheads for deployment).<sup>250</sup>

In addition to these arms control reductions, it appears nuclear weapons stored at the Mozdok bomber base for Bear H6 and Bear H16 aircraft (316 warheads under the START II counting rules) were taken to the Engels bomber base due to fighting in the Caucasus region.<sup>251</sup> Thus, in total, 2,073 Russian strategic warheads would have needed storing (see Table B4 below).<sup>252</sup>

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Procedures Governing the Conversion or Elimination of the Items Subject to the Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Reduction and Limitation of Strategic Offensive Arms," in the *Department of State Dispatch Supplement*, October 1991, Vol. 2, Supplement No. 5.

If Russia had not been able to scrap the non-operational Typhoon SSBNs, their warheads would have been counted towards Russia's START I warhead totals and Russia would have had to compensate by retiring other strategic systems.

<sup>250</sup> According to the U.S. government, historically nuclear material from dismantled Russian warheads "was recycled into new warheads;" "Certification of the Commitments of the Russian Federation: Justification," 8 April 1992, in the SFRC, Hearings on "U.S. Plans and Programs Regarding Dismantling of Nuclear Weapons in the Former Soviet Union," 27 July 1992, S. Hrg. 102-872, p. 37.

<sup>251</sup> "Firstly, as soon as disturbances began in the Caucasus all the warheads were removed from Mozdok;" Press Conference with Lt. General Igor Valynkin, Chief 12th Main Directorate of the Russian Ministry of Defense, regarding the nuclear security in Russian Federation armed forces, Russian Ministry of Defense, Official Kremlin International News Broadcast, 25 September 1997, (Federal News Service).

They may be stored at the Engels air base: "...the nuclear weapons were relocated to an air base in the city of Engels. We were told this by someone close to the Russian air force command," Boris Vishnevsky on interview with retired Colonel Zaki Zaynullin, "How Many Nuclear Warheads Does Dudayev Have? An Eye-Witness Claims: It Runs Into Tens, If Not Hundreds," *Komsomolskaya Pravda*, 1-8 December 1995, (FBIS-SOV-95-232, 4 December 1995).

Finally, General Habiger also noted that, "The Russians have brought the bombers back from Mozdok and have put them at Engels;" General Eugene Habiger, "Department of Defense News Briefing," 16 June 1998. The 1 July 1998 START I MOU places most of the bombers that were at Mozdok at Engels.

<sup>252</sup> Note: In May 1994, the DOD estimated that Russia had deactivated 378 ballistic missile launchers and removed 510 strategic warheads from their launch vehicles since September 1990; Harold Smith, ASD, Atomic Energy, testimony before the HASC on "National Defense Authorization Act for Fiscal Year 1995, Authorization and Oversight," 28 April 1994, HASC, No. 103-32, p. 1154.

By May 1995, the DOD claimed "over 1,000" strategic warheads had been deactivated in Russia; Walter Slocombe, Under Secretary of Defense for Policy, "Prepared Statement to the SASC," hearing on "National

## Appendix B: Stockpile Sizes and Numbers of Warheads Withdrawn

Table B4: Total Strategic Warheads Placed in Russian Nuclear Weapons Storages by mid-1998 Due to Withdrawals from Former Soviet Republics, START I Reductions or Retired Systems							
Weapons Systems		Removed under START I Rules by 7/98		Additional Launchers/Warheads Unofficially out of Service		Total Strategic WHs Added to Russian Storages	
Russia	WHs	Launchers	WHs	Launchers	WHs	Launchers	WHs
SS-11	1	326	326	0	0	326	326
SS-13	1	40	40	0	0	40	40
SS-17	4	47	188	0	0	47	188
SS-18	10	24	240	0	0	24	240
SS-19	6	2	12	8	48	10	60
<b>Total ICBMs</b>		<b>439</b>	<b>806</b>	<b>8</b>	<b>48</b>	<b>447</b>	<b>854</b>
SS-N-6	1	176	176	16	16	192	192
SS-N-8	1	88	88	192	192	280	280
SS-N-17	1	12	12	0	0	12	12
SS-N-18	3	16	48	16	48	32	96
SS-N-20	10	0	0	40	400	40	400
SS-N-23	4	0	0	0	0	0	0
<b>Total SLBMs</b>		<b>292</b>	<b>324</b>	<b>264</b>	<b>656</b>	<b>556</b>	<b>980</b>
<b>TOTAL Russia</b>		<b>731</b>	<b>1,130</b>	<b>272</b>	<b>704</b>	<b>1,003</b>	<b>1,834</b>
30 SS-24, 45 SS-25, and 2 SS-27 new WHs deployed in Russia. Thus no need to store 77 WHs. However, 316 WHs from Mozdok redeployed into other Russian storages. Thus total into Russian storages is 1,834 + 77 + 316 =							2,073
<u>Ukraine</u>							
SS-19	6	130	780	0	0	130	780
SS-24	10	46	460	0	0	46	460
Bomber WHs		-	580	0	0	0	580
<b>Total Ukraine</b>		<b>176</b>	<b>1,820</b>	<b>0</b>	<b>0</b>	<b>176</b>	<b>1,820</b>
<u>Kazakhstan</u>							
SS-18	10	104	1,040	0	0	104	1,040
Bomber WHs			370	0	0	0	370
<b>Total Kazakhstan</b>		<b>104</b>	<b>1,410</b>	<b>0</b>	<b>0</b>	<b>104</b>	<b>1,410</b>
<b>TOTAL Ukraine/Kazakhstan</b>		<b>280</b>	<b>3,230</b>	<b>0</b>	<b>0</b>	<b>280</b>	<b>3,230</b>
<b>GRAND TOTAL</b>		<b>1,011</b>	<b>4,360</b>	<b>272</b>	<b>704</b>	<b>1,283</b>	<b>5,303</b>

Security Implications of U.S. Ratification of the Strategic Arms Reduction Treaty -- START II," S. Hrg. 104-362, 17 May 1995, p. 14.

Finally, in fall 1996, the DOD said Russia had removed over 1,200 deployed strategic warheads; Harold Smith, "Cooperative Threat Reduction: Defense by Other Means," *Defense* 97, Issue 3, pp. 44-45.

## Appendix B: Stockpile Sizes and Numbers of Warheads Withdrawn

The seven-year implementation period for START I will be finished by December 2001. Russia is already below the START I limit of 1,600 deployed ICBMs, SLBMs, and bombers and it is close to the 6,000 warhead limit. However, Russia still has some way to go to meet the limit of 4,900 warheads on ICBMs and SLBMs and the sublimit of 1,540 warheads on heavy ICBMs. Some additional 1,288 warheads may be removed to meet the START I limits.

Per the above discussion, 704 of these warheads have already been unofficially removed from deployment. Thus another 584 warheads will need to be moved to storages by the end of 2001 to meet START I limits (see Table B5 below).

# Appendix B: Stockpile Sizes and Numbers of Warheads Withdrawn

Table B5: Estimated Number of Strategic Warheads to be Withdrawn from Service Under START I and START II, 1999 - 2004											
Weapon System		START I Accountable WHs Deployed 7/98		WHs Removed to Meet START I Limits <sup>253</sup>		Possible START I Force 12/2001		WHs Already Removed	WHs to be Removed by 12/2001	START II Mandated Additional Removals by end 2003	Total WHs Removed 1999-2004
	WHs	Launchers	WHs	Launchers	WHs	Launchers	WHs				
SS-18	10	180	1,800	26	260	154	1,540	0	260	1,540	1,800
SS-19	6	168	1,008	46	276	122 <sup>254</sup>	732	48	228	627	855
SS-24	10	46	460	0	0	46	460	0	0	460	460
SS-25/27	1	362	362	0	0	400	400	0	0	0	0
<b>Total ICBMs</b>		<b>756</b>	<b>3,630</b>	<b>72</b>	<b>536</b>	<b>722</b>	<b>3,132</b>	<b>48</b>	<b>488</b>	<b>2,627</b>	<b>3,115</b>
SS-N-6	1	16	16	16	16	0	0	16	0	0	0
SS-N-8	1	192	192	192	192	0	0	192	0	0	0
SS-N-18	3	208	624	48	144	160 <sup>255</sup>	480	48	96	0	96
SS-N-20	10	120	1,200	40 <sup>256</sup>	400	80	800	400	0	0	0
SS-N-23	4	112	448	0	0	112	448	0	0	0	0
<b>Total SLBMs</b>		<b>648</b>	<b>2,480</b>	<b>296</b>	<b>752</b>	<b>352</b>	<b>1,728</b>	<b>656</b>	<b>96</b>	<b>0</b>	<b>96</b>
Bear		68	516	0	0	68	516	0	0	0	0
Blackjack		6	48	0	0	6	48	0	0	0	0
<b>Total Bombers</b>		<b>74</b>	<b>564<sup>257</sup></b>	<b>0</b>	<b>0</b>	<b>74</b>	<b>564</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>TOTAL</b>		<b>1,478</b>	<b>6,674</b>	<b>368</b>	<b>1,288</b>	<b>1,148</b>	<b>5,424</b>	<b>704</b>	<b>584</b>	<b>2,627</b>	<b>3,211</b>
WHs on ICBMs and SLBMs		1,404	6,110	368	1,288	1,074	4,860				

<sup>253</sup> 1,600 ICBM, SLBM and bomber launchers, including only 154 heavy ICBMs (i.e. SS-18s); 6,000 warheads on ICBMs, SLBMs, and bombers, including only 4,900 on ICBMs and SLBMs, only 1,540 on heavy ICBMs and only 1,100 on mobile ICBMs; START I Treaty, Article II.

<sup>254</sup> The first deployed SS-27 ICBMs are being placed in SS-19 silos at Tatischevo. The number of SS-19s ICBMs may continue to be reduced as the number of silo-based SS-27s increases. This estimate assumes approximately 20 SS-27s a year are deployed through December 2001. General Yakovlev, Commander of the Strategic Rocket Forces, has stated that Russia plans to deploy 1-2 regiments of SS-27 ICBMs a year (of 10 missiles each) up to 2001; General Vladimir Yakovlev, News Conference, 19 February 1998 (Federal News Service). If Russia does not deploy 20 SS-27s a year, the number of deployed SS-19s may be higher. If so, other missiles may be retired to stay under the START I mandated 4,900 ICBM and SLBM warhead limit.

<sup>255</sup> The estimate of 10 Delta IIIs in service by December 2001 may be generous. *Jane's Fighting Ships 1998-99* (p. 549) says only 9 Delta IIIs are operational, six in the Northern Fleet and three in the Pacific.

<sup>256</sup> Although three Typhoon SSBNs may be non-operational, not all three may be declared as such by 2001-2003 because decommissioning facilities may not be ready for the third submarine. If the third Typhoon is declared out of service, additional Delta IIIs or SS-19s could remain in service through 2001, or in the case of Delta IIIs, even beyond January 2004, and Russia would still be under its respective START I and START II warhead limits.

<sup>257</sup> Note: Under START II accounting rules, 814 warheads are considered to be deployed on these 74 bombers. Unlike the ICBMs and SLBMs which must meet the constraints of specific sub-levels, START II will not impose any additional reductions on bomber forces.

If START II enters into force or some de-alerting initiative down to START II levels is taken, Russia would have to deactivate another 2,627 warheads by the end of 2003. Assuming that the warheads would need to be kept in storages because deactivating would involve removal of warheads from missiles, this would include: 1,540 warheads from the remaining 154 SS-18 ICBMs; 627 warheads that would be removed from SS-19 ICBMs that would have to be eliminated and the 105 SS-19s that would have to be downloaded to one warhead; and 460 warheads from the MIRVed SS-24s which will be eliminated under the treaty. Thus over the next 6 years, some 3,211 warheads would have to be removed to storages.

If economic problems continue, Russian strategic forces may shrink beyond the levels allowed by START II. If so, 1,385 additional warheads could be removed from service: 800 warheads from the four remaining Typhoon SSBNs, 480 warheads from the 10 remaining Delta III SSBNs, and 105 warheads from the remaining 105 SS-19 ICBMs (bomber weapons are already in storages, so bomber or ALCM retirements due to aging or lack of financing won't necessarily add to any storage overloading problem).

Table B6: Estimated Strategic Warheads to be Placed in Storages, 1999 - end 2003 due to:	
START I (by end 2001)	584
START II (by end 2003)	2,627
Forced by economic constraints and aging systems (through 2004)	1,385
TOTAL	4,596

Thus, overall, in the most pressing case, taking into account START I, START II, and possible early retirements, 4,596 warheads could be removed from deployment and into storages by 2004.

## (2) Tactical Weapons in Russia

Understanding the situation with tactical nuclear weapons is even more complex. Russian and western analysts estimate that some 13,700 to 21,700 tactical nuclear weapons were in the Soviet Union in 1991, seemingly primarily in Russia, Ukraine, and Belarus. This stockpile included warheads withdrawn from Eastern Europe and INF weapons and presumably fit, even if tightly so, into storages in those three countries. If some 3,000 - 6,000 tactical nuclear weapons were outside Russia when the Soviet Union dissolved, then 7,300 to 18,700 tactical weapons may have been in Russia. As discussed in Appendix A, by mid-1992, the tactical weapons outside of Russia had been brought to storages in Russia, and during 1992-1993 most of the tactical nuclear weapons forward deployed in Russia were consolidated into national-level or service-level central storage sites.

# Appendix B: Stockpile Sizes and Numbers of Warheads Withdrawn

Table B7: Russian Tactical Nuclear Weapons									
	Estimates of Total Tactical Nuclear Weapons in Service in USSR in 1991		To be eliminated	Total to be eliminated		Estimated total to remain in Russian non-strategic arsenal		Withdrawn due to political and technical reasons (Russian estimates)	
	Russian	U.S. <sup>258</sup>		Russian	U.S.	Russian	U.S.	By 1997	Remaining
<b>Ground Forces</b>									
Rocket Forces	4,000	2,800	All by 2000	4,000	2,800	0	0	4,000	0
Artillery	2,000	2,000	All by 2000	2,000	2,000	0	0	2,000	0
Corps of Engineers (ADMs)	700	-	All by 1998	700	-	0	0	500	200
<b>TOTAL GROUND FORCES</b>	<b>6,700</b>	<b>4,800</b>		<b>6,700</b>	<b>4,800</b>	<b>0</b>	<b>0</b>	<b>6,500</b>	<b>200</b>
<b>Air Defense (SAMs)</b>	<b>3,000</b>	<b>2,800</b>	<b>1/2 by 1996</b>	<b>1,500</b>	<b>1,400</b>	<b>1,500</b>	<b>1,400</b>	<b>2,400</b>	<b>600</b>
<b>TOTAL AIR DEFENSE</b>	<b>3,000</b>	<b>2,800</b>		<b>1,500</b>	<b>1,400</b>	<b>1,500</b>	<b>1,400</b>	<b>2,400</b>	<b>600</b>
<b>AF Frontal Aviation (bombs, short range ASMs)</b>	<b>7,000</b>	<b>4,000</b>	<b>1/2 by 1996</b>	<b>3,500</b>	<b>2,000</b>	<b>3,500</b>	<b>2,000</b>	<b>6,000</b>	<b>1,000</b>
<b>TOTAL AIR FORCE</b>	<b>7,000</b>	<b>4,000</b>		<b>3,500</b>	<b>2,000</b>	<b>3,500</b>	<b>2,000</b>	<b>6,000</b>	<b>1,000</b>
<b>Navy</b>						<b>0</b>	<b>0</b>		<b>0</b>
Ships/Submarines (ASM, ASW, land-attack)	3,000	2,200	1/3 by 1995	1,000	726	2,000	1,474	1,000	2,000
Naval Aviation	2,000	1,200	1/2 by 1995 <sup>259</sup>	1,000	600	1,000	600	2,000	0
<b>TOTAL NAVY</b>	<b>5,000</b>	<b>3,400</b>		<b>2,000</b>	<b>1,326</b>	<b>3,000</b>	<b>2,074</b>	<b>3,000</b>	<b>2,000</b>
<b>GRAND TOTAL</b>	<b>21,700</b>	<b>15,000</b>		<b>13,700</b>	<b>9,526</b>	<b>8,000</b>	<b>5,474</b>	<b>17,900</b>	<b>3,800</b>

<sup>258</sup> 1991 U.S. estimates of Russian tactical nuclear arsenal from: Robert Norris and William Arkin, "Nuclear Notebook: Estimated Soviet Nuclear Stockpile (July 1991)," *Bulletin of the Atomic Scientists*, July/August 1991, p. 48.

<sup>259</sup> Note: Although Arbatov and NRDC calculate that 1/2 of naval aviation's nuclear weapons like frontal/tactical aviation's would be eliminated, in Gorbachev's 1991 speech naval aviation weapons are discussed in the context of other naval weapons, implying perhaps only 1/3 of these were scheduled for elimination.

## Appendix C: Russian Nuclear Warhead Storages and Overloading

### 1. Types, Numbers and Locations of Nuclear Weapons Storages

**Early History** The Soviet Union began constructing nuclear weapons storages in the late 1940s. A recently declassified 1965 U.S. National Intelligence Estimate (NIE) describes how the Soviet nuclear weapons storage system subsequently developed in three distinct phases during the 1950s and early 1960s: During 1951-1955, "about six stockpile sites of all classes," were created; in the next phase, covering approximately 1955-1958, "at least 18 additional stockpile sites of all classes were activated bringing the total to about 24 at the end of 1958;" and from 1958 until the publication of the NIE, a third phase "of rapidly accelerated construction," was apparent. Also, during the third phase, the capacity of existing sites was increased "substantially."

The NIE concluded that:

As the result of these developments the USSR has a comprehensive system of hardened stockpile facilities extending back in successive echelons from forward operational storage sites at military bases to national reserve facilities at remote interior locations.<sup>260</sup>

According to the NIE, there were three classes of Soviet nuclear weapons storage facilities: storage facilities associated with nuclear weapons production facilities, "national reserve stockpile facilities, and operational and regional storage sites at military bases in direct support of military operations."<sup>261</sup> This organization of nuclear storages seemingly persisted. A 1989 U.S. intelligence document made a differentiation between "national bunkers" and varieties of "direct support bunkers."<sup>262</sup>

**12th GUMO and Service Control of Nuclear Weapons Storages** The storages associated with the nuclear weapons production facilities and the national-level reserve stockpile storages are under the control of the 12th Main Directorate (Glavnoye Upravleniye Ministerstvo Oborony) or 12th GUMO of the Ministry of Defense. The 12th GUMO is one of the MOD's "main and central directorates" and serves as the organization in charge of storage and security of nuclear weapons. As well as controlling the national-level stockpile storage sites, the Directorate helps to develop the requirements for nuclear weapons, takes

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<sup>260</sup> CIA, *The Soviet Atomic Energy Program*, NIE 11-2A-65, (Top Secret; partially declassified), 19 May 1965, p. 19.

<sup>261</sup> CIA, *The Soviet Atomic Energy Program*, NIE 11-2A-65, (Top Secret; partially declassified), 19 May 1965, p. 19.

<sup>262</sup> See the discussion of nuclear weapons facilities in Defense Intelligence Agency/Headquarters U.S. European Command, "NATO Target Data Inventory (NTDI) Handbook," 1 January 1989, pp. 369-373, released under the Freedom of Information Act to Greenpeace. Types of non-national level bunkers include: Type I, Type II (Guitar), Type III (Cruciform), Type IV (ASM), Type V (ASM MOD), Type VI, Type VII (Arys Mod), Type VIII, Type IX (Arys), Type VIII (Single Bay) and Vault.

## Appendix C: Russian Nuclear Warheads Storages and Overfilling

possession of nuclear weapons upon production, controls the movement of nuclear weapons, services nuclear warheads, inspects nuclear weapons facilities, and provides the standards for the security of nuclear weapons in the possession of the armed services.<sup>263</sup>

The 12th GUMO had its origins in a special department which was formed on 4 September 1947 in the Ministry of Defense for the purpose of studying the United States' use of nuclear weapons and nuclear weapons effects. Shortly after the explosion of the first Soviet atomic bomb in 1949, the Main Directorate was established in the Ministry of Defense on the basis of the already existing department and parts of the First Main Directorate. Its mission was "to provide centralized direction of testing, stockpiling, and operating nuclear weapons and protection against nuclear weapons."<sup>264</sup> In 1959, the 12th Main Directorate became part of the newly-organized Strategic Rocket Forces. However, in 1974, the 12th Main Directorate was re-created as part of the Ministry of Defense.<sup>265</sup>

Today, all military research organizations and units immediately engaged in nuclear weapons work are directly subordinate to the 12th GUMO. In recent years the 12th GUMO has additionally become responsible for dismantling nuclear weapons prior to their final disassembly by the Ministry of Atomic Energy (Minatom), and ensuring the safety of existing ones.<sup>266</sup> According to General Igor Valynkin, the current head of the 12th GUMO, some 30,000 servicemen are in the 12th Directorate, 45 per cent of whom are officers.<sup>267</sup>

As for the other types of storages, when the Soviet Union collapsed, all five major branches of the Soviet armed services -- the Strategic Rocket Forces, Navy, Air Forces, Ground Forces and Air Defense Forces -- had nuclear-weapons under their control, ranging from intercontinental missiles and bombers to nuclear torpedoes on naval vessels, nuclear

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<sup>263</sup> Col. General Yevgeny Maslin, "Nuclear Weapons: Results and Prospects," *Vooruzheniye, Politika, Konversiya*, No. 4 (7), 1995, (JPRS-UMA-95-026, 27 June 1995, p. 29); Oleg Falichev, Interview with Col. Gen. Yevgeny Maslin, "Who Has the Keys to the Nuclear Arsenal," *Krasnaya Zvezda*, (FBIS-SOV-93-228, 30 November 1993, pp. 40-41); Vladimir Orlov, "Interview with General Yevgeny Maslin," *Yaderny Control*, May 1995; CIA, *The Soviet Approach to Nuclear Winter*, NI IIA 84-10006, (Secret; partially declassified), December 1984, p. 12.

<sup>264</sup> Col. General Yevgeny Maslin, "Nuclear Weapons: Results and Prospects," *Vooruzheniye, Politika, Konversiya*, No. 4 (7), 1995, (JPRS-UMA-95-026, 27 June 1995, p. 29).

<sup>265</sup> Pavel Podvig, ed., *Russian Strategic Nuclear Weapons*, (Moscow: Izdat, 1998).

It is not clear, prior to 1974, if the 12th GUMO was known as the 12th Main Directorate or had another name when it was part of the Ministry of Defense or Strategic Rocket Forces.

<sup>266</sup> Col. General Yevgeny Maslin, "Nuclear Weapons: Results and Prospects," *Vooruzheniye, Politika, Konversiya*, No. 4 (7), 1995, (JPRS-UMA-95-026, 27 June 1995, p. 29); Oleg Falichev, Interview with Col. Gen. Yevgeny Maslin, "Who Has the Keys to the Nuclear Arsenal," *Krasnaya Zvezda*, (FBIS-SOV-93-228, 30 November 1993, pp. 40-41); Vladimir Orlov, "Interview with General Yevgeny Maslin," *Yaderny Control*, May 1995.

<sup>267</sup> Mikhail Shevtsov, "Russia Strictly Fulfilling Nuclear Test Ban Treaty," *ITAR-TASS*, 9 October 1998.

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artillery shells with the Ground Forces, and nuclear anti-aircraft missiles with the Air Defense Forces.<sup>268</sup>

During peacetime, the only nuclear warheads regularly deployed on launchers were those on ICBMs and SLBMs, those in tactical naval nuclear weapons (e.g., torpedoes and anti-ship cruise missiles) carried by ships and submarines at sea, and seemingly those on strategic ABM systems. Other nuclear weapons -- those for the Ground Forces' launchers (e.g., missiles and artillery), strategic and tactical aviation, and tactical air defense forces -- were stored separately from their launchers.<sup>269</sup>

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<sup>268</sup> For an analysis of the numerous types and numbers of Soviet strategic and tactical nuclear weapons see: Thomas Cochran, William Arkin, Robert Norris, and Jeffrey Sands, *Nuclear Weapons Databook Volume IV: Soviet Nuclear Weapons*, (New York: Harper and Row/Ballinger, 1989).

In 1997, the new Minister of Defense General Igor Sergeyev commenced a reorganization of the military which will change the number of services and so the number of services possessing nuclear weapons. During 1997-2000, to combine strategic defense, space, and strategic deterrence functions, the Military Space Forces and Anti-Missile Defense forces will be merged with the Strategic Rocket Forces. Also, the Air Defense Troops will be consolidated into the Air Force. Finally, the Ground Forces will be reorganized along territorial lines; Official Kremlin International News Broadcast, "Press Conference with Defense Minister Igor Sergeyev," 7 August 1997, (Federal News Service).

Thus, by the year 2000, with the denuclearization of the Ground Forces, nuclear weapons will be for the use of three armed services: the Strategic Rocket Forces, Air Force, and Navy.

<sup>269</sup> In 1991, Marshal V. Mikhalkin, Commander of the Ground Forces Missile and Artillery Forces, said, "the tactical nuclear ammunition, including the warheads, is kept separately from delivery vehicles and launchers;" V. Litovkin, "Who Keeps The Nuclear Button," *Izvestia*, 21 September 1991, (Soviet Press Digest, 21 September 1991, RUSSICA Information Inc. - RusData Dialine Russian Press Digest).

The same situation pertained with strategic and tactical Air Force and tactical Air Defense nuclear weapons. See: Stephen Meyer, "Soviet Nuclear Operations," Chapter 15 in Ashton Carter et al, eds., *Managing Nuclear Operations* (Washington, DC: The Brookings Institution), pp. 487-493; Thomas Cochran, William Arkin, Robert Norris, and Jeffrey Sands, *Nuclear Weapons Databook Volume IV: Soviet Nuclear Weapons*, (New York: Harper and Row/Ballinger, 1989), p. 16.

During the first decade or so of the Soviet nuclear program, all nuclear warheads were stored separately from their launchers. The 1965 NIE said that nuclear weapons for the use of army units (seemingly primarily tactical missile warheads) were kept in MOD depots, "which in many cases are located at considerable distances from the operational units." When needed, the NIE noted, the depots would probably receive authorization from the Soviet MOD to release the weapons to operational units. In the case of the air forces or Strategic Rocket Forces, a similar method of control was thought to exist, but "in these cases the operational storage facilities of the Ministry of Defense are part of the air base or of the missile launching complex." As for the Soviet Navy, the NIE speculated that probably nuclear weapons were kept on ships at sea and in land storages; CIA, *The Soviet Atomic Energy Program*, NIE 11-2A-65, (Top Secret; partially declassified), 19 May 1965, p. 18.

Col. Oleg Penkovsky, a Soviet army officer who spied for the United States and the United Kingdom during 1960-1962, provided similar information about warheads being kept in special depots separate from launchers. Elite KGB troops, known as OMBSDON divisions (Otdelnaya Motostrelkovaya Diviziya Osobogo Naznacheniya -- Independent Motorized Rifle Division for Special Purposes) were supposed to have guarded the depots, although the depots were under the control of Col. General N.N. Zhdanov, chief of the Main Directorate

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The nuclear weapons assigned for the use of the armed services were kept in service-controlled front-line depots or larger regional storages, commonly known as rocket/repair technical bases (RTBs, *raketno/remontno tekhnicheskaya baza*).<sup>270</sup> The functions of an RTB in the rear areas of a front were described as:

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of Artillery of the Ministry of Defense; Jerrold Schecter and Peter Deriabin, *The Spy Who Saved the World: How a Soviet Colonel Changed the Course of the Cold War*, (New York: Scribners, 1992), pp. 79, 149-150, 266, 453. See also: Oleg Penkovskiy, *The Penkovskiy Papers*, (Garden City, NY: Doubleday, 1965), p. 331.

Technical, command and control, and/or political reasons seemingly accounted for these practices. A 1969 *Newsweek* article said, Soviet concerns about accidents and control of nuclear weapons, "meant they kept their nuclear warheads as much as 50 miles from their missile sites and never risked going on full alert;" Edward Klein and Robert Littell, "Shh! Let's Tell the Russians," *Newsweek*, 5 May 1969, p. 47.

Also, a retired Soviet general who oversaw the deployment of Soviet nuclear weapons and missiles in Cuba in 1962 said that nuclear weapons were kept separate from delivery vehicles during this period until "more sophisticated safeguards against accidental launches were developed;" General Anatoly Gribkov and General William Smith, *Operation Anadyr: U.S. and Soviet Generals Recount the Cuban Missile Crisis*, (Chicago, Edition Q, 1994), pp. 26-27 and 46.

Finally, a 1974 book on the KGB interestingly noted: "Until the late 1960s, when the military finally persuaded the leadership it would be impractical to use atomic weapons in a future internal struggle, the KGB even retained custody of nuclear warheads;" John Barron, *KGB: The Secret Work of Soviet Secret Agents*, (New York: Reader's Digest Press, 1974), p. 10.

After this period, as missile technology improved (particularly the storage of liquid-fuels and the silo-basing of missiles), as tactical nuclear weapons become more widely deployed in the Navy and naval ships began more long-range deployments, and, perhaps as some of the issues of political control were resolved, nuclear weapons were routinely deployed on ICBMs, on naval vessels (both tactical and strategic), and on strategic ABM launchers. See discussion in: Stephen Meyer, "Soviet Nuclear Operations," Chapter 15 in Ashton Carter et al, eds., *Managing Nuclear Operations* (Washington, DC: The Brookings Institution), pp. 489-490.

<sup>270</sup> Some early discussion of the role of RTBs and PRTBs in relation to support of tactical missiles in the Ground Forces is found in: Lt. General M. Novikov, "Rear Services Support of Missile Troops in an Offensive Operation of a Front," *Voyennaya Mysl* (Military Thought), 3rd issue, 1960; Maj. General Yu. Novikov, "Defense of the Operational Rear," *Voyennaya Mysl*, 1st issue, 1962; Maj. General of Artillery, M. Glushkov, "The Question of the Organizational Structure of Missile Troops of Operational-Tactical Designation," *Voyennaya Mysl*, 1st issue, 1962; Col. General of Artillery G.F. Odintsov, "Rear Area Support of Missile Troops in Front Offensive Operations," *Voyennaya Mysl*, 2nd issue, 1961.

Col. Oleg Penkovsky, a Soviet army officer who spied for the United States and the United Kingdom during 1961-1962, provided copies of *Voyennaya Mysl* (a classified journal published by the Soviet Ministry of Defense) from the early 1960s to the CIA; see: Jerrold Schecter and Peter Deriabin, *The Spy Who Saved the World: How a Soviet Colonel Changed the Course of the Cold War*, (New York: Scribners, 1992), p. 83 ff. The CIA-translated copy of these articles are available at the National Security Archives, Washington, D.C.

Rogov et al. claim that the Ground Force's nuclear weapons storages were known as "mobile missile [or rocket] technical bases" and the Air Force's and Navy's were known as "missile [or rocket] maintenance bases;" Dr. Sergei Rogov and Dr. Alexander Konovalov, Institute of USA and Canada Studies, eds., *The Soviet Nuclear Legacy Inside and Outside Russia: Problems of Non-Proliferation, Safety, and Security*, (Institute of USA and Canada Studies: Moscow, 1993), p. 38.

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At the front missile [rocket]-technical bases the assembly of the missile-carriers and nuclear warheads, the mating of the missiles and the storage of reserve missiles of the front are performed; from these bases they are transported to armies and to missile large units. The reserve of missile/nuclear weapons located at front missile-technical bases ensures fulfillment of further tasks of the front and the subsequent offensive operation. Moreover, the reserve of nuclear means is stored at bases.<sup>271</sup>

The units of the armed service responsible operating the base, storage of the weapons, loading, transporting, and handing over the weapons to firing units, were known as mobile (podvizhnaya) RTBs (PRTBs). The PRTB weapons transporters would serve as a field nuclear weapons storage depot, once the weapons were dispersed to firing units.<sup>272</sup>

The nuclear weapons depots themselves were under the control of the armaments directorates of an armed service.<sup>273</sup> However, a 6th Directorate of an armed service had an important, analogous role to the 12th Main Directorate but at the service level. A 6th Directorate of an armed service received nuclear weapons from 12th Main Directorate storages and oversaw the safety, security and accounting of the nuclear weapons under service control.

The services' 6th Directorates also trace their origins to the immediate post-World War II period. A 6th Main Directorate of the Ministry of Defense was established on the basis of the 12th Main Directorate and had the responsibility for nuclear strike planning. In the late 1950s, the MOD's 6th Main Directorate was dis-established and its functions were transferred to newly-created 6th Directorates of the general staffs of each military service with nuclear forces.<sup>274</sup>

In 1998, the 6th Directorates' functions were to be taken over by the 12th Main

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<sup>271</sup> Maj. General Yu. Novikov, "Defense of the Operational Rear," *Voyennaya Mysl*, 1st issue, 1962.

<sup>272</sup> See also discussion of RTBs, PRTBs and administrative control in: Dr. Sergei Rogov and Dr. Alexander Konovalov, Institute of USA and Canada Studies, eds., *The Soviet Nuclear Legacy Inside and Outside Russia: Problems of Non-Proliferation, Safety, and Security*, (Institute of USA and Canada Studies: Moscow, 1993), pp. 38 and 40.

<sup>273</sup> Rogov et al, note that although these facilities were supervised by the 12th GUMO, "from the administrative point of view these facilities are under the command of different Services of the Armed Forces," Dr. Sergei Rogov and Dr. Alexander Konovalov, Institute of USA and Canada Studies, eds., *The Soviet Nuclear Legacy Inside and Outside Russia: Problems of Non-Proliferation, Safety, and Security*, (Institute of USA and Canada Studies: Moscow, 1993), p. 38.

For a discussion of the organizational structure of the Soviet armed services circa the mid-1980s, see: Harriet Fast Scott and William F. Scott, *The Armed Forces of the USSR*, 3rd ed., (Boulder, CO: Westview, 1984), pp. 141-182.

<sup>274</sup> Pavel Podvig, ed., *Russian Strategic Nuclear Weapons*, (Moscow: Izdat, 1998).

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Directorate. General Eugene Habiger, then-Commander-in-Chief U.S. Strategic Command, reported in June 1998 that the 12th Main Directorate took over responsibility for the Navy's nuclear weapons on 1 April 1998 and for Air Force's weapons on 1 May 1998. By the end of 1998, the 12th Main Directorate may take over responsibility for the Strategic Rocket Forces' nuclear weapons as well. According to General Habiger, this reorganization was done to insure the standardization of safety and security processes.<sup>275</sup>

**Types and Numbers of Storages** Overall, Russian nuclear warheads are thought to have been kept in five different categories of storage facilities:<sup>276</sup>

1. Some limited storage at the nuclear weapons assembly/disassembly plants utilized just prior to the disassembly of a warhead or just after its assembly.
2. Large storages controlled by the MOD's 12th Main Directorate associated with the Ural's region nuclear weapons assembly/disassembly plants;
3. National-level storages controlled by the 12th Main Directorate and spread throughout the former Soviet Union;<sup>277</sup>
4. Regional RTB storage sites which were operated by the military services' armaments directorates in conjunction with the services' 6th Directorates and are now

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<sup>275</sup> General Eugene Habiger, "Department of Defense News Briefing," 16 June 1998.

General Habiger in a previous press conference had mentioned the Strategic Rocket Forces had a 6th Directorate; General Eugene Habiger, "Department of Defense News Briefing," 4 November 1997.

For a brief discussion of the nuclear weapons function of the 6th Directorate of the Russian Northern Fleet see: Mikhail Turetsky, *The Introduction of Missile Systems into the Soviet Navy (1945-1962)*, (Falls Church, VA: Delphic Associates Inc., March 1983), pp. 12 and 109.

<sup>276</sup> For information on the location and number of U.S., French, U.K. nuclear weapons storage sites, as well as an earlier estimate of the number and location of Russian storages see: William M. Arkin, Robert Norris, and Joshua Handler, *Taking Stock: Worldwide Nuclear Deployments 1998*, (Washington, DC: Natural Resources Defense Council, March 1998).

<sup>277</sup> Lt. General Sergei Zelentsov of the 12th Main Directorate provided some description of the role of these storages in comparison to those at dismantlement facilities when he discussed the removal of tactical nuclear weapons from Ukraine:

The tactical nuclear weapons are stored in different places where their safe keeping can be ensured. Part of them is still en route to their destination in echelons moving from Ukraine towards the storage facilities. Most of these weapons are concentrated in storehouses on factory grounds [the storages next to the Sverdlovsk-45 and Zlatoust-36 plants may be considered to be on the territory of the plants] -- but as you understand, the holding capacity of such storages is not sufficient to house all the nuclear warheads, therefore part of it is stored elsewhere, in places that are similar to the near-the-plant facilities where the dismantling will take place;" "Press Conference on Withdrawal of Tactical Nuclear Weapons from the Ukraine by Members of CIS and Ukraine Military," Official Kremlin International News Broadcast, 6 May 1992, (Federal News Service). Taking part were Lt. General Sergei Zelentsov and Maj. General Vitaly Yakovlev.

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controlled by the MOD's 12th Main Directorate;<sup>278</sup>

5. Front-line RTB storages controlled by the military services.

The 1984 and 1985 editions of *Soviet Military Power* provided some general information on the locations of Russian nuclear weapons storages. So-called "Nuclear Weapons Stockpile Concentrations" were indicated to be in a considerable part of the border areas of the western Soviet Union; in the central parts of the Kola Peninsula; on the Crimean Peninsula; around Baku on the Aral Sea; in the Urals region seemingly around Sverdlovsk-Chelyabinsk; in Siberia seemingly between Semipalitinsk and Novosibirsk; east of Lake Baikal near Ulan-Ude and near Chita; around Vladivostok; and around Petropavlovsk-Kamchatskii.<sup>279</sup>

The breakup of the Soviet Union and the fall 1991 Presidential nuclear initiatives led to a reduction in the number of storages as well as the withdrawal of tactical nuclear weapons from most, if not all, depots for front-line units to regional RTB or national-level storages.<sup>280</sup> In November 1997, the DOD estimated that: "With the consolidation of tactical

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<sup>278</sup> Seemingly, either this type or the 12th Main Directorate storages may be referred to as "S" types of facilities in Russian.

The "S" type of facility was mentioned several times in reports about overcrowding in storages in the Ukraine in 1993-1994; Vladimir Ivakhnenko, "Incident in nuclear munitions store due to inadequate supervision," *Izvestia*, 16 September 1993, (BBC Summary of World Broadcasts, 17 September 1993); "Official accuses Russia of hampering implementation of nuclear service accord," *Holos Ukrayiny*, Kiev, 7 October 1993, (BBC Summary of World Broadcasts 13 October 1993); "Renewed Concern over Ukrainian Nuclear Weapons," *Krasnaya Zvezda*, 29 January 1994 (BBC Summary of World Broadcasts, 3 February 1994).

And, General Habiger visited a national-level storage facility near Saratov, which he called "Saratov Sierra 1050 [Sierra stands for S in the military alphabetical pronunciation system]" during his June 1998 visit to Russia; General Eugene Habiger, "Department of Defense News Briefing," 16 June 1998.

However, according to Podvig et al, the 6th Directorate of an armed service takes the nuclear weapons it receives to a service-controlled central storage site known as an "installation S;" Pavel Podvig, ed., *Russian Strategic Nuclear Weapons*, (Moscow: Izdat, 1998).

<sup>279</sup> U.S. Department of Defense, *Soviet Military Power*, 1984 and 1985 editions, p. 81 and 71 respectively.

<sup>280</sup> As noted in Appendix A, since the United States did not formally respond to Gorbachev's offer to withdraw all tactical aviation bombs to central sites, some analysts have suggested it is possible some Russian tactical aviation bombs are still kept at storages associated with airfields rather than at national- or service-level RTB storages.

Yet, when Gorbachev made his October 1991 speech the Soviet Union existed and the Soviet military may have wished to keep frontal/tactical aviation weapons deployed close to nuclear-capable aircraft in border republics and regions (e.g. Ukraine, Belarus, and the Transcaucasus). Now due to the independence of the republics, the number of airfields with storages has been greatly reduced. Also, it seems as if one storage may have served several frontal/tactical aviation units. Thus, today's lesser number of nuclear-capable frontal/tactical aviation units in Russia may be served by more "centralized" RTB Air Force controlled facilities in any event.

For a discussion of the decline of Russia's Air Force, see Benjamin Lambeth, *Russia's Air Power at the Crossroads*, (Santa Monica, CA: RAND, 1996).

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nuclear warheads and the transfer of strategic warheads, the number of storage sites holding warheads has been reduced from over 500 facilities to fewer than 100.<sup>281</sup>

Russian statements also indicate a large reduction in the number of storage facilities has taken place. In 1995, General Maslin claimed that Russia had reduced the number of nuclear-capable bases by over 250 by 1995.<sup>282</sup> In 1996, he declared the number of nuclear storage facilities in Russia had declined to one-third of their 1991 levels.<sup>283</sup> He noted that four national-level storages in Ukraine, one near Gomel in Belarus, one in Semipalatinsk in Kazakhstan, and one in Nalchik on Russian territory in the Caucasus, and one in the Far East had been closed.<sup>284</sup> In regards to the possible number of remaining storages, in November

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<sup>281</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, November 1997, p. 43.

In 1996, John Deutch, DCI, said, "We estimate that there were over 500 nuclear storage sites in the former Soviet Union and Eastern Europe in 1990 and there are less than 100 today, mostly in Russia, with a few remaining in Ukraine, Belarus and possibly Kazakhstan; John Deutch, DCI, statement before the SGAC, Permanent Subcommittee on Investigations, hearing on "Global Proliferation of Weapons of Mass Destruction," Part II, 22 March 1996, S. Hrg. 104-422, Pt. 2, p. 311.

In 1995, the CIA estimated that Russia had consolidated the number of weapon storage sites from over 600 in the former USSR in 1989 to 100 in 1995; Gordon Oehler, Director, Non-Proliferation Center, CIA, testimony before the SASC, on "Intelligence Briefing on Smuggling of Nuclear Material and the Role of International Crime Organizations, and on the Proliferation of Cruise and Ballistic Missiles," 31 January 1995, p. 4.

In 1995, Gloria Duffy, special coordinator for the Cooperative Threat Reduction, DOD, told Congress that tactical weapons were stored in "about 100 different locations in Russia;" Gloria Duffy, testimony before the HFAC, Subcommittee on Europe and the Middle East, Hearings on "FY 1995 Foreign Aid Requests for Russia and the Other New Independent States (NIS) of the Former Soviet Union," 24 March 1994.

<sup>282</sup> Col. General Yevgeny Maslin, "Summary of the Proceedings of the U.S. Defense Nuclear Agency's Fourth Annual International Conference on Controlling Arms," 19-22 June 1995, Philadelphia, PA.

<sup>283</sup> Col. General Yevgeny Maslin, "Cooperative Threat Reduction: The View from Russia," in Proceedings of the NATO Advanced Research Workshop on Dismantlement and Destruction of Chemical, Nuclear and Conventional Weapons, Bonn, Germany, 19-21 May 1996, (Dordrecht, The Netherlands: Kluwer Academic Publishers, 1997), p. 92; Col. General Yevgeny Maslin, remarks on U.S. and Russian Perspectives on the Cooperative Threat Reduction Program, made at the U.S. Defense Special Weapons Agency conference, "Walking the Walk: Controlling Arms in the 1990s," in "Summary of the Fifth Annual International Conference on Controlling Arms," 3-6 June 1996, Norfolk, VA.

<sup>284</sup> Vladimir Orlov, "Interview with General Yevgeny Maslin," *Yaderny Control*, May 1995, p. 2.

In Ukraine, there were two service-level nuclear weapons storage sites at the two ICBM bases (Pervomaysk and Khmel'nitskiy) and at the two bomber bases (Uzin and Priluki). In addition, there were two 12th Main Directorate national-level sites, one located at Makariv (north-central part of Ukraine) and another Kirovgrad (in the south); "Cooperative Threat Reduction Briefing on CTR Activities in Ukraine," n.d., Spring 1997. Note: one western report claimed, based on conversations with Ukrainian officials, that tactical nuclear weapons being removed from Ukraine were stored in "four major nuclear-weapons storage centers" in Ukraine; R. Jeffrey Smith, "Ukraine Rigs A-Weapons To Ensure Safe Transfer; Beepers Intended to Prevent Theft or Loss," *Washington Post*, 25 December 1991; R. Jeffrey Smith, "Ukrainian Minimizes West's Nuclear Fears; Precautions in Handling Warheads Are Extraordinary, Security Service Chief Says," *Washington Post*, 25

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1997, Defense Minister Igor Sergeyev noted one reason that Russia could not support a ban on anti-personnel mines was that, "there will be no replacement for them in the 80 protection areas around nuclear installations."<sup>285</sup>

**Numbers and Locations of National-level Storage Sites** In the Soviet Union, 29 national-level storage sites were thought to have been controlled by the MOD's 12th Main Directorate.<sup>286</sup> Some 20 may have been larger multi-bunker, multi-purpose national-level

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December 1991; R. Jeffrey Smith, "Ukrainian Minimizes West's Nuclear Fears; Precautions in Handling Warheads Are Extraordinary, Security Service Chief Says," *Washington Post*, 25 December 1991.

In Kazakhstan, there were service level nuclear weapons storage sites associated with the two SS-18 bases (Derzhavinsk and Zhanqiz-Tobe), and a storage facility for the bomber base which was at Semipalatinsk (now Chagan). In addition, in this same area near the Chagan bomber storage there was a "national" level site, i.e. a 12th Main Directorate controlled site. Finally, a nuclear weapons storage site seemingly was associated with the Sary Ozek IRBM missile facility; "Cooperative Threat Reduction Briefing on CTR Activities in Kazakhstan, n.d.," Spring 1997.

In Belarus, three national-level nuclear weapons storage sites seemingly existed at: Vetrino in the north, Smorgon in the center, and Gomel in the southeast. In addition, there were storages associated with the three former SS-25 bases in Belarus, Lida, Mozyr and Postavy; "Cooperative Threat Reduction Briefing on CTR Activities in Belarus," n.d., Spring 1997.

See also: CTR briefing in SGAC, Permanent Subcommittee on Investigations, hearing on "Global Proliferation of Weapons of Mass Destruction," 22 March 1996, S. Hrg. 104-422, Pt. 2, p. 649. Page 641 also lists Postavy as a SS-25 launch facility scheduled for destruction.

In the Russian press, two storage sites for the strategic missile forces in Kazakhstan have been mentioned: "The situation on the nuclear technical bases where these specialized munitions are stored is becoming threatening. Particularly in the garrisons at Derzhavinsk in Turgay Oblast and at Zhanqiz-Tobe in Semipalatinsk Oblast, where two missile divisions are stationed;" Victor Litovkin, "Nuclear Magazines In Kazakhstan on the Verge Of an Accident," *Izvestia*, 12 February 1994, (JPRS-TND-94-006, 16 March 1994, p. 38).

Other mentions of Russian nuclear storages sites in the Russian press include: a report that a 12th Main Directorate storage facility was located near Grozny at Grozny-20 (although this may have been the Nalchik site mentioned above); Boris Vishnevsky on interview with retired Colonel Zaki Zaynullin, "How Many Nuclear Warheads Does Dudayev Have? An Eye-Witness Claims: It Runs Into Tens, If Not Hundreds," *Komsomolskaya Pravda*, 1-8 December 1995, (FBIS-SOV-95-232, 4 December 1995).

<sup>285</sup> Interfax, "Sergeyev on Use of Russian 'Suitcase' Nuclear Weapons," 15 November 1997, (FBIS-SOV-97-318, 14 November 1997).

<sup>286</sup> The construction of a 30th site, located in the Russian Far East, was initiated in the mid-1980s. However, the project was not completed. For a discussion of the site see: Dr. Sergei Rogov and Dr. Alexander Konovalov, Institute of USA and Canada Studies, eds., *The Soviet Nuclear Legacy Inside and Outside Russia: Problems of Non-Proliferation, Safety, and Security*, (Institute of USA and Canada Studies: Moscow, 1993), p. 39.

Seven additional 12th Main Directorate controlled storages were constructed in Eastern Europe during the 1960s to support Warsaw Pact operations against NATO. These storages, however, apparently resembled the service-controlled storage sites, rather than the larger 12th Main Directorate national-level stockpile storage sites.

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stockpile storages, while the rest were smaller, specialized facilities.<sup>287</sup> Today, sixteen large Russian national-level nuclear weapons storage sites are thought to exist, but it is not clear that all of these are operational.<sup>288</sup>

From the Kola peninsula in northwest of Russia to the Far East in the Khabarovsk Kray, national-level storages are located near (see Maps 1-2 and Figures 1-11 and 16-18 in Appendix F):

- Olenegorsk: on the Kola peninsula south of Murmansk.
- Bulyzhino: western Russia several miles from the intersection of the Russian, Latvian and Byelorussian borders.<sup>289</sup>
- Chebsara: western Russia, north of Moscow.
- Mozhaysk: just west of Moscow.<sup>290</sup>
- Zhukovka: western Russia, northwest of Bryansk.<sup>291</sup>
- Golovchino: western Russia, several miles from the Ukrainian border, southwest of Voronezh.<sup>292</sup>
- Borisoglebsk: western Russia, just northwest of the town of the same name.<sup>293</sup>
- Krasnoarmeyskoye: western Russia, south of Saratov.<sup>294</sup>
- Nizhnyaya Tura: Ural region, near Sverdlovsk-45.

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<sup>287</sup> One Russian press report said: "One garrison where the country's nuclear potential is guarded belongs to the system of the Defense Ministry 12th Main Directorate and is situated next to Tula. At one time there were about 20 of these establishments but now their number has declined drastically; Denis Baranets, "Nuclear Rail Car Runs and Rattles...", *Komsomolskaya Pravda*, 23-30 January 1998, (FBIS-TAC-98-027, 27 January 1998).

Also, General Gely Batenin, special military adviser to the Russian Foreign Ministry, told *The Independent* that weapons transported to central storages were taken to 20 military "preliminary" storage sites in the Ural mountain region. To be taken apart involved further transportation to separate storage facilities at plants at Arzamas and Chelyabinsk; Andrew Higgins, "Deadly secrets for sale," *The Independent*, (UK) 19 April 1992.

As noted below, however, there does not seem to be large 12th Main Directorate controlled storages at Arzamas-16.

<sup>288</sup> A seventeenth at Prilepy in western Russia, known as Tula-50, military unit 25851 was recently closed, reportedly as a result of a hunger strike mounted by the civilian workers at the base, who were protesting the non-payment of their wages; Denis Baranets, "Nuclear Rail Car Runs and Rattles...", *Komsomolskaya Pravda*, 23-30 January 1998, (FBIS-TAC-98-027, 27 January 1998).

For previous report on strike of workers at storage facility see: Igor Pankov, "But What If It Was War Tomorrow?" *Komsomolskaya Pravda*, 21 June 1997, (FBIS-SOV-97-120, 21 June 1997).

<sup>289</sup> Contained approximately six storage bunkers as of 1970; Corona Mission 1111-2, 1 August 1970.

<sup>290</sup> Contained approximately 6-8 storage bunkers as of 1971; Corona Mission 1114-2, 1 April 1971.

<sup>291</sup> Contained 6-7 storage bunkers as of 1970; Corona Mission 1109-1, 10 March 1970.

<sup>292</sup> Contained 4-6 storage bunkers as of 1971; Corona Mission 1114-2, 1 April 1971. Also see: Corona Mission 1109-1, 10 March 1970.

<sup>293</sup> Contained 4-5 storage bunkers as of 1971; Corona Mission 1114-2, 2 April 1971.

<sup>294</sup> Contained 4-5 storage bunkers as of 1971; Corona Mission 1114-2, 3 April 1971. Also see: Corona Mission 1023-1, 22 August 1965, Figure 7 in Appendix F.

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- Karabash: Ural region, west of Chelyabinsk-65.<sup>295</sup>
- Yuryuzan: Ural region, near Zlatoust-36.
- Dodonovo: Siberia, near Krasnoyarsk-26.
- Zalari: Siberia, northwest of Irkutsk.
- Malaya Sazanka: Far East, south of Svobodnyy.<sup>296</sup>
- Khabarovsk: Far East.
- Komsomolsk-na-Amure: Far East.<sup>297</sup>

At least two of these sites -- those located nearest the Sverdlovsk-45 and Zlatoust-36 nuclear warhead assembly/disassembly plants -- consist of two large storage areas. The Corona satellite imagery reveals that as of 1970, two distinct storage sites containing at least nine storage bunkers in total were to the west of the town of Nizhnyaya Tura which contains the Sverdlovsk-45 plant.<sup>298</sup> The storage facility near Yuryuzan where the Zlatoust-36 plant is located also seems to be about double the size of the national-level storages not associated with a weapons production facility.<sup>299</sup> (See Figures 16-18 in Appendix F.)

The Nizhnyaya Tura, Karabash, and Yuryuzan national-level storages are located near or adjacent to the Sverdlovsk-45 and Zlatoust-36 plants. The Avangard warhead production plant at Arzamas-16 is not thought to have a 12th Main Directorate-controlled nuclear warhead storage for assembled warheads associated with it. The same situation pertains with Penza-19, which is generally thought to manufacture components rather than assemble nuclear

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<sup>295</sup> This facility may be known as Chelyabinsk-15; Boris Reznik, "'Roof' for Secret Nuclear Storage," *Izvestia*, 21 January 1998.

It contained several storage bunkers as of 1972; Corona Mission 1117-2, 31 May 1972.

<sup>296</sup> Contained 5-7 storage bunkers as of 1971; Corona Mission 1115-1, 14 September 1971, Corona Mission 1112-1, 20 November 1970, and Corona Mission 1108-1, 6 December 1969.

Malaya Sazanka has been a nuclear weapons storage since at least March 1958. A U-2 spy plane flight over the Soviet Far East photographed "a strange installation at Malaya Sazanka, which was eventually determined to be a structure for mating nuclear devices with their detonators;" Gregory Pedlow and Donald Welzenbach, History Staff, Center for the Study of Intelligence, *The CIA and the U-2 Program, 1954-1974*, (Central Intelligence Agency, 1998), p. 144. The facility and bunkers are visible in imagery from U-2 Mission 6011, 1 March 1958 (see Figure 11 in Appendix F).

<sup>297</sup> This facility may be located southwest of Komsomolsk near the town of Bolon; Boris Reznik, "'Roof' for Secret Nuclear Storage," *Izvestia*, 21 January 1998.

Note: In June 1992 a small scandal erupted when there were press reports, subsequently denied by officials, of 23 warheads missing from a storage near Komsomolsk. It unknown whether this was a national-level or service-level RTB storage; Col. V. Usoltsev, "Nobody Lost Any Nuclear Warheads and Vladimir Desyatov, Representative of the Russian Federation President in Khabarovsk Kray, Made No Statements to That Effect," *Krasnaya Zvezda*, 11 June 1992, (JPRS-TND-92-019, 19 June 1992, p. 24).

<sup>298</sup> Corona Missions: 1115-1, 15 September 1971; 1111-1, 23 and 24 July 1970; 1048-2, 2 October 1968; 1033-1, 25 May 1966; 1016-2, 21 January 1965; 9053, 2 April 1963; and 9031, 3 March 1962.

<sup>299</sup> Corona Mission 1115-2, 20 September 1971.

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warheads.

**Size and Capacity of the National-level Storage Sites** Some information about the national-level nuclear weapons storage sites has become available from site visits by U.S. military officials, declassified U.S. Corona satellite imagery and Russian press reports. General Eugene Habiger was taken to the Krasnoarmeyskoye national-level nuclear weapons storage located near Saratov on 2 June 1998. He described it as "closed cantonment area." Some 3,500 people lived on the base, of which 1,200 were military personnel and the rest were dependents. The storage bunker he was taken to was built into the side of a hill and inside there were five "nuclear weapons storage bays."<sup>300</sup>

Declassified Corona satellite imagery from the early 1970s shows that some 4-8 bunkers may be at a national-level nuclear weapons storage site. They are inside a squarish or polygonal fenced area encompassing several square kilometers (4 - 9 km<sup>2</sup> or 2-3 kilometers across). The actual facility, including associated housing complexes, heliports and railhead (the last which may be several miles away), takes up a larger area (see Figures 1-11 and 16-18 in Appendix F). Several, like the Krasnoarmeyskoye facility, are built in ravined areas where the bunkers seemingly may continue into a hill-side. Bunkers and maintenance buildings are arranged off access roads and the facilities generally seemed to be serviced by rail.<sup>301</sup>

One recent Russian press report offered this description of a national-level nuclear weapons storage site: "On average there are around a dozen structures on a unit's territory, each with six to eight storage facilities. The storage facilities contain 40-50 special items each."<sup>302</sup> Assuming that this means six to eight storage bunkers, some 240 - 400 warheads

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<sup>300</sup> General Eugene Habiger, "Department of Defense News Briefing," 16 June 1998.

<sup>301</sup> General Valynkin noted the average length of railroad at a 12th Main Directorate facility was 11 kilometers; Comments by General Igor Valynkin, then First Deputy Head of the 12th Main Directorate before the Duma Committee on Security, "Stenographic Record of the Parliamentary Hearings on the Topic: Issues Concerning the Security of Hazardous Nuclear Facilities," *Yaderny Kontrol Digest*, No. 5, Fall 1997, p. 16. The hearings were held 25 November 1996.

<sup>302</sup> Alexei Sinelnikov, incorporating account of interview with Russian Army officer identified only as "Valery", "Can a Nuclear Train Be Seized? Chernobyls Carried Past Us Every Day in Freightcars Without Our Even Suspecting," *Komsomolskaya Pravda*, 9-16 January 1998, (FBIS-TOT-98-009, 9 January 1998).

In another *Komsomolskaya Pravda* interview with a purported former 12th Main Directorate officer, the officer, Zaki Zaynullin, claimed 100-150 nuclear bombs were kept in a "semi-underground building," in a facility near Chernobyl. He said, based on this, a 12th Main Directorate storage facility supposedly near Grozny, Grozny-20, which had three to four storage "sections" could hold up to 600 [i.e., 450-600] nuclear bombs; Boris Vishnevsky on interview with retired Colonel Zaki Zaynullin, "How Many Nuclear Warheads Does Dudayev Have? An Eye-Witness Claims: It Runs Into Tens, If Not Hundreds," *Komsomolskaya Pravda*, 1-8 December 1995, (FBIS-SOV-95-232, 4 December 1995).

Another Russian report based on a Russian press story said a central storage base under construction in

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could be stored a national-level storage facility. Thus, in total, the currently operational national-level storages may be able to hold 4,800 to 8,000 nuclear warheads.

**Numbers and Locations of Service-level Storage Sites** If the equivalent of 20 national-level nuclear storage facilities are still functioning (as noted above, some sites may contain more than one large storage facility or some facilities may be double-sized), there may be approximately 60 service-controlled RTB sites. These would include the 23 storage sites associated with the ICBM bases (19) and strategic bomber bases (4).<sup>303</sup> Since the fall Presidential nuclear initiatives resulted in the withdrawal of tactical nuclear weapons to central storages, the approximately 40 remaining RTBs are service-controlled regional storages associated with naval bases<sup>304</sup> and Air Force units (note: under the 1997-1998

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the Far East military district had a territory of 61 square kilometers (some 21.6 square miles); Dr. Sergei Rogov and Dr. Alexander Konovalov, Institute of USA and Canada Studies, eds., *The Soviet Nuclear Legacy Inside and Outside Russia: Problems of Non-Proliferation, Safety, and Security*, (Institute of USA and Canada Studies: Moscow, 1993), p. 39.

This may indicate a larger site under construction, or the measurements may encompass the larger area of the railhead and housing complex in addition to the actual storage bunkers.

<sup>303</sup> The Strategic Rocket Forces is organized into four missile armies -- headquartered at Vladimir, Omsk, Orenburg, and Chita -- and 19 missile divisions, corresponding with the 19 main operating bases; Valery Borisenko, "Interview with Defense Minister Designee Igor Sergeyev. I. Sergeyev: Both the Missiles and the People Are Always in Complete Readiness," *Moskovskaya Pravda*, 4 June 1997, pp. 9-10, (FBIS-SOV-97-110, 4 June 1997); Anatoly Pankov, reporting on visit to Strategic Rocket Forces command center at Vlasikha near Moscow, "Man With a Gun: The Most Destructive Troops Which Never Fought," *Kuranty*, 21-27 May 1997, No. 20, p. 10.

The declassified Corona imagery of strategic bomber bases indicates a large nuclear weapons bunker is associated with a strategic bomber base. Such was the case at the Ukrainka strategic bomber base in the Russian Far East as of 1971; Corona Mission 1115-1, 14 September 1971; Corona Mission 1108-1, 6 December 1969 (see Figure 12 in Appendix F). And, the Engels strategic bomber base near Saratov; Corona Mission 1051-1, 4 May 1969.

During his two trips to Russia in 1997-1998, General Habiger visited storage sites at the SS-24 ICBM base at Kostroma, the SS-25 ICBM base at Irkutsk, and the strategic bomber base at Engels; General Eugene Habiger, Commander-in-Chief, U.S. Strategic Command, "Department of Defense News Briefing," 16 June 1998.

Note: no weapons, however, may be currently stored at the Mozdok air base.

<sup>304</sup> General Habiger visited a Navy-controlled nuclear storage facility near Severomorsk for naval nuclear weapons; General Eugene Habiger, Commander-in-Chief, U.S. Strategic Command, "Department of Defense News Briefing," 16 June 1998.

Naval storages are thought to include tactical and strategic naval nuclear weapons since these weapons are apparently are stored together in the same facility.

In regards to other Russian Navy-controlled RTB storage sites, they are thought to exist near nuclear-capable ship and submarine bases in the Northern, Pacific and Baltic Fleets; U.S. Department of Defense, *Soviet Military Power*, 1984 and 1985 editions, p. 81 and 71 respectively.

As for the Black Sea fleet, some Ukrainian press reports suggested nuclear weapons removed from the Russian ships based in Crimea may be kept near Novorossiysk; Anatoly Skychko, "That Is Just What We Need; Russian Nuclear Warheads," *Vseukrainskiye Vedomosti*, 26 March 1998, (FBIS-SOV-98-100, 10 April 1998);

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Russia military reorganization, the Russian Air Force now includes the former Air Defense Troops' tactical nuclear-capable surface-to-air missile units).<sup>305</sup> The Strategic Rocket Forces may also operate their own service-level regional RTBs.<sup>306</sup>

**Size of Service-level Storage Sites** Several sources provide some general descriptions of the size and capacity of service-controlled RTB storages. A declassified 1963 CIA analysis described a regional RTB storage site in the Ukraine as 4,900 by 1,650 feet and containing two smaller cruciform shaped buildings which stored weapons.<sup>307</sup> A front-line Soviet storage base in the former East Germany also contained two separate underground bunkers for nuclear weapons. Each bunker had two drive-up entrances for loading operations, contained four bays for holding weapons, with perhaps room for several dozen weapons in each bay.<sup>308</sup> A 1993 Russian emigre paper described how a nuclear weapons storage building was located at 15 of the Main Missile and Artillery Directorate's (GRAU) Missile-Artillery Arsenal.<sup>309</sup> The storage held the nuclear warheads for the short-range missiles

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Tetyana Sylina, "Will Nuclear Weapons Return to Crimea," *Kiyevskiye Vedomosti*, 21 April 1998, (FBIS-TAC-98-125, 5 May 1998).

<sup>305</sup> Official Kremlin International News Broadcast, "Press Conference with Defense Minister Igor Sergeyev," 7 August 1997, (Federal News Service).

For an overview of Russian air bases and fighter and medium-bomber deployments in western Russia, which could have associated service-controlled RTB storages, see: Andrew Duncan, "Russian Forces in Decline," Parts 2, 3, and 4, published successively in *Jane's Intelligence Review*, October, November, and December 1996.

<sup>306</sup> E.g., a two-bunker Strategic Rocket Forces-controlled regional RTB storage is located near Surovatikha. It was photographed by Corona satellite Mission 1116-2 of 6 May 1972 (see Figure 13 in Appendix F), but now be out of service.

According to the START I MOU, there also is an ICBM storage facility outside the town of Surovatikha (about 40 miles south of Nizhniy Novgorod and 20 miles north of Arzamas). As of July 1998, 87 SS-17s, 17 SS-18s, and 14 SS-25s were at the base.

Surovatikha has been a Strategic Rocket Forces' arsenal since at least the 1960s. Recently the base has also become an ICBM dismantlement facility, particularly for SS-18 ICBMs; "Missile base at Surovatikha makes progress in destruction of Satan missiles," *NTV*, Moscow, 1800 gmt 2 August 1998, (BBC Summary of World Broadcasts, 4 August 1998); "Kazakhstan gets rid of last SS-18s," *Aerospace Daily*, 19 September 1996.

<sup>307</sup> CIA, "Regional Nuclear Weapons Storage Site Near Berdichev, USSR," May 1963, in Kevin C. Ruffner, ed., *Corona: America's First Satellite Program*, Center for the Study of Intelligence, CIA, Washington, DC, 1995, pp. 170-171.

The Surovatikha facility mentioned above has a similar two-bunker configuration. Another such two-bunker nuclear weapons storage located southwest of Minsk and just east of the city of Stolbtsy is visible in a declassified Corona satellite image from Mission 1023-1 of 21 August 1965.

<sup>308</sup> Author's visit to former Soviet nuclear weapons storage site near Berlin in October 1997 (see Figure 15 in Appendix F).

<sup>309</sup> The GRAU evolved from the MOD's GAU (Main Artillery Directorate) in 1960. Its mission was to be the main missile and artillery procurement agency for all the armed services of the Soviet Union; Moysey Rabinovich, "Soviet Conventional Arms Transfers to the Third World: Main Missile and Artillery Directorate (1966-1990)," Global Consultants, Inc., Alexandria, VA, 1993, p. 1. See also: Chris Bellamy, *Red God of War:*

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kept at the arsenal. The storage at one arsenal at Bronnaya Gora in Byelorussia, known as Building 610, was described as being an "arched-shaped and earth-covered underground structure," which held 216 warheads.<sup>310</sup> Finally, a single nuclear weapons storage bunker is visible at a weapons storage facility associated with the Kholm Air Base, near Arkangelsk in the Corona satellite imagery.<sup>311</sup>

Recently declassified U.S. accounts of the Cuban missile crisis provide some further description of Russian nuclear warhead storages. Since Russian reports describe current storages as being built in the 1960s<sup>312</sup> and western reports say they were typical of nuclear weapon storages in the Soviet Union, these types of constructions may still be in operation, either in service-controlled RTB or national-level storage sites.

At the nine sites under construction for Soviet SS-4 MRBM and SS-5 IRBMs in Cuba identified in October 1992, U.S. intelligence found at least five nuclear weapons storages, with others possibly to be constructed. In addition, there was a separate nuclear storage installation at Guanajay.<sup>313</sup> There is some confusion, however, about the size of these

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*Soviet Artillery and Rocket Forces*, (London: Brassey's Defence Publishers, 1986), pp. 102 and 129.

<sup>310</sup> Moysey Rabinovich, "Soviet Conventional Arms Transfers to the Third World: Main Missile and Artillery Directorate (1966-1990)," Global Consultants, Inc., Alexandria, VA, 1993, pp. 8, 15-16, and 19.

Rabinovich's paper mainly concerns the 46th GRAU Missile-Artillery Arsenal at Bronnaya Gora, Byelorussia, which is located between Baranovichi and Brest, near Bereza. He says of the 216 warheads kept in Building 610, 72 were for Scud missiles, 72 were for SS-12 Scaleboard missiles, and 72 were for FROG-5 missiles, and he claims all 15 GRAU arsenals had the same complement of nuclear warheads. According to his report, in 1979 all nuclear warheads kept at GRAU arsenals were transferred to the control of the MOD's 12th Main Directorate and the warheads were transported to 12th Main Directorate storages.

The 15 GRAU arsenals were located at: Arys Station, Bronnaya Gora, Dobrush, El'ban Station, Kalinovka Station, Kedrovka Station, Kilyazi Station, Kirzhach, Lagushkin, Lozovaya Station (only FROG missiles were kept here), Rybinsk, Shepetovka, Staraya Toropa Station, Ulan-Ude and Znamenka Station.

The Bronnaya Gora site was covered under the INF Treaty and listed in the INF MOU data exchange. The map of the facility shows a separate area within the fence where Building 610 would have been located; the information from the INF MOU is available at the Federation of American Scientists' webpage at [www.fas.org](http://www.fas.org).

Bronnaya Gora and the separate section containing a structure in the nuclear weapons storage area are also visible on the declassified Corona satellite imagery; Corona Missions: 1108, 21 December 1969; 1023-1, 21 August 1965 and; 1002-1, 24 September 1963.

<sup>311</sup> Corona Mission 1115-2, 18 September 1971 (see Figure 14 in Appendix F).

<sup>312</sup> Vladimir Orlov, "Interview with General Yevgeny Maslin," *Yaderny Control*, May 1995, p. 3.

<sup>313</sup> Guided Missile and Astronautics Intelligence Committee, Joint Atomic Energy Intelligence Committee, National Photographic Intelligence Committee, "Supplement 1 to Joint Evaluation of Soviet Missile Threat in Cuba," 2200 Hours, 20 October 1962, p. 4; Guided Missile and Astronautics Intelligence Committee, Joint Atomic Energy Intelligence Committee, National Photographic Intelligence Committee, "Supplement 8 to Joint Evaluation of Soviet Missile Threat in Cuba," 0200 Hours, 28 October 1962, p. 3; CIA, "Memorandum: The Crisis, USSR/Cuba," 0600 Hours, 28 October 1962; Memorandum (N.A.), "Soviet Offensive Weapons in Cuba," 29 October 1962. All are reprinted in Mary McAuliffe, CIA History Center, ed., *CIA Documents on the Cuban*

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storage sites. One report said there was a storage associated with a IRBM site at Guanajay (but which may have been the stand-alone storage facility) which was a drive-through facility measuring some 114 x 60 feet. Another site associated with a second IRBM site at Remedios was some 67 x 35 feet. Three sites identified as MRBM sites, two at San Cristobal and one at Sagua La Grande, may have had buildings some 60 x 35 feet.<sup>314</sup> Another report said MRBM sites had storages which were some 80 x 35 feet and IRBM site storages were 112 x 35 feet.<sup>315</sup> Finally, a third account says the bunker at Guanajay was 112 x 18.5 feet, while the other bunkers which were observed were 71 x 18.5 feet. In addition, the bunkers were constructed of prefabricated concrete arches 18.5 feet wide at the base, 18.5 feet high and one meter wide.<sup>316</sup>

**Capacity of Service-level Storage Sites** Presumably service-controlled RTB facilities are sized to support the forces they are associated with. For example, in terms of ICBM bases, the Tatishchevo ICBM base, which has some 700 warheads atop the MIRVed ICBMs based there, should have a larger RTB storage than a smaller single-warhead SS-25 ICBM base.<sup>317</sup>

The discussions of the overfilling of the storage site associated with the Pervomaysk ICBM base in Ukraine in the fall of 1993 may provide some indication of the capacity of an ICBM base's RTB storage.<sup>318</sup> The Pervomaysk storage reportedly contained 6-8 times as many warheads as permitted. As discussed above in Appendix A, the forty SS-19 missiles

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*Missile Crisis 1962*, (Washington, DC: Central Intelligence Agency, October 1992), pp. 231, 340, 344, and 351, respectively.

<sup>314</sup> Guided Missile and Astronautics Intelligence Committee, Joint Atomic Energy Intelligence Committee, National Photographic Intelligence Committee, "Supplement 1 to Joint Evaluation of Soviet Missile Threat in Cuba," 2200 Hours, 20 October 1962, p. 4.

<sup>315</sup> Memorandum (N.A.), "Soviet Offensive Weapons in Cuba," 29 October 1962.

<sup>316</sup> Dino Brugioni, *Eyeball to Eyeball: The Inside Story of the Cuban Missile Crisis*, (New York: Random House, 1991, updated edition), pp. 538-539. Mr. Brugioni was a photo-interpreter during the missile crisis and provides a detailed description of the construction of the storage bunkers for nuclear weapons in Cuba.

<sup>317</sup> Note: however, since several of the current SS-25 bases either had larger number of older ICBMs or 3-warhead SS-20 IRBMs previously stationed in there -- e.g. 188 SS-17 warheads had been based at the current SS-25 base at Vypolzovo as of September 1990 and 45 three-warhead SS-20s had been based in the late 1980s at the current SS-25 base at Novosibirsk -- their associated service-controlled RTB storages might be able to accommodate a larger number of warheads than current deployments indicate; see: START MOU Data Exchange for September 1990 reprinted in *Department of State Dispatch Supplement*, October 1991, Vol. 2, Supplement No. 5, and "MOU Regarding the Establishment of the Data Base," for the INF Treaty reprinted in Joseph P. Harahan, On-Site Inspection Agency, *On-Site Inspections Under the INF Treaty: A History of the On-Site Inspection Agency and INF Treaty Implementation, 1988-1991*, (Washington, D.C.: Government Printing Office, 1993), pp. 181-190.

<sup>318</sup> As of September 1990, according to the START I MOU data exchange, 240 warheads on SS-19 ICBMs and 460 warheads on SS-24 ICBMs were based at Pervomaysk.

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with six warheads each were deactivated over the summer of 1993 at Pervomaysk. Thus some 240 warheads may have been at this storage facility, since strategic warheads were not being shipped to Russia at this point and the 12th Main Directorate controlled storage facilities in Ukraine were temporarily inaccessible due to squabbling over the ownership of nuclear weapons in Ukraine. This implies the Pervomaysk RTB storage normally could hold some 30-40 warheads for the purposes of maintenance, temporary storage, etc. Another report in early January said 500 warheads were in storages in Ukraine and they were overfilled by 6-8 times, implying such storages hold 60-80 warheads.<sup>319</sup>

Since, according to the START I MOU data exchange, 700 warheads were deployed on SS-19 and SS-24 missiles at Pervomaysk, the base's RTB storage may have had the capacity to hold of 4 to 11 per cent of the base's deployed warheads. If so, based on this estimate, RTB storages at ICBM bases today may each hold a handful to several dozen warheads. In total, 180 - 500 warheads may be kept at these storages. Tables C1 and C2 list recent past and current deployments at ICBM bases (some of which were also IRBM bases) and provide an estimate of the size of the RTB storage site associated with each base.

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<sup>319</sup> "Let's Hope They Don't Land Themselves in Trouble," *Krasnaya Zvezda*, 14 September 1993; Victor Litovkin, "Nuclear Warheads 'Running a Temperature' in Ukraine. Russian Specialists Fly Out to Treat Them," *Izvestia*, 15 September 1993, Vladimir Ivakhnenko, "Incident in Nuclear Munitions Store Due to Inadequate Supervision," *Izvestia*, 16 September 1993, Maj. General Vitaly Yakovlev and Capt. 2nd Rank Alexander Pelts, "Ukraine's 'Nuclear Mace' Has Been Overheated. Will That Cool the Arrogant Politicians?" *Krasnaya Zvezda*, 16 September 1993, (JPRS-TAC-93-019, 29 September 1993, pp. 36-38); Vladimir Suprun, "Russia Concerned Over Nuclear Charges Stored In Ukraine," *ITAR-TASS*, 5 October 1993; Ihor Zabilyk, "The One-Sided Game Continues," *Holos Ukrayiny*, 7 October 1993, (JPRS-TND-93-034, 27 October 1993, pp. 34 and 39); "Renewed Concern over Ukrainian Nuclear Weapons," *Krasnaya Zvezda*, 29 January 1994, (BBC Summary of World Broadcasts, 3 February 1994).

A similar problem seemed to arise in storages for ICBM warheads in Kazakhstan in early 1994 as political maneuverings lead to delays in warhead shipments. An *Izvestia* newspaper article, citing unnamed Russian Ministry of Defense sources, reported that twice as many nuclear warheads as were allowed by safety regulations were being kept at the storages associated with the SS-18 ICBM bases at Derzhavinsk and Zhanqiz-Tobe; Victor Litovkin, "Nuclear Magazines in Kazakhstan on the Verge of an Accident," *Izvestia*, 12 February 1994, (JPRS-TND-94-006, 16 March 1994, p. 38).

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Table C1: Russian ICBM Warhead Deployments Late 1980s - Sept. 1990 and July 1998 and Future START II WH Removals by Base							
ICBM Bases	System/WHs		Deployed/Total WHs				WHs to be Removed Under START II <sup>320</sup>
			Previous Deployments: late 1980s - Sept. 1990		Deployed July 1998		
1. Aleysk	SS-18/RS-20	10	30	300	30	300	300
2. Barnaul	SS-25/RS-12M	1	0	0	36	36	
	SS-20 IRBM	3	36	108	0	0	
Barnaul Total						36	
3. Bershet	SS-24/RS-22	10	9	90	15	150	150
	SS-11/RS-10	1	60	60	0	0	
Bershet Total				150		150	
4. Dombarovskiy	SS-18/RS-20	10	64	640	52	520	520
5. Drovyanaya	SS-25/RS-12M	1	0	0	18	18	
	SS-11/RS-10	1	50	50	0	0	
	SS-20 IRBM	3	45	135		0	
Drovyanaya Total						18	
6. Irkutsk	SS-25/RS-12M	1	36	36	36	36	
7. Kansk	SS-25/RS-12M	1	27	27	45	45	
	SS-20 IRBM	3	36	108		0	
Kansk Total						45	
8. Kartaly	SS-18/RS-20	10	46	460	46	460	460
9. Kostroma	SS-24/RS-22	10	12	120	12	120	120
10. Kozelsk	SS-19/RS-18	6	60	360	60	360	360
11. Krasnoyarsk	SS-24/RS-22	10	12	120	9	90	90
	SS-11/RS-10	1	40	40	0	0	
Krasnoyarsk Total				160		90	
12. Nizhny Tagil	SS-25/RS-12M	1	45	45	45	45	
13. Novosibirsk	SS-25/RS-12M	1	27	27	45	45	
	SS-20 IRBM	3	45	135		0	
Novosibirsk Total						45	
14. Tatishchevo	SS-19/RS-18	6	110	660	100	600	600
	SS-24/RS-22	10	10	100	10	100	100
Total Tatishchevo				760		700	
15. Teykovo	SS-25/RS-12M	1	36	36	36	36	
	SS-11/RS-10	1	26	26	0	0	
Teykovo Total				62		36	
16. Uzhur	SS-18/RS-20	10	64	640	52	520	520
17. Vypolzovo	SS-25/RS-12M	1	0	0	18	18	
	SS-17/RS-16	4	47	188	0	0	
Vypolzovo Total				188		18	
18. Yoshkar-Ola	SS-25/RS-12M	1	18	18	36	36	
	SS-13/RS-12	1	40	40	0	0	
Yoshkar-Ola Total				58		36	
19. Yurya	SS-25/RS-12M	1	45	45	45	45	

<sup>320</sup> The actual number of warheads removed from SS-19s at either of the two SS-19 bases may be less since under START II 105 SS-19 missiles can be retained with one warhead each.

## Appendix C: Russian Nuclear Warheads Storages and Overfilling

Table C2: Estimate of Capacity of RTB Storages Associated with Current ICBM Bases, Based on Maximum 1990 Russian IRBM and ICBM Warhead Deployments <sup>321</sup>			
IRBM/ICBM Bases	Maximum WHs Deployed in approx. 1990	Of WHs Deployed, RTB Storage Holds	
		4 Per Cent	11 Per Cent
1. Aleysk	300	12	33
2. Barnaul	108	4	12
3. Bershet	150	6	17
4. Dombrovskiy	640	26	70
5. Drovyanaya	185	7	20
6. Irkutsk	36	1	4
7. Kansk	108	4	12
8. Kartaly	460	18	51
9. Kostroma	120	5	13
10. Kozelsk	360	14	40
11. Krasnoyarsk	160	6	18
12. Nizhny Tagil	45	2	5
13. Novosibirsk	135	5	15
14. Tatishchevo	760	30	84
15. Teykovo	62	2	7
16. Uzhur	640	26	70
17. Vypolzovo	188	8	21
18. Yoshkar-Ola	58	2	6
19. Yurya	45	2	5
Totals	4,560	180	503

<sup>321</sup> In 1990, larger numbers of older single warhead ICBMs as well as multiple warhead SS-20 IRBMs were deployed at several current ICBM bases which now hold a lesser number of missiles and warheads. It is assumed a storage commensurate with supporting a larger number of warheads is still in place at these bases.

Note: The Svobodnyy and Yasnaya ICBM bases have been closed and are not included in these totals. However in 1990, 60 and 90 single-warhead SS-11 ICBMs were at these bases, respectively.

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An estimate of RTB storages associated with bomber bases can be made from the START I Treaty data exchange. According to the START I MOU, 350 - 400 weapons have been deployed with strategic bombers at strategic bomber bases at Mozdok and Ukrainka. Since, as noted above, all the weapons at Mozdok were moved to the Engels Air Base, it seems the storage at Engels can also accommodate a similar amount of warheads. Thus, the storages utilized at the three bomber bases in Russia today may be able to store 1,050 - 1,200 weapons in total.

Table C3: Russian Strategic Bomber Warhead Deployments September 1990, December 1994, and July 1998 (using START II counting rules)								
Air Base	Aircraft	WHs	Number of Deployed Bombers/WHs					
			Sept. 1990		Dec. 1994		July 1998	
1. Engels	Blackjack/Tu-160	12	0	0	5	60	6	72
	Bear H16/Tu-95MS16	16	0	0	0	0	18	288
	Bear H6/Tu-95MS6	6	0	0	0	0	2	12
	<b>Total Engels</b>		<b>0</b>	<b>0</b>	<b>5</b>	<b>60</b>	<b>26</b>	<b>372</b>
2. Mozdok	Bear H16/Tu-95MS16	16	22	352	19	304	1	16
	Bear H6/Tu-95MS6	6	0	0	2	12	0	0
	<b>Total Mozdok</b>		<b>22</b>	<b>352</b>	<b>21</b>	<b>316</b>	<b>1</b>	<b>16</b>
3. Ryazan <sup>322</sup>	Bear G/Tu-95K22	2	0	0	24	48	4	8
	<b>Total Ryazan</b>		<b>0</b>	<b>0</b>	<b>24</b>	<b>48</b>	<b>4</b>	<b>8</b>
4. Ukrainka	Bear H16/Tu-95MS16	16	0	0	18	288	16	256
	Bear H6/Tu-95MS6	6	0	0	26	156	27	162
	Bear G/Tu-95K22	2	46	92	0	0	0	0
	Bear B/Tu-95K	1	15	15	0	0	0	0
	<b>Total Ukrainka</b>		<b>61</b>	<b>107</b>	<b>44</b>	<b>444</b>	<b>43</b>	<b>418</b>
<b>TOTAL</b>			<b>83</b>	<b>459</b>	<b>94</b>	<b>868</b>	<b>74</b>	<b>814</b>

<sup>322</sup> Since the number of strategic bombers at the Dyagilevo air base near Ryazan is quite small, it is not clear it has as large a nuclear weapons storage as the bases at Engels, Mozdok, or Ukrainka. Reportedly, its main function has been as a training and repair facility for strategic bombers. Two U.S. B-52 bombers and a KC-10 tanker visited the base in March 1992 and the commander of the U.S. 8th Air Force, General Philip Ford, visited on 5 June 1998; Steven Zaloga, "Strategic Forces of the SNG," *Jane's Intelligence Review*, February 1992; "B-52s go in peace," *Jane's Defence Weekly*, 14 March 1992; Air Forces of the World: Russia, *Flight International*, 10 September 1997; "Senior US officer visits Russian air force training centre," *Interfax* 5 June 1998 (BBC Summary of World Broadcasts, 8 June 1998)

Nonetheless, strategic bombers and Tu-22 Backfire medium-range bombers have been kept there. Former Prime Minister Victor Chernomyrdin "inspected" Tu-95 MS [Bear H] and Tu-22 MZ [Backfire] bombers at the base in November 1996; "Chernomyrdin visits military establishments, Airborne Troops in Ryazan Region," *ITAR-TASS*, 1 November 1996 (BBC Summary of World Broadcasts, 2 November 1996). Also a western reporter observed some Tu-22 Backfires at the base in 1993: Craig Covault, "Russian Bomber Force Seeks Tactical Role," *Aviation Week and Space Technology*, 15 November 1993.

Thus, the Dyagilevo/Ryazan air base may have a nuclear storage larger than the what is suggested by the strategic bomber deployments listed in the START I MOU.

## Appendix C: Russian Nuclear Warheads Storages and Overfilling

Several sources suggest RTB storages for non-strategic and naval nuclear weapons (naval tactical and strategic weapons are stored together) may hold some 100 - 200 nuclear warheads. A CIA analysis of Soviet forward nuclear storage sites in Eastern Europe in 1979 noted that the 23 storages in Eastern Europe could hold, depending on the type of weapon stored and storage practices, 370 - 1,070 tactical nuclear bombs and 1,700 - 2,900 FROG and SCUD missile warheads, or 2,070 - 3,970 weapons in total. This implies each storage could hold on average 90 - 172 nuclear weapons.<sup>323</sup> Also, as noted above, possibly 216 tactical missile warheads were kept in a nuclear storage at the GRAU arsenal at Bronnaya Gora.<sup>324</sup>

Finally, a recent Russian account of the Cuban missile crisis details how 158 Soviet nuclear warheads were sent to Cuba and where they were stored. Of the 158 warheads, 134 were offloaded onto Cuban soil, while 24 for the 24 SS-5 IRBMs to be deployed in Cuba were stored afloat aboard their transport ship. Of the remaining warheads, 36 were for the 36 SS-4 MRBMs, 80 were for 80 FKR tactical ground-launched cruise missiles, 12 were for 12 FROG/Luna tactical missiles, and six were for six nuclear-capable Il-28 bombers. In October 1962, 88 of these including 36 SS-4 warheads, 40 FKR warheads and 12 FROG/Luna warheads, were kept in a main nuclear weapons storage site at Bejucal near Havana. The forty remaining FKR warheads were deployed in eastern Cuba near the second FKR missile site and the six warheads for the Il-28 bombers were apparently kept at the airfield at Santa

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<sup>323</sup> CIA, *Warsaw Pact Forces Opposite NATO*, NIE 11-14-79, (Top Secret; partially declassified), 31 January 1979, pp. 45-46.

The NIE said that 11 storage sites were located at Soviet tactical airfields and 12 were isolated installations for the storage of warheads for tactical missiles. Eight sites were in East Germany (6 airfields, 2 warhead storages), five were in Poland (2 airfields, 3 warhead storages), four were in Czechoslovakia (1 airfield, 3 warhead storages), three were in Hungary (2 airfields, 1 warhead storage), and three were in Bulgaria (all warhead storages; for a discussion of whether nuclear weapons were deployed in Bulgaria, see Appendix A). In addition, seven "temporary storage" sites were located in East Germany, two in Poland, and three in Hungary.

Some have noted, however, that post-1989 analyses suggest that the lower estimates of the numbers of nuclear weapons kept in Soviet nuclear weapons storages are more appropriate. Western pre-1989 analyses tended to over-estimate the number of warheads kept in Soviet nuclear weapons storages.

<sup>324</sup> As noted above in Appendix A, whether Soviet nuclear weapons were deployed in Bulgaria remains uncertain. However, the reports that claim they were deployed provide some information about the numbers of nuclear weapons kept in storages. Rabinovich estimated that there were 146 nuclear warheads for missiles kept in the RTB storages in Bulgaria, however it is unclear whether they were kept at one facility or spread among several; Moysey Rabinovich, "Soviet Conventional Arms Transfers to the Third World: Main Missile and Artillery Directorate (1966-1990)," Global Consultants, Inc., Alexandria, VA, 1993, pp. 44-45.

*Komsomolskaya Pravda* reported that, according to a purported officer who had served at one of the 12th Main Directorate nuclear weapons facilities in Bulgaria, about 70 nuclear warheads were kept in an underground storage at the base; Yelena Ardabatskaya, "The USSR Could Have Delivered a Nuclear Strike Against the West From Sofia...; 'Sensational' disclosures of a retired Soviet Army captain who served at a 'top-secret' base close to the Bulgarian capital," *Komsomolskaya Pravda*, 11 September 1996, (FBIS-SOV-96-209-S, 11 September 1996).

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Clara in central Cuba.<sup>325</sup>

Matching up the Russian provided numbers and locations with the bunkers identified in the 1962 CIA analyses of the deployments of missiles and warheads in Cuba is difficult. In October 1962, the United States was not sure that nuclear weapons had been deployed in Cuba. However, since the Guanajay sites identified in the 1962 CIA reports are in the same general vicinity of Bejucal in western Cuba, perhaps the largest facility identified by the CIA was the central RTB storage on Cuba and held the 88 warheads at Bejucal.<sup>326</sup> While the smaller storages at the missile sites were the front-line storages, which may have held some dozen or more warheads for the MRBMs, IRBMs, or FROG/Luna rockets to be deployed nearby.

Table C4: Russian SLBM Warhead Deployments September 1990 and July 1998						
Fleet	SLBM	WHs	SLBMs Deployed/Total WHs			
			Sept. 1990		July 1998	
Northern Fleet. Two basing areas on Kola Peninsula. In several fjords NW of Murmansk at Yagelnaya, Olenya, and Nerpichya/Zapadnaya Litsa, and E of Murmansk at Gremikha/Ostrovnoy. Note: Gremikha may be non-operational. Also, most or all of the Yankee and Delta SSBNs which carry the SS-N-6 and SS-N-8 SLBMs may be out of service.	SS-N-20	10	120	1,200	82	820
	SS-N-23	4	112	448	112	448
	SS-N-18	3	80	240	64	192
	SS-N-17	1	12	12	0	0
	SS-N-8	1	172	172	108	108
	SS-N-6	1	96	96	0	0
<b>Total Northern Fleet</b>			<b>592</b>	<b>2,168</b>	<b>366</b>	<b>1,568</b>
Pacific Fleet. Two bases. One at Rybachy near Petropavlovsk-Kamchatski. Second at Pavlovsk SE of Vladivostok.	SS-N-18	3	144	432	144	432
	SS-N-8	1	108	108	84	84
	SS-N-6	1	96	96	16	16
<b>Total Pacific Fleet</b>			<b>348</b>	<b>636</b>	<b>244</b>	<b>532</b>
<b>Total SLBMs</b>			<b>940</b>	<b>2,804</b>	<b>610</b>	<b>2,100</b>

As Table C5 below indicates, the above estimates suggest that the approximately 60 service-controlled RTB storages could accommodate 5,230 - 9,700 nuclear warheads. Overall, the 80 Russian national- and service-level RTB nuclear storages may be able to hold 10,030 - 17,700 nuclear warheads. However, as noted above, if RTB storages had less capacity than pre-1989 western estimates suggested, then perhaps the lower-capacity estimate for RTB storages is more appropriate. If so, the Russian nuclear weapons storage complex

<sup>325</sup> See: General Anatoly Gribkov's account in General Anatoly Gribkov and General William Smith, *Operation Anadyr: U.S. and Soviet Generals Recount the Cuban Missile Crisis*, (Chicago, Edition Q, 1994), pp. 26-27 and 46. General Gribkov was in the Soviet General Staff's Main Operations Directorate in October 1962 and oversaw the planning and deployment of the Soviet missiles and nuclear weapons to Cuba.

<sup>326</sup> Bejucal is 13 miles South of Havana. Guanajay is 22 miles SW of Havana and some 18 miles due west of Bejucal.

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may be able to house 10,000 - 13,000 nuclear warheads.

Table C5: Capacity of Russian National-level and Service-controlled RTB Storages, 1998			
Type of Storage	Numbers and Capacity of Storages	Number of WHs at Storages	
		Low Estimate	High Estimate
National-level Storages	20 sites, holding 240 - 400 WHs each	4,800	8,000
<b>Total National-level Sites</b>		<b>4,800</b>	<b>8,000</b>
Service-controlled RTB Storages			
19 ICBM bases	19 storages of various sizes	180	500
3 Bomber bases	3 storages, each holds 350 - 400 WHs	1,050	1,200
Other RTB storage sites	40 storages, each holds 100 - 200 WHs	4,000	8,000
<b>Total Service-Controlled Sites</b>		<b>5,230</b>	<b>9,700</b>
<b>Total</b>		<b>10,030</b>	<b>17,700</b>

### 2. Reports of Overloading of Storages

Reports of overloading at storages sites surfaced shortly after the withdrawal of the tactical nuclear weapons into Russia. In the spring of 1992, General Sergei Zelentsov, then chief of the MOD's 12th Main Directorate, remarking on the shipments of nuclear weapons back to Russia, reportedly said, "There isn't a single storage facility that hasn't been filled to capacity."<sup>327</sup> One official at Chelyabinsk-70 noted, "We were removing warheads from their prepared storage areas to other sites. The weapons were sited at bases built long ago and, furthermore, ones not designed to take additional warheads."<sup>328</sup> One set of Russian analysts said Ministry of Defense storages in rear areas were overloaded by 35% to 120% of

<sup>327</sup> Quoted in Andrew Higgins, "Deadly secrets for sale," *The Independent*, (UK) 19 April 1992.

<sup>328</sup> Interview with Gennady Novikov, Chief of the Sector Special Security Laboratory at Chelyabinsk-70, by V. Umnov, "Few Bombs Will Survive Till the Year 2000: In the Past Year the Safety of Our Nuclear Weapons Has Declined Sharply," *Komsomolskaya Pravda*, 12 March 1992, (FBIS-SOV-92-051, 16 March 1992, p. 7).

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their capacity.<sup>329</sup> In 1994, another unofficial Russian estimate suggested that rear area storages had been some 18% to 107% overfilled after all the tactical nuclear weapons had been withdrawn into Russia and removed from front-line units, although they were probably less overfilled by 1994 due to dismantlements.<sup>330</sup> Finally in late 1996, General Igor Valynkin, then First Deputy Head of the 12th Main Directorate, said that nuclear weapons storages were overloaded with weapons with expired service lives and weapons scheduled for disassembly under Russia's international commitments particularly because disassembly plans were not being fulfilled.<sup>331</sup>

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<sup>329</sup> Dr. Sergei Rogov and Dr. Alexander Kononov, Institute of USA and Canada Studies, eds., *The Soviet Nuclear Legacy Inside and Outside Russia: Problems of Non-Proliferation, Safety, and Security*, (Institute of USA and Canada Studies: Moscow, 1993), p. 29.

<sup>330</sup> Anton Surikov and Igor Sutyagin of the USA and Canada Institute, "Nuclear Weapons in the Former Soviet Union: Safety and Security Aspects," presentation at Royal Institute of International Affairs' Former Soviet States and European Security Project, 15 March 1994, pp. 20 and 34-38.

<sup>331</sup> Comments by General Igor Valynkin, then First Deputy Head of the 12th Main Directorate before the Duma Committee on Security, "Stenographic Record of the Parliamentary Hearings on the Topic: Issues Concerning the Security of Hazardous Nuclear Facilities," *Yaderny Kontrol Digest*, No. 5, Fall 1997, p. 12. The hearings were held 25 November 1996.

## Appendix D: Dismantling and Eliminating Warheads

Although storages were overloaded in the early 1990s, the warhead storage space problem may have been alleviated by the late 1990s, depending on dismantlement and elimination rates. This section overviews the situation with the dismantlement and elimination of nuclear weapons.

### 1. Definitions of Dismantling and Elimination

The final elimination of a Russian nuclear weapon involves three steps: 1) disabling, 2) dismantling, and 3) destruction.<sup>332</sup> After the fall 1991 Presidential Initiatives, U.S. and Russian officials and specialists held a series of meetings to discuss the implementation of these proposals. During the fall of 1991 and the first half of 1992, the United States urged Russia to consolidate its nuclear forces and eliminate them, particularly tactical nuclear weapons, and offered to provide assistance to do so. In these meetings, U.S. officials learned that prior to movement, weapons are disabled "so that they cannot produce a nuclear yield." At the military storage sites prior to the hand over to the weapons facilities for destruction, the weapons, were "further disabled to the point that the process is difficult to reverse."<sup>333</sup>

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<sup>332</sup> For a description of U.S. dismantlement procedures see: The Arms Control and Disarmament Agency's response to questions in Hearings on "Consideration of Ratification of the Treaty Between the U.S. and the Russian Federation on Further Reduction and Limitations of Strategic Offensive Arms (The START Treaty) Treaty Doc. 103-1," S. Hrg. 104-30, pp. 158-159. According to ACDA, it takes from a few days to a few weeks to disassemble a U.S. nuclear weapon. The process is similar to the reverse of the assembly process and "requires approximately 2,000 prescribed steps to combine hundreds of separate parts and subassemblies to form a weapon." See also the description in: Department of Energy, *Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapons Components, Volume I -- Main Report*, November 1996, pp. 1-5 to 1-11.

<sup>333</sup> Reginald Bartholomew, Undersecretary of State for International Security Affairs, testimony before the SASC on "Assisting the Build-Down of the Former Soviet Military Establishment," 5 February 1992, S. Hrg. 102-625, pp. 10 and 16. Also see his testimony before the SFRC on "The START Treaty," 6 February 1992, S. Hrg. 102-607, Pt. 1, pp. 6, 12, 13. And: Stephen Hadley, ASD, International Security Policy, testimony before the SASC on "Assisting the Build-Down of the Former Soviet Military Establishment," 5 February 1992, S. Hrg. 102-625, pp. 22 and 39.

During their meetings in Washington on 25-26 November 1991, Bartholomew outlined to Deputy Soviet Foreign Minister Alexei Obukhov several U.S. ideas for "quick steps to disable Soviet nuclear weapons." These included, "removing tritium, fuses, neutron generators, power supplies, etc." Such steps, Bartholomew said, "would prevent use should they fall into the wrong hands and to give confidence that the dismantling is already beginning." According to Bartholomew, the Soviet experts at the meeting agreed that, "as a technical matter Soviet weapons could be rapidly disabled," however they continued to insist that Soviet nuclear weapons were, "already fully secure," in any event; Reginald Bartholomew, Undersecretary of State for International Security Affairs, "Memorandum for the Secretary, Subject: My Meetings With Obukhov," 27 November 1991, (Secret; declassified and released under the Freedom of Information Act to Center for Energy and Environmental Studies, Princeton University)

An indication of the kind of disabling work which may be done at a central storage site comes from a CIA description of a facility at Malaya Sazanka which had been photographed by a U-2 spy plane in March 1958. According to the CIA, the facility was determined to be a structure for mating nuclear devices with their

Generally, when discussing this process, U.S. officials use the word dismantle to mean destruction or elimination of nuclear warheads. However, the dismantling and destruction steps were officially defined in an Ukraine-Russian agreement as:

Dismantling is defined as: "the process of disassembling nuclear munitions into their component parts with the extraction of the warhead."

Destruction is defined as: "the process of physical demolition or irreversible deformation of the casing and component parts and the extraction from the warhead of the fissionable materials in order to rule out the possibility of reuse in nuclear munitions."<sup>334</sup>

## 2. Elimination Facilities

In July 1992, former Minatom Minister Victor Mikhailov said the four Russian plants where nuclear warheads were assembled -- at Arzamas, Nizhnyaya Tura, Zlatoust, and Penza -- would be utilized to destroy them.<sup>335</sup> The four Minatom facilities used for production of nuclear warheads are:<sup>336</sup>

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detonators;" Gregory Pedlow and Donald Welzenbach, History Staff, Center for the Study of Intelligence, *The CIA and the U-2 Program, 1954-1974*, (Central Intelligence Agency, 1998), p. 144.

Removal of a detonator would disable a warhead.

<sup>334</sup> "Protocol to the 'Agreement between Ukraine and the Russian Federation Concerning the Procedure for Movement of Nuclear Munitions from the Territory of Ukraine to Central Pre-Factory Bases of the Russian Federation for the Purpose of Dismantling and Destroying Them,' Concerning the Procedures for Monitoring the Destruction of Nuclear Munitions, Removed from the Territory of Ukraine, at Industrial Enterprises of the Russian Federation," 1992 (translated by the U.S. Department of State, Language Services), printed in SASC, Hearings on "The Military Implications of START I and START II," 4 August 1992, S. Hrg. 102-953, p. 259.

<sup>335</sup> O. Volkov and A. Khokhlov, "Nuclear Danger is No More Than a Myth. That is What Russian Nuclear Minister Victor Mikhailov Believes," *Komsomolskaya Pravda*, 22 July 1992, (JPRS-TND-92-026, 31 July 1992, p. 21). Also: in response to the Ukrainian decision to stop warhead shipments, Col. General Victor Samsonov, Chief of the Joint Armed Forces General Staff said Russia had four plants for dismantling nuclear weapons; Victor Litovkin, "Ukraine Has No Access to Nuclear Weapons, High Command Asserts," *Izvestia*, 16 March 1992, (JPRS-TND-92-008, 26 March 1992, p. 52). See Figures 16-19 in Appendix F for Corona satellite imagery of Arzamas-16, Sverdlovsk-45 and Zlatoust-36.

<sup>336</sup> Oleg Bukharin, "Security of Fissile Materials in Russia," *Annual Review of Energy and the Environment*, 1996, p. 474. See also: Thomas Cochran, Robert Norris, and Oleg Bukharin, *Making the Russian Bomb: From Stalin to Yeltsin*, (Westview Press: Boulder, CO, 1995), p. 34.

<u>Facility</u>	<u>Location</u>
Avangard Electromechanical Plant	Arzamas-16, ( <i>Sarov</i> , Nizhny Novgorod Oblast)
Elektrokhimpribor Plant	Sverdlovsk-45, ( <i>Lesnoy</i> at Nizhnyaya Tura)
Priborostroitelny Zavod	Zlatoust-36, ( <i>Trekhgornyy</i> at Yuryuzan)
Production Association Start	Penza-19, ( <i>Zarechnyy</i> at Kuznetsk)

U.S. intelligence agencies have provided these descriptions of the weapons production and dismantlement facilities: A recently declassified 1965 National Intelligence Estimate said that the intelligence community had, "identified two major nuclear weapon fabrication complexes, located at Nizhnaya Tura [sic] and Yuryuzan in the Urals. Each of these include large nuclear weapons stockpile facilities. In addition, the Kasli R and D facility probably produces some nuclear weapon components, and there is a possible nuclear weapons or component fabrication installation near Penza."<sup>337</sup>

In 1992, the DIA told Congress that there was: "A very large plant at Nizhnyaya Tura in the Urals, north of Sverdlovsk (now Yekaterinburg), a much smaller facility at Yuryuzan southwest of Sverdlovsk and a small component fabrication and assembly plant at Penza, southeast of Gorky (now Nizhny Novgorod)."<sup>338</sup> While the CIA said that the plants at Nizhnyaya Tura and at Yuryuzan were both "several times larger than the U.S. Pantex facility." The CIA noted, however, that, "imagery evidence indicates that the Yuryuzan facility has done most of the work on dismantlements so far."<sup>339</sup> Indeed, these two large facilities and the Avangard plant area at Arzamas-16 are easily discernable on the declassified Corona satellite imagery from the 1960s and 1970s.<sup>340</sup>

<sup>337</sup> CIA, *The Soviet Atomic Energy Program*, NIE 11-2A-65, (Top Secret; partially declassified), 19 May 1965, pp. 18-19.

According to a 1964 CIA National Intelligence Estimate, Kasli is located between Chelyabinsk and Yekaterinburg, near the plutonium production facilities at Chelyabinsk-65 and the nuclear weapons design facility at Chelyabinsk-70; CIA, *The Soviet Atomic Energy Program*, NIE 11-2-64, (Top Secret; partially declassified), 16 July 1964, p. 23.

It is unknown whether it was a nuclear weapons related facility (today it is a metallurgical production center) or perhaps one of other nearby nuclear weapons facilities was misidentified as Kasli at the time.

<sup>338</sup> Lt. General James Clapper, USAF, Director, DIA, testimony before SASC hearing on "Threat Assessment, Military Strategy, and Defense Planning," 22 January 1992, S. Hrg. 102-755, pp. 55-56.

<sup>339</sup> Lawrence Gershwin, NIO for Strategic Programs, CIA, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, p. 498.

<sup>340</sup> For example, the Sverdlovsk-45 plant is visible in Corona Missions: 1115-1, 15 September 1971; 1111-1, 23-24 July 1970; 1048-2, 2 October 1968; 1033-1, 25 May 1966; 1016-2, 21 January 1965; 9053, 2 April 1963; and 9031, 3 March 1962. The Zlatoust-36 plant is visible in Missions: 1115-2, 20 September 1971; 1115-1, 14 September 1971; and 1110-2, 3 June 1970. Arzamas-16 and the Avangard plant are visible in Missions: 1116-2.

The through-put of these plants is not known. However, in 1992, a retired nuclear weapon assembly worker from Arzamas-16 reportedly said that, per the central plan in the early 1960s, on average 30 weapons a month were assembled in his shop at Arzamas-16, and, that, production was increased during the Cuban missile crisis.<sup>341</sup>

The plants are thought to be somewhat specialized in what they dismantle, e.g. Arzamas-16 and Sverdlovsk-45 are thought to produce and so dismantle physics packages.<sup>342</sup> Arzamas-16, Zlatoust-36 and Sverdlovsk-45 may have also specialized in dismantling certain types of warheads. For example, Arzamas-16 may have dismantled tactical warheads: e.g., in June 1992, the Russian press reported that the destruction of tactical nuclear warheads had begun in Arzamas-16.<sup>343</sup> Also, some warheads may have had to have been serially dismantled, with some work being done at one plant and the rest at another.

All plants at some point seemingly were involved in the warhead dismantling process.<sup>344</sup> Yet, as of 1998, it appears that Sverdlovsk-45 and Zlatoust-36 are engaged in most if not all of the dismantlement work and Arzamas-16 and Penza-19's role in warhead dismantlement is secondary or is or soon will be finished.<sup>345</sup>

### 3. Estimates of Dismantlement Rates

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6 May 1972 and 1114-2, 3 April 1971.

<sup>341</sup> V. Filin, "Nuclear bomb assembly technology. Yardman Minayev speaks," *Komsomolskaya Pravda*, 6 February 1992, (BBC Summary of World Broadcasts, 8 February 1992).

<sup>342</sup> They also store fissile material components from retired warheads before they are sent to Tomsk-7 or Chelyabinsk-65; Oleg Bukharin, "Security of Fissile Materials in Russia," *Annual Review of Energy and the Environment*, 1996, p. 476.

<sup>343</sup> "Arzamas-16 Begins Destroying Nuclear Weapons," *Moscow Radio Rossii Network*, 23 June 1992, (JPRS-TND-92-020, 25 June 1992, p. 25).

<sup>344</sup> However, if Penza-19 is a component manufacturing facility, then it may not engage in the dismantlement of warheads and/or physics packages. Although one Russian press report claims assembly, dismantling and storage of nuclear weapons occurs at Penza-19: "The Start production association, Zarechny (Penza-19). Assembly, dismantling and storage of nuclear warheads occurs here. The production buildings were constructed during the 1960s and are now obsolete both physically and technologically. The reduction of nuclear armaments has resulted in increased volume of dismantling warheads and storing nuclear components. The physical protection of nuclear materials does not preclude, according to the data of the Federal Counter-Intelligence Service, unsanctioned access to nuclear components of warheads;" Alexander Bolsunovsky and Valery Menshchikov, "Nuclear Security is Inadequate and Outdated," *Moskovskiy Novosti*, No. 49, 9-15 December 1994, (FBIS-SOV-95-006-S, 10 January 1995).

<sup>345</sup> In February 1998, then Minatom Minister Mikhailov said that, as part of the long-term conversion program of the Russian nuclear weapons complex, two out of the four plants producing nuclear weapons and one out of the two plants manufacturing nuclear weapons components would be closed by the year 2000; "Press Conference with Nuclear Energy Minister Victor Mikhailov," Official Kremlin International News Broadcast, 18 February 1998 (Federal News Service). It is thought Arzamas-16 and perhaps Penza-19 are two of the plants being considered for closure.

Russian and U.S. officials have made several claims about the number of warheads that have been dismantled or eliminated.<sup>346</sup> During the 1991-1992 U.S.-Russian meetings, Russian officials gave U.S. officials information about Russia's procedures for dismantling nuclear weapons and provided estimates of dismantlement rates. Russian officials claimed that Russia was dismantling at least 1,000 warheads a year and could dismantle as many as 4,000 a year with the existing labor force at the nuclear weapons facilities. In addition, in one case, General Sergei Zelentsov claimed at a non-governmental conference that Russia could dismantle up to 8,000 warheads a year if no production was undertaken.<sup>347</sup>

However, overall, U.S. officials have tended to suggest that Russia is dismantling weapons rather slowly. Most Russian officials' comments about the numbers of dismantled weapons involve weapons removed from Ukraine, Kazakhstan or Belarus. Two conclusions can be drawn from this "best available" information. On the one hand, if the Russian plants have mainly been dismantling weapons from Ukraine, it indicates a low dismantlement rate. On the other, if Russian plants have been dismantling other than warheads withdrawn from Ukraine, it provides a minimum dismantlement rate. In the absence of better information, some analysts suggest that the conservative estimate is more appropriate, and that Mr. Mikhailov's statements which indicate a dismantlement rate of closer to 3,000 weapons a year are too vague to be reliable.

**a. General comments about total number of weapons to be dismantled:** In November 1991, President Gorbachev said that 15,000 Soviet nuclear weapons were to be eliminated as a result of his October 1991 response to President Bush's proposals.<sup>348</sup> This

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<sup>346</sup> Note: It is not always clear that a claim of certain amount of warheads dismantled means the warheads were dismantled or they were actually destroyed.

<sup>347</sup> General Sergei Zelentsov's comments to Federation of American Scientists and Natural Resources Defense Council Workshop quoted in Herbert Abrams and Dan Pollak, *Security Issues in the Handling and Disposition of Fissionable Material*, Center for International Security and Arms Control, Stanford University, November 1993, pp. 10 and 22.

<sup>348</sup> TASS, "Gorbachev Interviewed by Japanese News Agency [Kyodo Tsushin]," 27 November 1991, (BBC Summary of World Broadcasts, 29 November 1991).

According to Deputy Soviet Foreign Minister Alexei Obukhov, Soviet officials gave this information to U.S. government officials during meetings on 25-26 November 1991 in Washington on the Bush-Gorbachev disarmament proposals. The 15,000 weapons were to be eliminated by the year 2000; Mikhail Mayorov, "Obukhov Discusses Soviet, U.S. Arms Talks," *INTERFAX*, 4 December 1991, (FBIS-SOV-91-234, 5 December 1991, p. 1); Andrei Surazhansky, "U.S. Disarmament Viewed," *TASS*, 4 December 1991, (FBIS-SOV-91-234, 5 December 1991, p. 2); Andrei Surazhansky, "15,000 Soviet Nuclear Warheads Eliminated by Year 2000," *Krasnaya Zvezda*, 5 December 1991, (FBIS-SOV-91-235, 6 December 1991, p. 1).

Interestingly in 1992, Mr. Mikhailov reportedly said that Gorbachev's proposals would have called for the destruction of 18,000 warheads by the end of 1991; International Physicians for Prevention of Nuclear War, interview with Victor Mikhailov, Minister of Atomic Energy, in *Nuclear Weapons in the Commonwealth of Independent States: A Report of the International Physicians for Prevention of Nuclear War* (Cambridge, MA),

15,000 number seemingly included both tactical and strategic warheads. In May 1992, the CIA estimated that some 9,000 - 16,000 weapons were slated for dismantling. According to the CIA, the Gorbachev and Yeltsin initiatives involved some 1,200 strategic warheads and 5,000 - 12,000 tactical nuclear weapons, and there were some 2,700 nuclear weapons remaining from the INF treaty.<sup>349</sup> In February 1993, after the START I treaty had been signed, the CIA said that Russia may have to destroy 20,000 tactical and strategic warheads per unilateral and START commitments.<sup>350</sup> However, in November 1995, the DOD suggested that Russia had 22,000 nuclear weapons to dismantle as of 1992.<sup>351</sup> While, in November 1997, seemingly dis-aggregating the 22,000 number, the DOD estimated that 15,000 tactical nuclear weapons could be eliminated as a result of the 1991 Presidential unilateral initiatives, and strategic arms agreements could lead to the retirement and disassembly of more than 7,000 strategic warheads.<sup>352</sup> As noted, Russia announced in fall 1991 that Russia planned to complete the dismantlement of withdrawn tactical weapons by

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24 April 1992, p. 14.

<sup>349</sup> Lawrence Gershwin, NIO for Strategic Programs, CIA, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, p. 497.

Note: however in regards to INF weapons, by December 1991, according to General Sergei Zelensov, all nuclear warheads which were attached to Soviet medium and short range missiles, and also to those missiles which have completed their service lives, were dismantled; A. Naryshkin, "Military Official Says All Soviet Nuclear Munitions Are Accounted For," TASS, 23 December 1991, (BBC Summary of World Broadcasts, 28 December 1991). In 1993, the CIA seemed to confirm this, slightly contradicting their earlier statement, by noting: "Tactical and strategic warheads are being dismantled. A Ministry of Defense official told the press in December 1991 that warheads from medium-range missiles and those from obsolete missiles -- presumably including some strategic systems -- have been dismantled;" Lawrence Gershwin, NIO for Strategic Programs, testimony before SASC hearing on "Current Developments in the Former Soviet Union," 3 February 1993, S. Hrg. 103-242, p. 38.

Gorbachev used the 15,000 number in summing up a response to a question concerning tactical nuclear weapons. Other mentions of this number in the Soviet press suggested it could include more than just tactical nuclear weapons. E.g.: In an interview, General Vladimir Lobov, Chief of the General Staff concluded in describing the Gorbachev initiatives as they relate to strategic weapons that, "On the whole, 15,000 nuclear warheads will be scrapped;" Alexander Yakovlev, interview with General Vladimir Lobov, "Military Observer on Achieving Disarmament," *Moscow Radio Moscow World Service*, 6 December 1991, (FBIS-SOV-91-236, 9 December 1991, p. 1).

Early in 1992, U.S. officials also said Russian officials told them in 1991 that Russia planned to destroy 15,000 nuclear weapons. However, the U.S. officials did not specify whether this was just tactical nuclear weapons or both strategic and tactical nuclear weapons; Robert Gates, DCI, testimony before SGAC hearing on "Weapons Proliferation in the New World Order," 15 January 1992, S. Hrg., 102-720, pp. 8 and 38.

But in any event, per Mr. Gershwin's comments above, the U.S. government seemingly interpreted Gorbachev's proposal, -- i.e., the 15,000 number -- as applying to tactical and strategic weapons.

<sup>350</sup> Lawrence Gershwin, NIO for Strategic Programs, testimony before SASC hearing on "Current Developments in the Former Soviet Union," 3 February 1993, S. Hrg. 103-242, pp. 19-20.

<sup>351</sup> Harold Smith, ASD, Atomic Energy, testimony to the HIRC hearings on "Newly Independent States of the Former Soviet Union: U.S. Policy and Assistance," 14 November 1995, p. 163.

<sup>352</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, November 1997, p. 43.

the year 2000.<sup>353</sup>

#### **b. U.S. Statements about dismantlements and dismantlement rates**

In late 1991, ACDA claimed that Russia was dismantling some 1,500 warheads a year.<sup>354</sup> In early 1992, the CIA also said Russian officials claimed that 1,500 warheads year could be dismantled, but said that this was probably optimistic given the internal problems Russia had at the moment.<sup>355</sup>

In early 1992, a visiting group of U.S. senators were told by "high-level" Minatom officials that Russia dismantled more than 1,000 warheads a year, and it had been dismantling weapons at that rate since 1985.<sup>356</sup> Commenting on this information, the CIA said, "Our only direct information on Russian dismantlement capacity has come from diplomatic exchanges. During these conversations, Russian officials have stated capacity ranges of 'somewhat less than 1,500' to approximately 4,000 warhead per year. [deleted]"<sup>357</sup>

By May 1992, the CIA reported that, "Recent claims by different Russian officials" of dismantlement capacity range from 4,000 to 8,000 warheads per year. The CIA judged that more than 1,500 a year could be dismantled, and that a claim of 4,000 a year was credible. But the CIA questioned whether Russia would "go that high due to storage limitations and

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<sup>353</sup> See also U.S. officials' statements: President Gorbachev gave the U.S. a schedule that "stretches out to the year 2000 to dismantle the tactical nuclear weapons (plus weapons to be eliminated under START plus weapons previously planned to be retired);" Reginald Bartholomew, Undersecretary of State for International Security Affairs, testimony before the SASC on "Assisting the Build-Down of the Former Soviet Military Establishment," 5 February 1992, S. Hrg. 102-625, pp. 11 and 16.

The year 2000 still seems to be the anticipated completion date for tactical nuclear warhead dismantlements; e.g., In November 1997, General Sergeyev told the press that, "I hope that this process will be completed by the year 2000;" "Press Conference with Defense Minister Igor Sergeyev," Official Kremlin International News Broadcast, 14 November 1997, (Federal News Service). Also see discussion below.

<sup>354</sup> "Some Soviet experts have estimated it could take them 10 years to dismantle some 15,000 nuclear weapons. This, probably, is the time needed for complete disassembly of weapons and warheads into components, to be destroyed or safeguarded, as appropriate. Merely disabling those weapons, however, to make them militarily unusable, could be done in a shorter time;" Ronald F. Lehman II, Director ACDA, testimony before the SFRC hearings on "The START Treaty in a Changed World," 7 November 1991, S. Hrg. 102-406, p. 166.

<sup>355</sup> "Russian officials have claimed that they can dismantle about 1,500 weapons per year. We have a moderate degree of confidence they can do this, but at that rate it would still take over 10 years to dismantle the 15,000 weapons they say they will destroy;" Robert Gates, DCI, testimony before SGAC hearing on "Weapons Proliferation in the New World Order," 15 January 1992, S. Hrg., 102-720, pp. 8, 17 and 38.

<sup>356</sup> Stated in Sen. Strom Thurmond's written question to Robert Gates, DCI, printed in hearing on "Threat Assessment, Military Strategy, and Defense Planning," 22 January 1992, S. Hrg. 102-755, p. 63.

<sup>357</sup> Robert Gates, DCI, testimony before SASC hearing on "Threat Assessment, Military Strategy, and Defense Planning," 22 January 1992, S. Hrg. 102-755, p. 63.

safety concerns."<sup>358</sup>

Also in May 1992, a DOD official who had participated the U.S.-Russian meetings on implementing the Presidential initiatives, reported that the head of the Russian dismantlement effort told him that the existing labor force could dismantle 4,000 nuclear weapons a year. This official, however, was left with the impression that 1,000-1,500 weapons were being taken apart a year.<sup>359</sup>

In February 1993, Lawrence Gershwin, National Intelligence Officer for Strategic Programs at the CIA, said that in November 1992, "Moscow indicated over 600 tactical warheads from Ukraine had been eliminated and provided a schedule -- by the year 2000 -- for all others to be dismantled." He said he thought the Russian dismantlement rate was "something under 2,000 weapons a year."<sup>360</sup> Later in February 1993, he repeated, that probably less than 2,000 warheads a year were being dismantled, but that the Russians had said 4,000 or 5,000 warheads a year could dismantled.<sup>361</sup> His chief, R. James Woolsey, Director Central Intelligence, echoed that Russia was destroying about 2,000 warheads a year and could go up to 4,000-5,000.<sup>362</sup>

In May 1993, the State Department said Russian officials had told the United States that, "the dismantlement of nuclear warheads is ongoing and that they have begun to dismantle and eliminate the tactical warheads withdrawn from Ukraine. We judge that warhead dismantlement is taking place and we estimate that Russia could have eliminated at least 1,000 of the tactical nuclear warheads withdrawn from Ukraine."<sup>363</sup> This suggests a minimum dismantlement rate of some 1,000 warheads a year, if dismantlements began in the summer of 1992.

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<sup>358</sup> Lawrence Gershwin, NIO for Strategic Programs, CIA, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, p. 498.

<sup>359</sup> Robert Barker, ASD, Atomic Energy, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, p. 505.

<sup>360</sup> Lawrence Gershwin, NIO for Strategic Programs, testimony before SASC hearing on "Current Developments in the Former Soviet Union," 3 February 1993, S. Hrg. 103-242, pp. 20 and 38.

Note: If Russia started warhead elimination in June-July 1992 (see discussion below) and had destroyed 600 warheads by November 1992, then Russia may have been able to dismantle about 1,200 warheads a year at minimum.

<sup>361</sup> Lawrence Gershwin, NIO for Strategic Programs, testimony before SGAC hearing on "Proliferation Threats of the 1990s," 24 February 1993, S. Hrg. 103-208, p. 39.

<sup>362</sup> R. James Woolsey, DCI, testimony before SGAC hearing on "Proliferation Threats of the 1990s," 24 February 1993, S. Hrg. 103-208, p. 46.

<sup>363</sup> Warren Christopher, Secretary of State, testimony before the SFRC, Hearings on "The Treaty Between U.S. and the Russian Federation on Further Reduction and Limitation of Strategic Offensive Arms (The START II Treaty) Treaty Doc. 103-1," 11 May 1993, S. Hrg. 103-325, p. 20.

In March 1994, Ashton Carter, Assistant Secretary of Defense for Nuclear Security and Counterproliferation, stated that, "Our understanding, which we think is pretty good," is that Russia is dismantling a couple of thousand warheads a year.<sup>364</sup> While Harold Smith, Assistant Secretary of Defense for Atomic Energy, told Congress that, "The Russians told us that they have been dismantling about 2,000 - 3,000 warheads per year,"<sup>365</sup> and that he estimated it would take Russia five to eight years to dismantle the warheads scheduled for elimination.<sup>366</sup> In October 1994, DOD estimated that Russia had dismantled "at least 5,000 warheads," since 1991,<sup>367</sup> suggesting a rate of around 1,500 weapons a year.

However in spring 1995, the DOD said that, "No precise data on the direction and rate of current Russian nuclear warhead dismantlement can be obtained from National Technical Means to verify Russian statements. By early 1995, 2,700 - 5,200 nuclear warheads could have been dismantled, if the Russians intend to meet their warhead reduction goals by 2003." But Russian comments about slowdowns associated with "the Ukrainian warhead removal may indicate as little as 1,500 tactical nuclear weapons have actually been dismantled."<sup>368</sup> Overall, this would suggest a dismantlement rate of 675 - 1,300 warheads a year or even less. Yet also in spring 1995, the DOE said, "we have high levels of confidence that the Russians are moving warheads to dismantlement facilities and removing fissile material from these facilities, which suggests a significant Russian nuclear weapon dismantlement rate."<sup>369</sup>

By January 1996, the Energy Department said that Russia has stated that it had dismantled about 80% of the warheads removed from Ukraine. These were presumably strategic ones since this was done under the agreed schedule of the January 1994 Trilateral Agreement. If so, and 1,820 nuclear warheads were in Ukraine, some 1,500 strategic warheads had been dismantled since March 1994 (over 21 months), or some 860 warheads a

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<sup>364</sup> Ashton Carter, Counterproliferation, testimony on "Nuclear Disarmament of the Former Soviet Union," before the HAC "DOD Appropriations for 1995, Part 4," 9 March 1994, p. 567.

<sup>365</sup> Department of Defense Answers to Questions for the Record from Harold Smith, ASD, Atomic Energy's testimony on "Nuclear Disarmament of the Former Soviet Union," before the HAC "DOD Appropriations for 1995, Part 4," 9 March 1994, p. 580.

<sup>366</sup> Harold Smith, ASD, Atomic Energy, testimony before the HASC on "National Defense Authorization Act for Fiscal Year 1995, Authorization and Oversight," 28 April 1994, HASC, No. 103-32, p. 1145.

<sup>367</sup> John Deutch, Deputy Secretary of Defense, "Testimony on U.S. Nuclear Policy," before the HCFA hearing on "U.S. Nuclear Policy," 5 October 1994, pp. 12 and 23.

In December 1994, the Department of Energy noted that at least 333 of the Ukrainian strategic warheads had been dismantled; Joint Russian-American Commission on Economic and Technological Cooperation, "Report of the Nuclear Energy Committee," Moscow, 14-16 December 1994, p. 2.

<sup>368</sup> DOD answers to questions for the record, testimony on "Counterproliferation of Weapons," before the HAC "DOD Appropriations for 1995, Part 5," 1 March 1995, p. 288.

<sup>369</sup> Kenneth Baker, Acting Director, Office of Nonproliferation and National Security, DOE, testimony before the SASC, FY 1996, Strategic Forces, 16 May 1995, S. Hrg. 104-387, Pt. 7, p. 309.

year.<sup>370</sup> But in 1996, DOD reported that, "Russian statements and actions are consistent with the large-scale dismantlement efforts now underway."<sup>371</sup> And, in June 1996, the State Department said that "Russian officials have stated that Russia is dismantling about 2,000 warheads per year. As a result, Russia's total inventory of nuclear warheads (i.e., deployed and non-deployed warheads) is estimated to have decreased to roughly 25,000."<sup>372</sup>

In March 1997, Franklin Miller, Acting Assistant Secretary of Defense for International Security Policy repeated to Congress that Russian officials had said that Russia was dismantling about 2,000 warheads a year, and that "progress in dismantling tactical and strategic nuclear weapons" was being made. He noted that the Russians had said they would complete their dismantlements under the fall 1991 Presidential nuclear initiatives, but DOD projections were, "that they will not complete it by the year 2000."<sup>373</sup> By fall 1997, DOD became slightly more pessimistic about Russian warhead dismantlement rates, saying that "As of January 1997, the stockpile of Russian strategic and tactical nuclear warheads was estimated at 25,000 warheads," a reduction of "more than 5,000 warheads since a major elimination program began in 1992."<sup>374</sup> This suggests a dismantlement rate of around 1,000 warheads a year. DOD went on to note that "Russia is believed to be dismantling warheads, but Moscow has not divulged specific information on warhead reductions." DOD assessed that "many retired warheads slated for elimination are awaiting dismantlement," probably because the economic situation had "slowed the reduction effort." DOD also stated that the process of eliminating strategic nuclear warheads only began in 1994 and judged that strategic nuclear weapons constituted the "majority of warhead eliminations so far," despite the fact that a "major elimination program began in 1992"<sup>375</sup> as the last tactical nuclear weapons were brought into Russia.

### c. Russian Statements

As noted above, Soviet officials claimed in fall 1991 that 15,000 nuclear weapons were to be eliminated under President Gorbachev's proposals. General Lobov said that serial dismantling was to begin in the second half of 1992 and would be completed by the year

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<sup>370</sup> U.S.-Russian Commission on Economic and Technological Cooperation, "Report of the Nuclear Energy Committee," Washington, 29-30 January 1996, pp. 2-3.

<sup>371</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, April 1996, p. 31.

<sup>372</sup> Richard Morningstar, Special Advisor to the President and the Secretary of State on Assistance to the NIS, Department of State, "Answers to Questions for the Record" for his testimony to the HCIR hearing on "Effectiveness of U.S. Assistance Programs in Russia, Ukraine, Armenia, and the Other Newly Independent States," 13 June 1996, p. 212.

<sup>373</sup> Franklin Miller, Acting ASD, International Security Policy, testimony before the SASC, FY 1998, Strategic Forces, 5 March 1997, S. Hrg. 105-37, Pt. 7, pp. 87 and 99.

<sup>374</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, November 1997, p. 43.

<sup>375</sup> U.S. Department of Defense, *Proliferation: Threat and Response*, November 1997, p. 43.

2000,<sup>376</sup> implying a dismantlement rate of 2,000 warheads a year if 15,000 warheads were taken apart over 7.5 years.

In January 1992, Minatom officials and "other informed sources," told a visiting U.S. Congressional delegation that "some 8-10 thousand warheads have been disassembled in Russia since 1985."<sup>377</sup> If these weapons were dismantled over six years, this suggests a minimum capacity of 1,300 - 1,700 nuclear weapons a year.<sup>378</sup>

In June 1992, the Russian press reported that the destruction of tactical nuclear warheads had begun in Arzamas-16, and that a group of Ukrainian observers was expected soon.<sup>379</sup>

In April 1993, then Minatom Minister Victor Mikhailov told the press that Russia had dismantled 3,000 nuclear "charges" in 1992, and that "beginning from 1987 we dismantled about 13,000 nuclear charges. In other words, during these six odd years we have been dismantling an average 3,000 nuclear charges a year." He noted, that in 1992, due to the Presidential nuclear initiatives, "dismantling proceeded at a faster pace."<sup>380</sup> Yet, in May 1993, Mr. Mikhailov told *Rossiyskie Vesti* that approximately 13,000 nuclear munitions had been dismantled since 1987, when active dismantling began, or about 2,000 warheads a year

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<sup>376</sup> Alexander Yakovlev, interview with General Vladimir Lobov, "Military Observer on Achieving Disarmament," *Moscow Radio Moscow World Service*, 6 December 1991, (FBIS-SOV-91-236, 9 December 1991, p. 1).

In May 1992, General Yakovlev of the 12th Main Directorate, also said tactical nuclear weapons removed from the Ukraine would begin to be scrapped "in a month's time" at Minatom facilities; "Press Conference on Withdrawal of Tactical Nuclear Weapons from the Ukraine by Members of CIS and Ukraine Military," Official Kremlin International News Broadcast, 6 May 1992, (Federal News Service). Taking part were Lt. General Sergei Zelentsov and Maj. General Vitaly Yakovlev.

See also: the CIA noted in 1993: "In June 1992, Ukrainian Defense Minister Morozov told the press that dismantling of warheads from Ukraine, presumably tactical ones, had begun. Russian press made a similar claim in August;" Lawrence Gershwin, NIO for Strategic Programs, testimony before SASC hearing on "Current Developments in the Former Soviet Union," 3 February 1993, S. Hrg. 103-242, p. 38.

<sup>377</sup> "Trip Report: Senate Armed Services Committee Delegation's Visit to Russia, Kazakhstan and Ukraine, January 15-20, 1992," 31 January 1992, p. 4.

<sup>378</sup> Note also: in spring 1992, then Minatom Minister Victor Mikhailov told a visiting IPPNW delegation that Russia had decreased its arsenal by 15-20% since 1986; International Physicians for Prevention of Nuclear War, interview with Victor Mikhailov, Minister of Atomic Energy, in *Nuclear Weapons in the Commonwealth of Independent States: A Report of the International Physicians for Prevention of Nuclear War* (Cambridge, MA), 24 April 1992, p. 14.

<sup>379</sup> "Arzamas-16 Begins Destroying Nuclear Weapons," *Moscow Radio Rossii Network*, 23 June 1992, (JPRS-TND-92-020, 25 June 1992, p. 25).

<sup>380</sup> "Press Conference by RF Atomic Energy Minister Victor Mikhailov (Tomsk Accident and Other Problems)," held at Bolshaya Ordynka Str., Official Kremlin International News Broadcast, 20 April 1993, (Federal News Service).

on average were being dismantled [i.e. over some six years].<sup>381</sup>

In June 1993, Mr. Mikhailov told Russian television that Russia had over 40,000 nuclear weapons at the beginning of 1986 and that the number had been reduced by "virtually 15,000" weapons.<sup>382</sup> This implies a dismantlement rate of over 2,000 warheads a year on average. In general, he noted that the dismantling of nuclear weapons had been going on for a long time, because the limited service lives of nuclear weapons -- 10 to 20 years -- meant some were always being taken apart. He commented that, large scale dismantling only began in 1987 and had increased greatly "over the past two years."<sup>383</sup> Finally, in 1993 he said, "Our nuclear arsenals have been reduced by more than 10,000 weapons since the middle of the 1980s."<sup>384</sup> Although this is not inconsistent with the claims outlined above, this last statement suggests a slightly lower dismantlement rate.

In December 1993, General Yakovlev, said that in accordance with the agreement between Ukraine and Russia, more than 1,300 tactical nuclear weapons that had been deployed in the Ukraine were destroyed during the past year under the control of Ukraine.<sup>385</sup> This suggests a minimum dismantlement rate of some 1,300 warheads a year, if, as noted, no other weapons but the tactical ones withdrawn from the Ukraine were being worked on.

In June 1994, General Yakovlev said that in "approximately July 1992, we began eliminating these weapons under observation of Ukrainian specialists," and that "of the total quantity of [tactical] weapons withdrawn from Ukraine, we have already eliminated 1,500 units, or over half." He also added that the United States eliminates around 2,000 warheads a

<sup>381</sup> Sergei Ovsienko, "Melting of Weapons-Grade Plutonium Stockpile," *Rossiyskie Vesti*, 19 May 1993.

<sup>382</sup> Interview with Victor Mikhailov by Alexander Peslyak, *Russian Television Network*, 3 June 1993, (JPRS-TND-93-017, 7 June 1993, p. 19).

<sup>383</sup> Interview with Victor Mikhailov by Alexander Peslyak, *Russian Television Network*, 3 June 1993, (JPRS-TND-93-017, 7 June 1993, p. 19).

<sup>384</sup> Victor Mikhailov, *I Am a "Hawk"*, (Moscow: Kron-Press, 1993), p. 123, reprinted from "Novyye Promyshlennyye Tekhnologii 1993," Special Edition 1 (255), *Problemy Konversii* (Russian Federation Ministry of Atomic Energy), (JPRS-TAC-94-010-L, 24 August 1994).

See also discussion in: Thomas Cochran and Robert Norris, *Russian/Soviet Nuclear Warhead Production*, NWD-93-1, (Natural Resources Defense Council, Washington, DC, 8 September 1993), p. 22.

<sup>385</sup> General Vitaly Yakovlev, "Realization of Reduction and Limitation Programs for Nuclear Weapons and the Opportunity of an Information Exchange on Amount of Produced Fissile Materials and Their Localization," Talk prepared for the U.S.-Russian Workshop on CTB, Fissile Material Cutoff and Plutonium Disposal," 15-17 December 1993, Washington, DC, Natural Resources Defense Council, Federation of American Scientists, Moscow Physical-Technical Institute.

year, and that, "Our rate is not any lower."<sup>386</sup> This statement implies a minimum dismantlement rate of some 750 warheads a year or, taking into account his earlier statement, it suggests that 1,300 tactical nuclear weapons were eliminated in the first year and several hundred in the next. Later in June he was quoted as saying that 50 percent of all the tactical nuclear warheads removed to Russia from Central Asia, the Transcaucasus, Belarus, and Ukraine had been dismantled,<sup>387</sup> which would imply an even higher dismantlement rate.

In June 1995, General Yevgeny Maslin commented that Russia had destroyed "several thousand nuclear weapons; even more than the United States destroyed."<sup>388</sup> In August 1995, while discussing the strategic nuclear weapons withdrawals from Ukraine, Kazakhstan, and Belarus, he said that 900 of the 1,000 nuclear weapons removed from Ukraine had been destroyed under Ukrainian supervision.<sup>389</sup> Since strategic weapons from the Ukraine only began to be transferred in March 1994, this implies a minimum dismantlement rate of less than 1,000 warheads a year.

In 1996, in a seemingly updated version of his comments in August 1995, General Maslin repeated that by late March 1996, 900 of the strategic nuclear weapons removed from the Ukraine had been eliminated.<sup>390</sup> Since the first strategic nuclear weapons from Ukraine were shipped to Russia in March 1994, this indicates a minimum dismantlement rate of some 450 strategic warheads a year.

In May 1996, General Maslin claimed that, since 1991, Russia had "eliminated half of the nuclear weapons for use by tactical aircraft and air defenses, while nuclear weapons for

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<sup>386</sup> Kirill Belyaninov, interview with Maj. General Vitaly Yakovlev, "Can the Nuclear Charge be Lost: Major General Vitaly Yakovlev from the Ministry of Defense Categorically Asserts That it Can't," *Literaturnaya Gazeta*, 1 June 1994, (JPRS-UMA-94-028, 29 June 1994, pp. 6-7).

<sup>387</sup> "Official Says 50 Percent of CIS Nuclear Missiles Dismantled," *Moscow Radiostantsiya Ekho Moskvy*, 10 June 1994.

<sup>388</sup> Col. General Yevgeny Maslin, "Summary of the Proceedings of the U.S. Defense Nuclear Agency's Fourth Annual International Conference on Controlling Arms," 19-22 June 1995, Philadelphia, PA.

Note: from 1991 to 1995, the United States dismantled and disposed of some 7,200 warheads, and an average rate of 1,440 per year; See Table 5 in main text based on data from the Department of Energy, Albuquerque Operations office, 18 March 1997 released in response to a Freedom of Information Act to Center for Energy and Environmental Studies, Princeton University.

<sup>389</sup> Col. General Yevgeny Maslin, "Cooperation Between the Russian Ministry of Defense and the U.S. Defense Department on Nuclear Weapons Safety," *The Nonproliferation Review*, Fall 1995, p. 77.

<sup>390</sup> General Yevgeny Maslin, "Russian-U.S. Cooperation on Nuclear Weapons Safety," in John Shields and William Potter, *Dismantling the Cold War: U.S. and NIS Perspectives on the Nunn-Lugar Cooperative Threat Reduction Program*, (Cambridge, MA: Center for Science and International Affairs, 1997), p. 143. The book was based on an August 1995 conference. See General Maslin's comments reprinted in the *Nonproliferation Review* above.

use in tactical sea-based complexes have been reduced by one-third."<sup>391</sup> This suggests that 4,726 - 6,000 tactical weapons were dismantled perhaps over four years, or 1,200 - 1,500 a year. He added that in the last three years 3,500 nuclear weapons withdrawn from Ukraine, including 2,000 tactical ones, were eliminated. This overall denoted a dismantlement rate of almost 1,200 weapons a year for the weapons withdrawn from Ukraine. It is not clear if the tactical weapons from the Ukraine are included in the overall total of tactical weapons claimed to be dismantled, but if so, an additional 700 - 1000 warheads a year may have been dismantled or 1,900 - 2,200 warheads a year, and if not, then 2,400 - 2,700 warheads a year may have been dismantled in total.

In March 1997, *Segodnya* reported then Minatom Minister Mikhailov told an international conference at Obninsk that 50 percent of Russia's nuclear arsenal had been scrapped.<sup>392</sup> In April 1997, he told *INTERFAX* that nearly 50 per cent of the arsenal had been dismantled and that nearly 400 tons of HEU had been removed from nuclear warheads.<sup>393</sup> If the baseline is the 30,000 - 32,000 nuclear warheads estimated to be in existence in 1991/92, then his statements imply 15,000 - 16,000 warheads were dismantled at a rate of approximately 2,500 - 3,000 warheads a year. However, if there are 22 to 30 kgs of HEU in a Russian warhead (see discussion in Appendix E below), then 13,000 to 18,000 nuclear weapons may have been dismantled.

In September 1997, General Igor Valynkin, the new head of the 12th Main Directorate said, "that all the nuclear devices removed from Ukraine, Belarus and Kazakhstan and those which were in Russia are in place and what we were supposed to destroy by agreements with the United States and Ukraine we are destroying under the surveillance of Ukrainian observers. And today 98 percent of the strategic nuclear warheads have been destroyed and 60 percent of the tactical warheads have been destroyed."<sup>394</sup> If so, it appears that most of the 3,280 strategic nuclear weapons returned Russia from March 1994 to May 1996 were

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<sup>391</sup> Col. General Yevgeny Maslin, "Cooperative Threat Reduction: The View from Russia," in Proceedings of the NATO Advanced Research Workshop on Dismantlement and Destruction of Chemical, Nuclear and Conventional Weapons, Bonn, Germany, 19-21 May 1996, (Dordrecht, The Netherlands: Kluwer Academic Publishers, 1997), p. 90.

He repeated this comments in June 1996. See: Col. General Yevgeny Maslin, remarks on U.S. and Russian Perspectives on the Cooperative Threat Reduction Program, made at the U.S. Defense Special Weapons Agency conference, "Walking the Walk: Controlling Arms in the 1990s," in "Summary of the Fifth Annual International Conference on Controlling Arms," 3-6 June 1996, Norfolk, VA.

<sup>392</sup> Anton Trofimov, "Russia Has Rid CIS Of Her Nuclear Warheads," *Segodnya*, 11 March 1997, (Russian Press Digest, RUSSICA Information Inc).

<sup>393</sup> "Country Dismantles Nearly Half of Its Nuclear Arsenal," *INTERFAX*, 27 April 1997, (FBIS-TAC-97-117); "Nearly 50 Percent of Russia's Nuclear Arsenal Dismantled: Official," *Agence France Presse*, 27 April 1997.

<sup>394</sup> Press Conference with Lt. General Igor Valynkin, Chief of the 12th Main Directorate of the Russian Ministry of Defense, regarding the nuclear security in Russian Federation armed forces, Russian Ministry of Defense, Official Kremlin International News Broadcast, 25 September 1997, (Federal News Service).

dismantled by September 1997 (42 months), at an average rate of around 900 warheads a year. Depending on the number of tactical warheads withdrawn, since July 1992 (62 months) 500 - 1,200 weapons a year might have been eliminated. Overall, then, since March 1994, perhaps 1,400 - 2,100 weapons a year were dismantled.

In December 1997, the head of the Ukrainian Armed Forces Verification Center, Gen. Mykola Honcharenko, reportedly said the last of the strategic warheads withdrawn from Ukraine would be destroyed at the beginning of 1998. Also, the same press account said that some of the tactical nuclear weapons removed from Ukraine still needed to be dismantled.<sup>395</sup> If so, then some 1,820 strategic warheads withdrawn from Ukraine were dismantled over almost four years or at an average rate of 455 warheads a year. If there were some 2,000 - 2,500 tactical warheads withdrawn from the Ukraine by May 1992, then these were being eliminated at an average rate of 360 - 450 warheads a year. Thus, some 815 - 900 warheads a year on average may have been eliminated.

In February 1998, Russian Defense Minister Igor Sergeyev, in discussing the CTR program, said that, "More than 10,000 operations have been performed in dismantling nuclear weapons and no emergency situations have arisen, thanks to this cooperation."<sup>396</sup> Assuming this means 10,000 warheads were dismantled since 1991/1992, it implies a dismantlement rate of some 1,600 warheads a year over six years.

In April 1998, at a NATO-Russian Permanent Joint Council meeting, the ambassadors, "exchanged views and information on nuclear weapons issues."<sup>397</sup> At the meeting, the Russians said that in regards to the tactical weapons reductions proposed in the fall 1991 Presidential nuclear initiatives, 80 per cent of the weapons proposed for elimination had been destroyed and they all would be eliminated by the year 2000. A breakdown of the categories of weapons eliminated was also provided: the Russians claimed that all of the anti-ballistic missile warheads; 80 per cent of the artillery shells, tactical missiles and land mines; half of the anti-air missile warheads; and one-third of the naval tactical missile warheads had been destroyed.<sup>398</sup> Assuming this means that all the tactical weapons scheduled for dismantling

<sup>395</sup> "Ukraine: Russia Nears Completion of Ukraine Warhead Disassembly," *Kiev Intelnews*, 19 December 1997, (FBIS-TAC-97-353, 19 December 1997).

<sup>396</sup> Jonathan Wright, "Cold War Melts at Russia's Nuclear Nerve Center," *Reuters*, 14 February 1998.

<sup>397</sup> "NATO-Russian Statement on the 29 April 1998 Permanent Joint Council Meeting at Ambassadorial Level," Press Release (98)50, 29 April 1998, available at: [www.nato.int/doc](http://www.nato.int/doc).

<sup>398</sup> Jorgen Dragsdahl, "NATO-Russia Cooperation Stuck in Neutral," BASIC Reports, 4 June 1998, No. 64, p. 4. A U.S. official also confirmed that the Russians had mentioned 80 per cent of their warheads had been dismantled. Other less precise reports of the meeting are: "Moscow, NATO Tally Their Shrinking Nuclear Arsenals," *Reuters*, 29 April 1998, which claims NATO estimates Russia has destroyed half of its arsenal, "down from 10,000 to 12,000 warheads;" "NATO and Russia Talk About Nuclear Weapons," *Associated Press*, 29 April 1998, which also claims NATO said that the Russians said they have destroyed half of their weapons, and that

under the 1991 Presidential nuclear initiatives except ground force weapons have been eliminated, then based on the estimates of tactical warheads to be eliminated provided in Table B7, this suggests 8,000 - 12,000 tactical nuclear weapons have been eliminated, at an average rate of 1,300 - 2,000 weapons a year over six years.

Finally, in July 1998, First Deputy Atomic Energy Minister Lev Ryabev said that several hundred warheads a year were being dismantled as a result of agreements made at the end of the Cold war.<sup>399</sup>

Two other reports in the Russian press also suggest a minimum elimination rate of 1,000 to 2,000 warheads a year: In 1992, a retired nuclear weapon assembly worker at Arzamas-16 reportedly said that, per the central plan, on average 30 weapons a month were assembled and that production was increased during the Cuban missile crisis.<sup>400</sup> Assuming that the four production facilities or several production shops had a minimum equivalent capacity, then disassembling 1,500 weapons a year or even 2,000 with a little new production or reworking of old warheads could be feasible.<sup>401</sup> Conversely, economic or planning

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the Russians are believed to have up to 12,000 tactical nuclear weapons; "NATO-Russia Council Discusses Nuclear Weapons for the First Time," *Agence France Presse*, 29 April 1998; and "NATO Works on Detailed Plan for Post-SFOR Force," *Xinhua*, 29 April 1998.

<sup>399</sup> Adam Tanner, "Russia Seeks Billions to Convert Nukes," *Reuters*, 29 July 1998.

Note, however, in September 1997, he told a visiting group of foreign specialists in Moscow that Russia was dismantling well over 2,000 warheads a year; author's notes from meeting, September 1997.

<sup>400</sup> V. Filin, "Nuclear bomb assembly technology. Yardman Minayev speaks," *Komsomolskaya Pravda*, 6 February 1992, (BBC Summary of World Broadcasts, 8 February 1992).

<sup>401</sup> Pressures for new production or reworking deployed warheads may have been relatively low in the 1990s. As noted above, only some 77 new strategic warheads may have been needed to be produced since 1991/1992 to outfit 45 newly deployed SS-25 ICBMs, three new SS-24 ICBMs and two new SS-27 ICBMs. As for tactical weapons, it seems at least for several years no new production took place: "As for Russia itself, all we are doing as far as tactical weapons are concerned is dismantling them. Our enterprises have not produced a single device since the time of the agreement was signed with the republics," Kirill Belyaninov, interview with Major General Vitaly Yakovlev, "Can the Nuclear Charge be Lost: Major General Vitaly Yakovlev from the Ministry of Defense Categorically Asserts That it Can't," *Literaturnaya Gazeta*, 1 June 1994, (JPRS-UMA-94-028, 29 June 1994, p. 6).

Also note: "The volume of work connected with the recycling of nuclear weapons and their destruction is increasing in connection with the INF and START treaties and the tactical nuclear arms initiatives. In fact, our plants are occupied more with the elimination of old weapons than the production of new ones even at this time; Victor Mikhailov, *I Am a "Hawk"*, (Moscow: Kron-Press, 1993), Reprinted in book from Yu. Popov and L. Chernenko, interview with Victor Mikhailov, "The Keys to the Nuclear Arsenal," *Pravitelstvenny Vestnik*, No. 1, 1992, (JPRS-TAC-94-010-L, 24 August 1994). —

And: Arbatov claims new production or reworking is very low; Alexei Arbatov, chapter on Russian perspectives on future nuclear reductions, in Harold Feiveson, Bruce Blair and Frank von Hippel, *The Nuclear Turning Point*, (to be published by the Brookings Institution).

As for reworking existing warheads, assuming that Russian warheads need to be undergo a major reworking every 10-15 years, then 7-10 percent of the deployed arsenal may have to be reworked every year. If

disruptions could have dropped the dismantlement rates to lower than 1,500 warheads a year.<sup>402</sup> In fact, in November 1996 General Igor Valynkin, then a first deputy of the MOD's 12th Main Directorate complained the "disassembly plans" were not being fulfilled, and as a result over two thousand weapons with expired service lives were sitting in storages. He noted, at current dismantlement rates, the backlog of warheads with expired services lives

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Russia is reworking any warheads, it probably is attempting to rework those that would allow it to keep START II/III levels of forces (i.e. 2,000 - 3,500 strategic warheads) and perhaps enough tactical warheads to retain a force of 5,500 - 8,000 warheads (the amount which might be left after the 1991-1992 Presidential Initiatives per the Russian Tactical Nuclear Warhead table above) then some 525 - 1150 warheads might need to be reworked a year. However, Arbatov's notes that in the years 2001-2003, Russia may have zero to only a 1,000 tactical nuclear weapons because of low or non-existent production, suggesting much smaller amounts of tactical nuclear weapons are being reworked/produced. Thus, it is possible only several hundred reworked/new warheads a year, if that, are being assembled.

In regards to the need to regularly rework Russian warheads: "We may assume that the usual guaranteed lifetime [of a nuclear munition] is 10-15 years. Each year 2,000-3,000 have to be taken out of service and dismantled and replaced by an equal number of new ones;" Interview with Gennady Novikov, Chief of the Sector Special Security Laboratory at Chelyabinsk-70, by V. Umnov, "Few Bombs Will Survive Till the Year 2000: In the Past Year the Safety of Our Nuclear Weapons Has Declined Sharply," *Komsomolskaya Pravda*, 12 March 1992, (FBIS-SOV-92-051, 16 March 1992, p. 8).

Also: "Since the service period of nuclear munitions is from 10 to 20 years, then naturally over that period we were always carrying out the dismantling of nuclear munitions but not on a large scale;" Interview with Minatom Minister Victor Mikhailov by Alexander Peslyak, *Russian Television Network*, 3 June 1993, (JPRS-TND-93-017, 7 June 1993, p. 19).

And: "We already have some experience in this field. The nuclear weapon is a complex device consisting of electronic elements, generators, active nuclear materials--uranium, plutonium, and tritium--and conventional explosives. It also has a limited service life--10 or 15 years, for example--after which it is disassembled. For this reason, we have always conducted dismantling operations;" Victor Mikhailov, *I Am a "Hawk"*, (Moscow: Kron-Press, 1993).

Finally: "As for the warheads, it is simply dangerous to keep them longer than the warranty period. For they also contain conventional explosives. After approximately 10 years' storage these start to crack, to change their physical and chemical properties.... All this can lead to various consequences. Take, for example, those prebreakdown warheads on Ukrainian territory. Why has hydrogen -- this explosive mixture -- started exuding from them? Scientists will conduct a special investigation;" Colonel Oleg Falichev, Interview with Col. General Yevgeny Maslin, Chief of the Defense's Ministry's 12th Main Directorate, "Who Has the Keys to the Nuclear Arsenal," *Krasnaya Zvezda*, 26 November 1993, (FBIS-SOV-93-228, 30 November 1993).

<sup>402</sup> The problems of the closed cities of the Minatom nuclear weapons complex have been reported on widely. See e.g.: Kimberly Marten Zisk, "Arzamas-16: Economics and Security in a Closed City," *Post-Soviet Affairs*, January-March 1995, pp. 57-80; V. A. Tikhonov, "Closed Cities in Open Russia," *Studies on Russian Economic Development*, Vol. 7, No. 6, pp. 519-529; Richard H. Rowland, "Russia's Secret Cities," *Post-Soviet Geography and Economics*, September 1996, pp. 426-462; Oleg Bukharin, "The Future of Russia's Plutonium Cities," *International Security*, Spring 1997, pp. 126-158; Matthew Bunn, Oleg Bukharin, Jill Cetina, Kenneth Luongo, and Frank von Hippel, "Retooling Russia's Nuclear Cities," *The Bulletin of the Atomic Scientists*, September/October 1998, pp. 44-50.

to be dismantled would increase "several-fold."<sup>403</sup>

In fall 1993, when another agreement was reached with Ukraine about the withdrawal of strategic forces at the Massandra summit, Russian military officials said that the warheads in Ukraine could be removed and "completely reprocess[ed]" in 17 months.<sup>404</sup> Since there were 1,820 - 1,984 strategic warheads in Ukraine in 1993, this implies a shipping/dismantlement rate of 107 - 116 warheads a month or approximately 1,280 - 1,400 warheads a year.

#### 4. Summary of the Numbers of Dismantled Weapons

Per Victor Mikhailov's comments some 10,000 to 15,000 warheads may have been eliminated by the 1991-1992 timeframe, at an average rate of 2,000 - 3,000 warheads a year. Since 1991, Russian statements indicate the possibility that these higher rates of dismantlement have continued. If, per Mr. Mikhailov's 1997 statement, half of the some 30,000 - 32,000 nuclear weapons in the 1991-1992 arsenal (15,000 - 16,000 warheads) had been eliminated over 5-6 years then some 2,500 - 3,200 weapons a year may have been eliminated. And, if Russia was dismantling more than just weapons removed from Ukraine, then dismantlement rates of over 1,500 warheads a year may have been achieved.

However, if by 1997, as DOD claims, only "more than 5,000 warheads" had been eliminated since 1992, then somewhere around 1,000 weapons a year may have been eliminated. This lower number may have been due to limited plant capacity, new production or reworking of existing warheads, or economic or planning disruptions (it is also possible high rates of dismantlement were achieved in the early 1990s and then fell as the economic crisis finally hit the dismantlement plants). In any event, the low to moderate elimination rates discussed above may have yielded some 7,000 - 17,500 warheads being eliminated from 1991 to the end of 1997 (see Table D1).

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<sup>403</sup> Comments by General Igor Valynkin, then First Deputy Head of the 12th Main Directorate before the Duma Committee on Security, "Stenographic Record of the Parliamentary Hearings on the Topic: Issues Concerning the Security of Hazardous Nuclear Facilities," *Yaderny Kontrol Digest*, No. 5, Fall 1997, p. 12. The hearings were held 25 November 1996.

<sup>404</sup> Andrei Naryshkin, "Russian defence minister: nuclear agreements 'a change for the better'," *ITAR-TASS*, 4 September 1993, (BBC Summary of World Broadcasts, 6 September 1993).

Appendix D: Dismantling and Eliminating Warheads

Table D1: Rate of Yearly Nuclear Warhead Eliminations							
Total Cum. End	1,000/yr	1,500/yr	2,000/yr	2,500/yr	3,000/yr	3,500/yr	4,000/yr
1991	1,000	1,500	2,000	2,500	3,000	3,500	4,000
1992	2,000	3,000	4,000	5,000	6,000	7,000	8,000
1993	3,000	4,500	6,000	7,500	9,000	10,500	12,000
1994	4,000	6,000	8,000	10,000	12,000	14,000	16,000
1995	5,000	7,500	10,000	12,500	15,000	17,500	20,000
1996	6,000	9,000	12,000	15,000	18,000	21,000	24,000
1997	7,000	10,500	14,000	17,500	21,000	24,500	28,000
<b>1998</b>	<b>8,000</b>	<b>12,000</b>	<b>16,000</b>	<b>20,000</b>	<b>24,000</b>	<b>28,000</b>	<b>32,000</b>
1999	9,000	13,500	18,000	22,500	27,000	31,500	36,000
2000	10,000	15,000	20,000	25,000	30,000	35,000	40,000
2001	11,000	16,500	22,000	27,500	33,000	38,500	44,000
2002	12,000	18,000	24,000	30,000	36,000	42,000	48,000
2003	13,000	19,500	26,000	32,500	39,000	45,500	52,000

## Appendix E: Eliminated Warhead Storage

The final problem in dealing with withdrawn Russian nuclear weapons is storing the fissile components from dismantled warheads. The size of storages available for holding the fissile components from dismantled warheads and the size of this problem is, however, unclear.

### 1. The Mayak Fissile Material Container Storage Facility

During the series of U.S.-Russian meetings in the fall of 1991 and early 1992, Russian officials claimed the main bottleneck to dismantling warheads was a lack of storage space for the materials from dismantled warheads. Russia proposed building new storage sites to hold the fissile components from the dismantled warheads.<sup>405</sup> According to the Russian officials, a new storage facility would be needed by 1997 in order "to meet their dismantlement schedule."<sup>406</sup>

The United States initially was reluctant to support this proposal. The CIA concluded that Russia had "sufficient secure storage for the warheads and the fissile materials derived from dismantlement."<sup>407</sup> The United States instead suggested that Russia make use of: existing military nuclear storage facilities, filling in spaces vacated by weapons which were

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<sup>405</sup> Reginald Bartholomew, Undersecretary of State for International Security Affairs, testimony before the SASC on "Assisting the Build-Down of the Former Soviet Military Establishment," 5 February 1992, S. Hrg. 102-625, pp. 11 and 16.

In addition, according to General Burns, in January 1992 the Russians said the storage facility was their major problem; Maj. General William Burns, Special Envoy on the Safety, Security, and Dismantlement of Nuclear Weapons, Department of State, testimony before the SFRC, Hearings on "U.S. Plans and Programs Regarding Dismantling of Nuclear Weapons in the Former Soviet Union," 27 July 1992, S. Hrg. 102-872, p. 35.

E.g.: "The only thing we lack is storage facilities, and not [destruction] facilities," said Boris Nikipelov, an official in the Russian Ministry of Atomic Power and Industry; George Leopold, "Warhead Transfer to Russia Is Ahead of Schedule; Only 2 Republics Still Possess Weapons," *Defense News*, 2 March 1992.

<sup>406</sup> Joseph Kelly, Director-in-Charge, International Affairs Issues, National Security and International Affairs Division, "Soviet Nuclear Weapons: U.S. Efforts to Help Former Soviet Republics Secure and Destroy Weapons," (GAO/T-NSIAD-93-5), 9 March 1993, testimony for the SGAC hearing on "Disposing of Plutonium in Russia," 9 March 1993, S. Hrg. 103-135, pp. 25 and 33.

In 1993, then Minatom Minister Victor Mikhailov told the Russian press that it was realized as early as 1987 that the Soviet Union needed expanded and improved storage facilities for storing fissile material removed from dismantled warheads, particularly for the storage of plutonium-239. The financing of such facilities from the Soviet budget, however, was delayed and thus seemingly little or no work was done. So, in 1990, he said, he approached the United States about possible "joint construction of storage facilities." As he told it, subsequently, the Nunn-Lugar CTR funds were made available to help with this project; Interview with Victor Mikhailov by Alexander Peslyak, *Russian Television Network*, 3 June 1993, (JPRS-TND-93-017, 7 June 1993, p. 19).

<sup>407</sup> Lawrence Gershwin, NIO for Strategic Programs, CIA, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, pp. 497-498. Also: his testimony before SGAC hearing on "Proliferation Threats of the 1990s," 24 February 1993, S. Hrg. 103-208, p. 40.

eliminated; civilian facilities; or deep-underground facilities. The United States estimated that, "This approach would allow for the completion of at least initial dismantlement 5 years sooner," than under what the Russians had proposed.<sup>408</sup> Through early 1992, the United States pressed for these alternatives. Secretary of State Jim Baker even raised it with Foreign Minister Andrei Kozyrev in their 11 March 1992 meeting.<sup>409</sup>

However, the Russians responded that these ideas had been examined and were thought to be "impractical."<sup>410</sup> According to Russian officials, Russia historically did not need long term storage facilities for weapons grade materials because the nuclear material from dismantled warheads "was recycled into new warheads."<sup>411</sup> Russia continued to propose the construction of a new long-term storage facility. And, even the CIA conceded that, to meet Russian standards, the long-term storage of dismantled warheads, "would require modification of existing facilities."<sup>412</sup>

By summer 1992, the United States was coming around to the Russian position.<sup>413</sup> And, in October 1992, the United States signed an agreement to provide technical assistance to the Russia for a new fissile material storage facility. Construction was to start in July 1994.<sup>414</sup> Initially, the Russian government envisioned constructing one 50,000 container facility at Chelyabinsk-65 and another at Tomsk-7. Each would have been constructed in two phases.<sup>415</sup> However, environmental protests in Tomsk led to only the Chelyabinsk project

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<sup>408</sup> Stephen Hadley, ASD, International Security Policy, testimony before the SASC on "Assisting the Build-Down of the Former Soviet Military Establishment," 5 February 1992, S. Hrg. 102-625, pp. 22-23 and 61.

<sup>409</sup> Reginald Bartholomew, Undersecretary of State for International Security Affairs, Answers to Questions for testimony before the SASC on "Assisting the Build-Down of the Former Soviet Military Establishment," 5 February 1992, S. Hrg. 102-625, p. 61.

<sup>410</sup> Stephen Hadley, ASD, International Security Policy, testimony before the SASC on "Assisting the Build-Down of the Former Soviet Military Establishment," 5 February 1992, S. Hrg. 102-625, pp. 22-23 and 61.

<sup>411</sup> "Certification of the Commitments of the Russian Federation: Justification," 8 April 1992, in the SFRC, Hearings on "U.S. Plans and Programs Regarding Dismantling of Nuclear Weapons in the Former Soviet Union," 27 July 1992, S. Hrg. 102-872, p. 37.

<sup>412</sup> Lawrence Gershwin, NIO for Strategic Programs, CIA, testimony on "Nuclear Weapons Control and Destruction," before the HAC "DOD Appropriations for 1993, Part 5," 6 May 1992, pp. 497-498. See also his testimony before SGAC hearing on "Proliferation Threats of the 1990s," 24 February 1993, S. Hrg. 103-208, p. 40.

<sup>413</sup> Maj. General William Burns, Special Envoy on the Safety, Security, and Dismantlement of Nuclear Weapons, Department of State, testimony before the SFRC, Hearings on "U.S. Plans and Programs Regarding Dismantling of Nuclear Weapons in the Former Soviet Union," 27 July 1992, S. Hrg. 102-872, p. 10.

<sup>414</sup> Harold Smith, ASD, Atomic Energy, testimony before the HFAC, Subcommittee on International Security, International Organizations and Human Rights, hearing on "Stemming the Plutonium Tide: Limiting the Accumulation of Excess Weapon-Usable Nuclear Materials," 23 March 1994, pp. 48-49.

<sup>415</sup> Hazel O'Leary, Secretary of Energy, testimony before the SASC, FY 1996, Strategic Forces, 4 April 1995, S. Hrg. 104-387, Pt. 7, p. 722.

In addition to helping to construct a storage facility, the United States is also providing Russia with

proceeding.<sup>416</sup>

Design changes and other problems delayed construction by several years.<sup>417</sup> The foundation slab was only completed in October 1996 and construction of the first half is now scheduled to be completed in late 1999 or early 2000, although some U.S. officials expect it will not be ready to open until 2002. The facility is designed to hold 50,000 fissile material containers, which is estimated to equal to more than 12,500 dismantled nuclear warheads.<sup>418</sup>

It is unclear whether the construction delay has slowed Russian dismantlement efforts. In 1993, the CIA reported that, "some Russian officials have recently indicated that operational date of the fissile material storage facility will not affect the elimination of those warheads as committed to by Gorbachev and Bush (i.e. the tactical nuclear warheads)."<sup>419</sup> And, as noted, it seems as some eliminated warhead parts are being stored in military facilities and, moreover, the facility was not needed until 1997. However, DOD officials have kept repeating that Russian officials have said the lack of storage space, "would create a

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fissile material containers. A contract for production was awarded in September 1993. Russia had initially expressed an interest in 100,000 such containers, but the current plan is to provide 50,000. 25,000 are currently in Russia as of 25 August 1998; see: CTR webpage at [www.ctr.osd.mil](http://www.ctr.osd.mil).

<sup>416</sup> It was from U.S. non-governmental organizations that the people of Tomsk were to learn that the decision had been made to build a storage site for plutonium in Tomsk Oblast on the territory of the Siberian Chemical Combine! The presence of such a neighbor while the combine continues all other forms of activity could not but cause alarm, and so it upset the entire oblast. In 1992-1993, more than 100,000 signatures were collected of citizens of the oblast protesting against building of the facility. The accident at the SCC [Siberian Chemical Combine reprocessing plant] in April 1993 further intensified the negative attitude toward construction; V. G. Vorobyov, A. M. Dmitriyev, A. S. Dyakov, Yu. I. Yershov, D. P. Osanov and L. V. Popova, *Plutony V Rossii: Ekologiya, Ekonomika, Politika. Nezavisimyy Analiz*, (Plutonium in Russia: Ecology, Economics, Policy. An Independent Analysis), Moscow, Center for Ecological Policy of Russia, Center for Nuclear Ecology and Energy Policy, Socio-Ecological Union, 1994, (JPRS-TEN-95-001-L, 31 January 1995).

<sup>417</sup> According to the United States, delays in design development by Minatom was a big problem. In addition, when the site was shifted from Tomsk to Chelyabinsk some design changes resulted. The design for Tomsk was customized to take into account that Tomsk was an active seismic location and it utilized "horizontal racking" of fissile material containers. When the site was shifted to Chelyabinsk, during 1994 Minatom customized the design for Mayak and utilized a new concept, the vertical storage of fissile material containers. This design resulted in many changes and new requirements, "including a new cooling system for safely storing the plutonium;" See: Richard Morningstar, Special Advisor to the President and the Secretary of State on Assistance to the NIS, Department of State, "Answers to Questions for the Record" for his testimony to the HCIR hearing on "Effectiveness of U.S. Assistance Programs in Russia, Ukraine, Armenia, and the Other Newly Independent States," 13 June 1996, p. 21.

<sup>418</sup> CTR Briefing, "Russia", 18 November 1996.

<sup>419</sup> Adm. William O. Studeman, Acting DCI, 23 August 1993 letter with answers for questions for the record for R. James Woolsey, DCI's testimony for the SGAC hearing on "Proliferation Threats of the 1990s," 24 February 1993, S. Hrg. 103-208, p. 144.

warhead dismantlement bottleneck."<sup>420</sup>

## 2. HEU Deal and the Numbers of Fissile Material Containers

Some fissile material containers will be emptied or not needed, however, as some warheads are being converted to LEU fuel for nuclear power plants. To try to reduce the amount of HEU from dismantled warheads in Russia, the United States proposed to purchase the excess HEU for the purpose of blending it down for use in nuclear power plants. On 18 February 1993, the United States and Russia signed an agreement which provided for the United States to purchase the blended-down equivalent of 500 metric tons of HEU (i.e. weapons grade uranium of over 90% enrichment of uranium-235) over a 20 year period.<sup>421</sup>

Estimating the number of fissile material containers the HEU deal obviates is difficult. The DOE estimates that the first shipment in 1995 from 6.1 metric tons of HEU was equivalent to approximately 240 nuclear weapons, suggesting on average a weapon had 25 kgs of HEU.<sup>422</sup> The U.S. Enrichment Corporation (USEC) estimates this was equivalent to 277 nuclear weapons, implying on average 22 kgs of HEU per weapon. In 1997, however, the USEC estimated the 18 metric tons of HEU equivalent that was shipped was equivalent to 610 warheads, implying an average of 30 kgs of HEU per warhead.<sup>423</sup> Strategic nuclear warheads in Kazakhstan in 1994 reportedly contained 44,357 kgs of weapons-grade HEU.<sup>424</sup>

<sup>420</sup> According to Franklin Miller, Acting ASD, International Security Policy, testimony before the SASC, FY 1998, Strategic Forces, 5 March 1997, S. Hrg. 105-37, Pt. 7, p. 73.

Also: some Russian officials said the lack of a facility was, "a significant bottleneck to progress on nuclear warhead dismantlement," according to Harold Smith, ASD, Atomic Energy, testimony before the HASC on "National Defense Authorization Act for Fiscal Year 1995, Authorization and Oversight," 28 April 1994, HASC, No. 103-32, p. 1158.

<sup>421</sup> "Agreement Between the Government of the United States of America and the Government of the Russian Federation Concerning the Disposition of Highly Enriched Uranium Extracted from Nuclear Weapons," 18 February 1993, available from the Arms Control and Disarmament Agency, Public Affairs Office.

Note: Warheads from Ukraine were also dismantled in return for Russia shipping reactor fuel to Ukraine under the January 1994 Trilateral Agreement discussed above. However, Russia was not obliged to use HEU from the dismantled warheads in the fuel.

<sup>422</sup> Andrew Bieniawski, U.S. DOE, and Vladislav Balamutov, Minatom, Briefing on the "HEU Purchase Agreement," 11 June 1997;

<sup>423</sup> U.S. Enrichment Corporation, "Megatons to Megawatts Program: Progress Status, December 1997."

<sup>424</sup> Article 3: The Republic of Kazakhstan's share resulting from the Russian Federation's sale of slightly enriched uranium and the timetable and procedure for reciprocal settlements are determined on the basis of the fact that: the nuclear munitions withdrawn from the territory of the Republic of Kazakhstan to the territory of the Russian Federation in accordance with the 28 March 1994 Agreement Between the Russian Federation and the Republic of Kazakhstan on the Strategic Nuclear Forces Temporarily Stationed on the Territory of the Republic of Kazakhstan contain 44,357 kg of highly enriched uranium expressed in terms of 90-percent uranium-235; see: "Draft Protocol on the Timetable and Procedure for Reciprocal Settlements for Recycled Nuclear Munitions to the Agreement Between the Russian

If there were 1,410 - 1,462 strategic warheads in Kazakhstan, this implies some 30-31 kgs of HEU per strategic warhead on average.

According to then Minatom Minister Victor Mikhailov, the materials from an eliminated warhead are placed into 3-4 containers.<sup>425</sup> Assuming one container is for the pit, then 2-3 containers would be used to hold the secondary. If each warhead has 22-30 kgs of HEU, then each fissile material container may hold 7-15 kgs of HEU. Thus, if the 500 mt-HEU deal is completed, 33,300 - 71,400 fissile material containers may not be needed.

Table E1: Estimates of Number Weapons Eliminated through HEU Purchase Agreement				
	Equivalent amount of HEU shipped (Mt)	22 kgs per warhead	25 kgs per warhead	30 kgs per warhead
1995	6.1	277	244	203
1996	12	545	480	400
1997	18	818	720	600
1998 (est.)	24	1,091	960	800
Total end 1998	60	2,731	2,404	2,003
Total to go	440	20,000	17,600	14,667
Total end 2015	500	22,731	20,004	16,670

Federation Government and the Government of the Republic of Kazakhstan on Cooperation and Reciprocal Settlements When Recycling Nuclear Munitions"; from the 'Departmental Supplement' section in *Rossiyskaya Gazeta*, 25 November 1995, (FBIS-TAC-95-007, 25 November 1995).

<sup>425</sup> Overall, he claimed that about 100,000 containers will be needed to handle the materials taken from dismantled warheads in the 1990s; Interview with Victor Mikhailov in "Russian Treatment of Nuclear Materials Described," Vienna *ORF Television Network*, 16 October 1992, (JPRS-TND-93-039, 28 October 1992, p. 18).

The internal cylindrical dimensions of the containers are: 11-12 inches high and some 8 inches in diameter (see Figure 20 in Appendix F).

Previously it was assumed that pits were going to be stored whole in containers, but Russia has approached the United States for assistance to produce internal racks to hold two two-kilogram spheres made of plutonium removed from warheads; U.S. Cooperative Threat Reduction Program Office, February 1998 briefing on status of CTR program.

Table E2: Estimates of the Number of Fissile Material Containers (FMC) Needing Storage		
Total Possible FMCs needing storage due to:	3 FMCs per WH	4 FMCs per WH
Warheads dismantled to early 1990s (Note: some may require only 1 FMC)	30,000	60,000
Warheads available for dismantling by 1998	67,700	90,300
<b>Total by 1998</b>	<b>97,700</b>	<b>150,300</b>
<u>Post-1998</u>		
ICBM and SLBM WH retirements due to START I/II	9,600	12,800
ICBM and SLBM WHs retired due to economic problems	4,200	5,500
Bomber WHs retired due to economic problems	2,400	3,300
<b>Total Post-1997</b>	<b>16,200</b>	<b>21,600</b>
<b>Total Possible FMCs Needing Storage</b>	<b>113,900</b>	<b>171,900</b>
Subtract FMCs not needing storage:		
FMCs for WHs which only need 1 FMC	-10,400	-15,600
FMCs Stored in Future Mayak FMC Facility <sup>426</sup>	-50,000	-50,000
<b>Total FMCs Not Needing Storage</b>	<b>-60,400</b>	<b>-65,600</b>
<b>Total FMCs Possibly lacking Secure Storage Without HEU deal</b>	<b>53,500</b>	<b>106,300</b>
	Low	High
FMCs obviated by HEU Deal:	-33,300	-71,400
Low (15 kgs HEU/FMC)- High (7 kgs HEU/FMC)		
<b>Total FMCs Possibly Lacking Secure Storage if:</b>		
FMCs hold 15 kgs HEU/FMC	20,200	73,000
FMCs hold 7 kgs HEU/FMC	-17,900	34,900

<sup>426</sup> As noted above, other FMC storage facilities with an unknown capacity currently exist. E.g., 23,000 FMCs were reportedly already in storage at Tomsk-7 by the early 1990s.

## Appendix F: The Corona Program, Maps and Figures

The Corona imaging-reconnaissance satellite program's successful operation began with Mission 9009 of 18 August 1960. Over 100 further missions were flown before the program ended in May 1972, with Mission 1117. The Corona program greatly expanded the coverage of the Soviet Union over what had been previously available through the limited overflights of U-2 spy-planes; the first successful mission provided more coverage of the Soviet Union than all the previous U-2 missions combined. It (and successor generation of reconnaissance satellites) are credited with providing crucial intelligence on Soviet military developments. One of Corona's first contributions was to show that there was not a missile gap in favor of the Soviet Union, a controversial issue in the 1960 presidential campaign.<sup>427</sup>

The Corona imagery was declassified and made public in 1995, mainly due to the urging of Vice-President Al Gore, who felt it contained valuable environmental and scientific data.<sup>428</sup> The imagery can viewed at the National Archives in Washington, DC, or it is for sale from the U.S. Geological Survey, EROS Data Center, at: <http://edcwww.cr.usgs.gov>.

In total, the Corona imagery covered many if not all of the nuclear-weapons related sites in the Soviet Union. Many sites were photographed again and again from 1960 to 1972 by successive missions. However, the images usable for analysis of Soviet nuclear-weapons programs are limited due to several problems.

The first missions provided imagery with a ground resolution of 40 feet, but technological advances rapidly increased the theoretical resolution achievable (see Table F1). However, in practice there could be considerable variation in the resolution of the images. Poor resolution could result due to trouble with the mission (image resolution can even vary from frame to frame on the same roll of film from the same mission) or because the area of

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<sup>427</sup> John Prados, *The Soviet Estimate, U.S. Intelligence Analysis and Russian Military Strength*, (New York: The Dial Press, 1982), pp. 113-119; Lawrence Freedman, *U.S. Intelligence and the Soviet Strategic Threat*, 2nd ed, (Princeton, NJ: Princeton University Press, 1986), pp. 72-73; William E. Burrows, *Deep Black: Space Espionage and National Security*, (New York: Random House, 1986); William Broad, "Big Picture of Cold War: U.S. Spy Photos Go Public," *The New York Times*, 25 February 1995; Robert McDonald, "Corona: Success for Space Reconnaissance, A Look into the Cold War, and a Revolution for Intelligence," *Photogrammetric Engineering & Remote Sensing*, June 1995, pp. 689-720; Kevin C. Ruffner, ed., *Corona: America's First Satellite Program*, Center for the Study of Intelligence, CIA, Washington, DC, 1995 [this volume contains a short history of the Corona program, declassified intelligence analyses based on Corona imagery, and a copy of the Clinton Administration Executive Order declassifying the Corona imagery (E.O. 12951, 22 February 1995)]; Curtis Peebles, *The Corona Project: America's First Spy Satellites*, (Annapolis, MD: The Naval Institute Press, 1997); Dwayne Day, John Logsdon and Brian Latell, eds., *Eye in the Sky: The Story of the Corona Spy Satellites*, (Washington, DC: Smithsonian Institution Press, 1998).

For satellite imagery of some U.S. nuclear weapons facilities, see Microsoft's Terraserver website at: [www.terraserver.com](http://www.terraserver.com). Imagery of the United States and Corona images of Russian nuclear-weapons related facilities are or will be available on the Federation of American Scientists' website at: [www.fas.org](http://www.fas.org).

<sup>428</sup> E.g.: William Broad, "Big Picture of Cold War: U.S. Spy Photos Go Public," *The New York Times*, 25 February 1995.

interest is located at the edges of the film where the resolution deteriorates greatly. Not infrequently, good quality earlier images provide better resolution of a subject than poor quality later images.

In addition, clouds may completely cover large areas containing sites of concern and even scattered "popcorn" clouds with their accompanying ground shadow can block a view. Exposure problems can also ruin a view of an area. Finally, even if it is a clear day and the film resolution is good, trees or snow cover can mask objects of interest.

Table F1: Corona Satellite Program			
Designation	Resolution	Launches	Period
KH-1	40 feet	10	1959-60
KH-2	25 feet	10	1960-61
KH-3	25 feet	6	1961-62
KH-4	25 feet	26	1962-63
KH-4A	9 feet	52	1964-69
KH-4B	6 feet	17	1967-72

Soviet counter-measures are another matter of concern in understanding the Corona imagery. The Soviet Union became aware of the U.S. satellite reconnaissance program quite early on (indeed, the Corona missions like the U-2 overflights were politically controversial). A 23 June 1958 Aviation Week and Space Technology article provided the "most definitive disclosure" about U.S. reconnaissance satellites, according to a CIA special NIE from the time.<sup>429</sup> Apparently, the Soviet Union took steps to foil the U.S. satellite reconnaissance program. The KGB's 1967 annual report to the Central Committee of the CPSU, said:

The organs of military counterintelligence of the KGB did significant work on camouflaging rocket launching pads, depots of nuclear weapons and other objects from the enemy's space reconnaissance.<sup>430</sup>

Nonetheless, many nuclear-weapons related facilities are discernable on the Corona imagery and the imagery is of a sufficient enough resolution to detect and even identify many

<sup>429</sup> CIA, "Implications of Certain U.S. Earth Satellite Programs," (secret, declassified) Special National Intelligence Estimate, SNIE, 100-6-58, 29 July 1958, p. 5.

<sup>430</sup> *The KGB's 1967 Annual Report*, with Commentaries by Raymond Garthoff and Amy Knight available at the Cold War International History Project, Woodrow Wilson International Center for Scholars, Washington, DC, at: <http://cwihp.si.edu>.

objects of interest.<sup>431</sup> Overall, Corona remains a valuable tool for exploring the Soviet nuclear-weapons infrastructure.

<sup>431</sup> According to the Defense Department the following resolutions are needed for interpretation:

Table F2: "Target Resolution Required for Interpretation Tasks"				
Target	Detection (in feet)	General Identification	Precise Identification	Description
Bridge	20	15	5	3
Troop Units (Bivouac, Road)	20	7	4	1
Airfield Facilities	20	15	10	1
Rockets and Artillery	3	2	0.5	0.17
Missile Sites (SSM/SAM)	10	5	2	1
Vehicles	5	2	1	0.17
Railroad Yards and Shops	100	50	20	5
Roads	30	20	6	2
Urban Area	200	100	10	10
Surfaced Submarines	100	20	5	3
Supply Dump	5	2	1	0.08
Command and Control Headquarters	10	5	3	0.5
Nuclear Weapons Components	8	5	1	0.08

Detection: "Location of a class of units, object, or activity of military interest."

General Identification: "Determination of general target type."

Precise Identification: "Discrimination within target type of known types."

Description: "Size/dimension, configuration/layout, components construction, count of equipment, etc."

From: Robert Parker, Acting Director, Defense Research and Engineering and Dr. R.A. Greenberg, Assistant Director, Space and Advance Systems; and Howard Barfield, Staff Support, Space and Advance Systems, answers to questions for record, *NASA Authorization for Fiscal Year 1978*, Senate Committee on Commerce, Science and Transportation, Subcommittee on Science, Technology and Space, 9 March 1977, No. 95-5, Part 3, p. 1643.



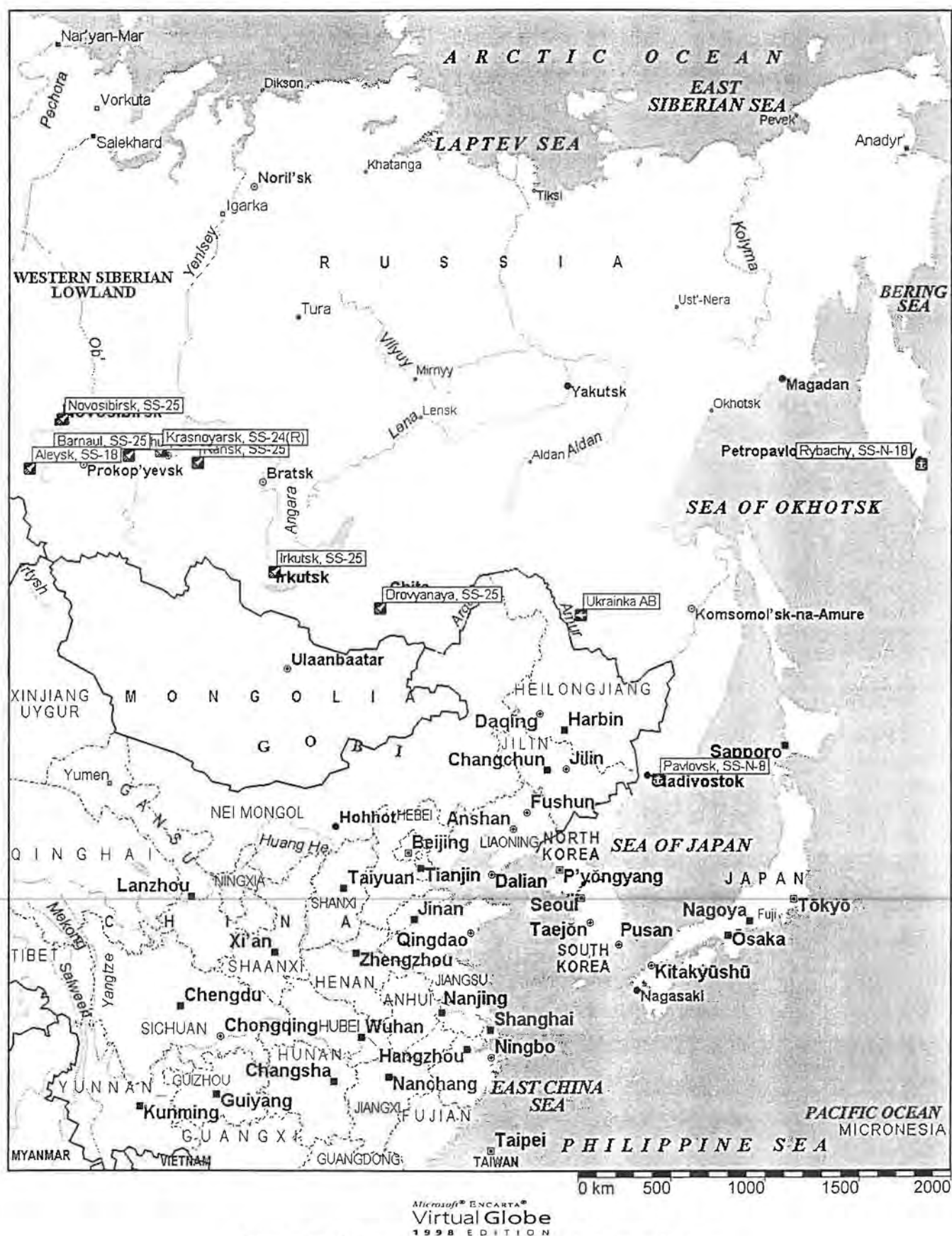
Map 1: National-level Nuclear Weapons Storages, Western Russia  
*Appendix F, Joshua Handler, Princeton University*



Map 2: National-level Nuclear Weapons Storages, Northern/Eastern Russia  
Appendix F, Joshua Handler, Princeton University









**Map 5:** from CIA, *Warsaw Pact Forces Opposite NATO*, NIE 11-14-79, (Top Secret; partially declassified), 31 January 1979, p. 46.

**Soviet Nuclear Storage Sites in Eastern Europe**

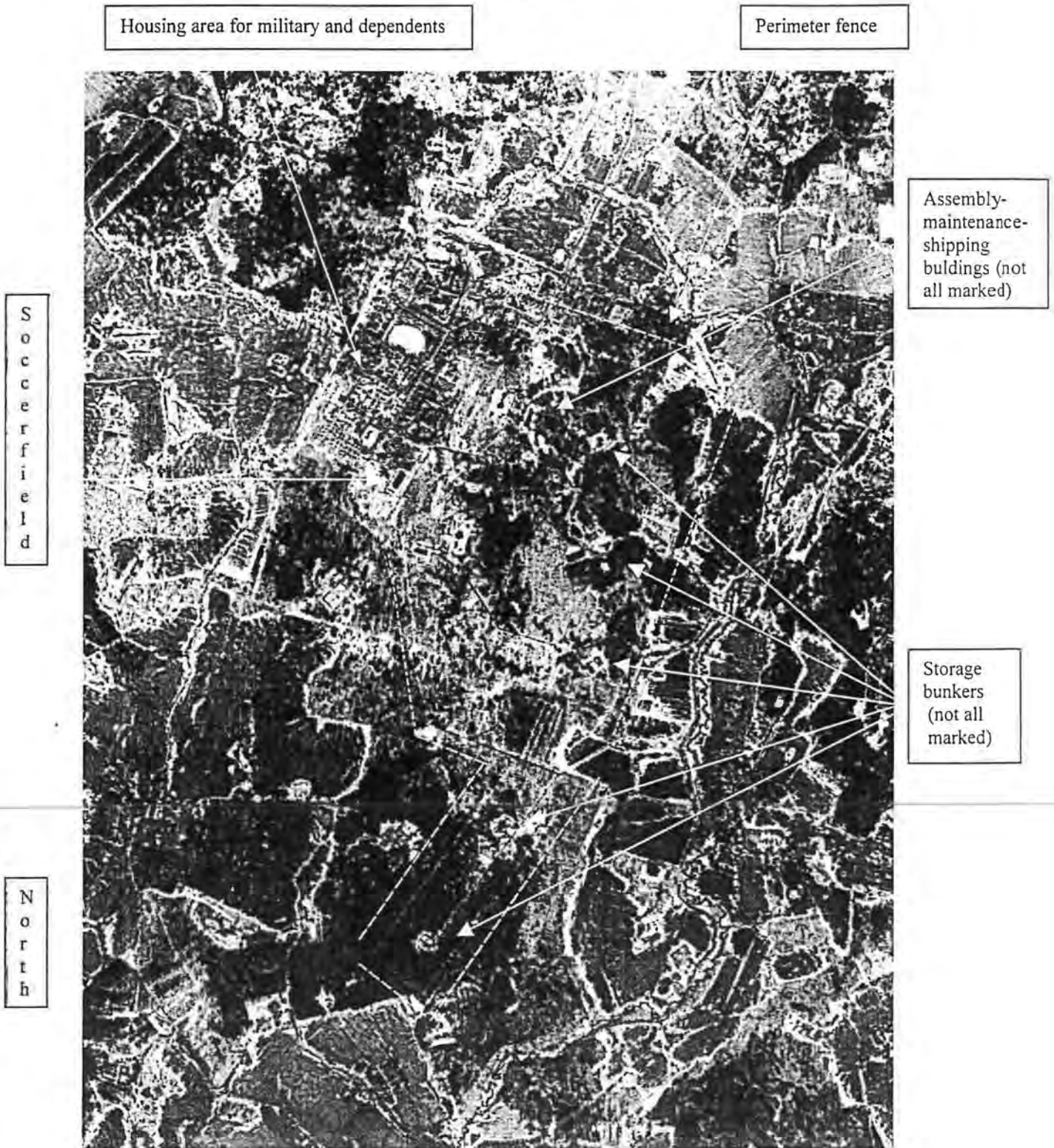


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46  
~~Top Secret~~

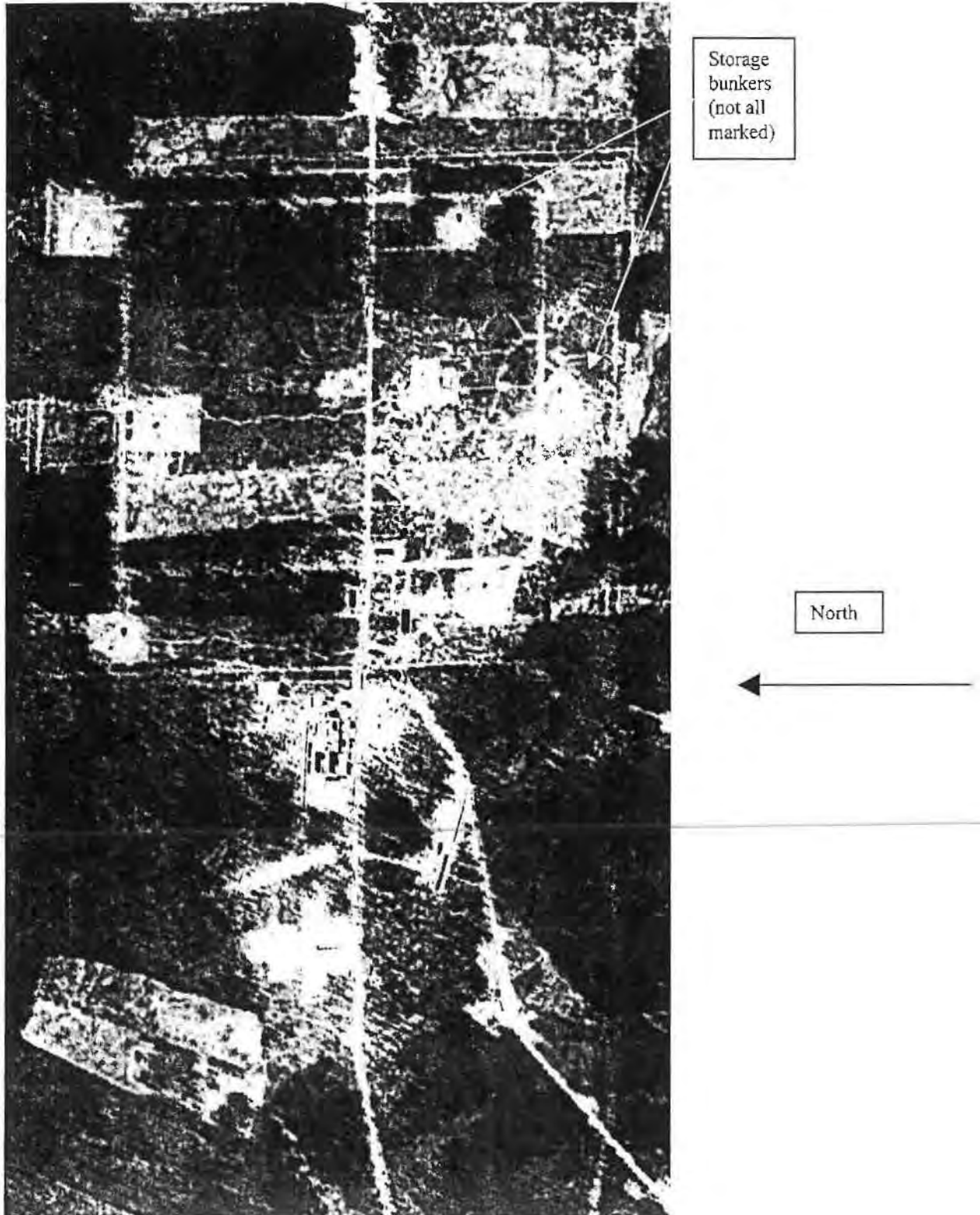
**Figure 1:** Mozhaysk National-level Nuclear Weapons Storage Facility, Moscow region.  
Approx. 55°26'N; 35°46'E; 75 miles WSW of Moscow.  
Image from: Corona Mission No. 1114-2, 1 April 1971.



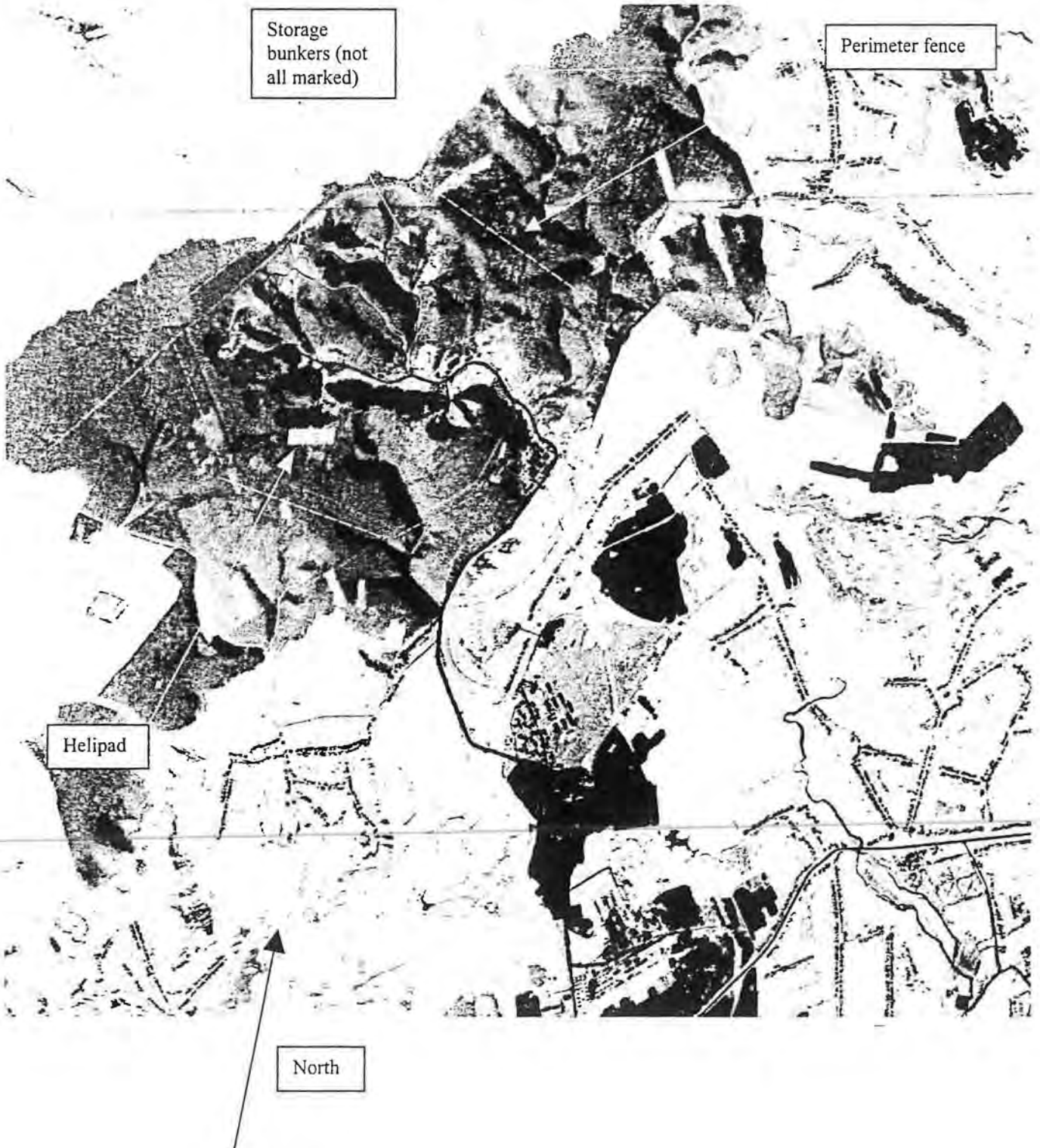
**Figure 2:** Bulyzhino National-level Nuclear Weapons Storage Facility, Western Russia.  
Approx. 58 14'N; 28 22'E; 80 miles west of Velikiye Luki.  
Image from: Corona Mission No. 1111-2, 1 August 1970.



**Figure 3:** Zhukovka National-level Nuclear Weapons Storage Facility, Western Russia.  
Approx. 53°34'N; 33°58'E; 30 miles NW of Bryansk.  
Image from: Corona Mission No. 1109-1, 10 March 1970.



**Figure 4:** Golovchino National-level Nuclear Weapons Storage Facility, Western Russia. Approx. 50°34'N; 35°45'E; 35 miles west of Belgorod; about 10 miles from Ukraine. Image from: Corona Mission No. 1109-1, 10 March 1970.



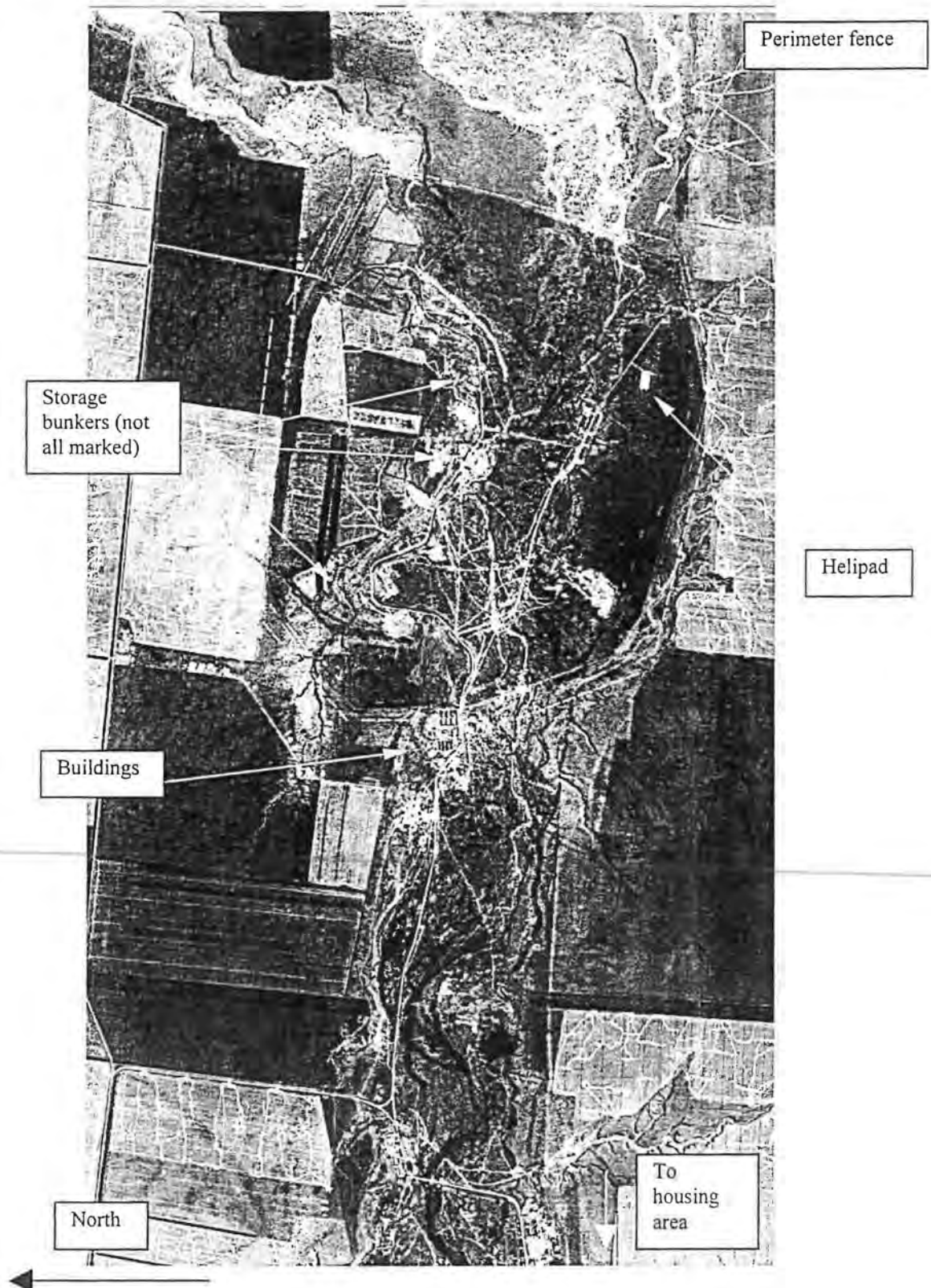
**Figure 5:** Golovchino National-level Nuclear Weapons Storage Facility, Western Russia.  
Approx. 50°34'N; 35°45'E; 35 miles west of Belgorod; about 10 miles from Ukraine.  
Image from: Corona Mission No. 1114-2, 1 April 1971.



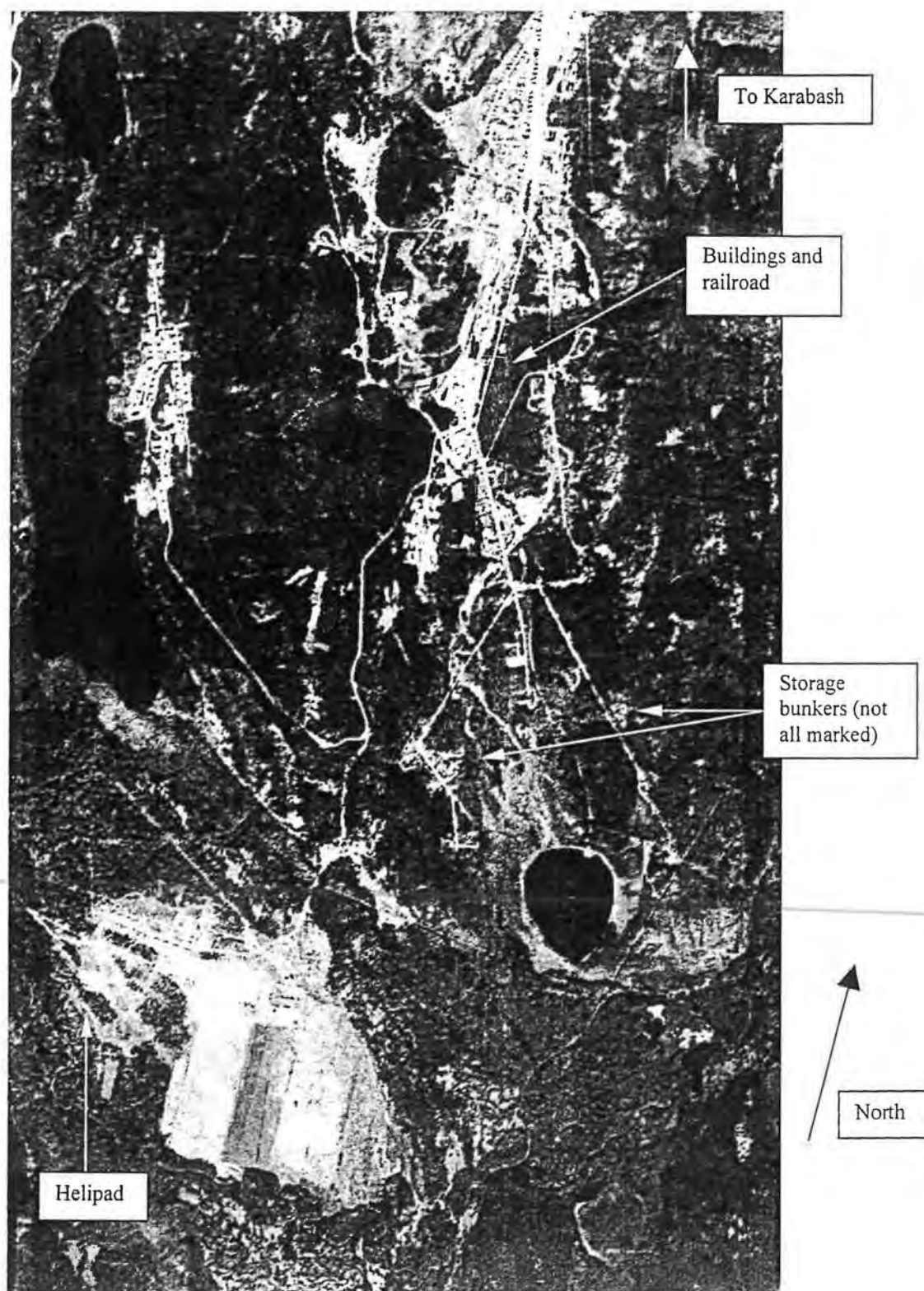
**Figure 6:** Borisoglebsk National-level Nuclear Weapons Storage Facility, Western Russia.  
Approx. 51°24'N; 41°54'E; 8 miles WNW of Borisoglebsk.  
Image from: Corona Mission No. 1114-2, 2 April 1971.



**Figure 7:** Krasnoarmeyskoye National-level Nuclear Weapons Storage Facility, Western Russia.  
Approx. 51 12'N; 45 56'E; 25 miles south of Saratov.  
Image from: Corona Mission No. 1023-1, 22 August 1965.



**Figure 8:** Karabash National-level Nuclear Weapons Storage Facility, Ural region, Russia.  
Approx. 55°26'N; 60°13'E; 4 miles south of Karabash city.  
Image from: Corona Mission No. 1115-1, 14 September 1971.



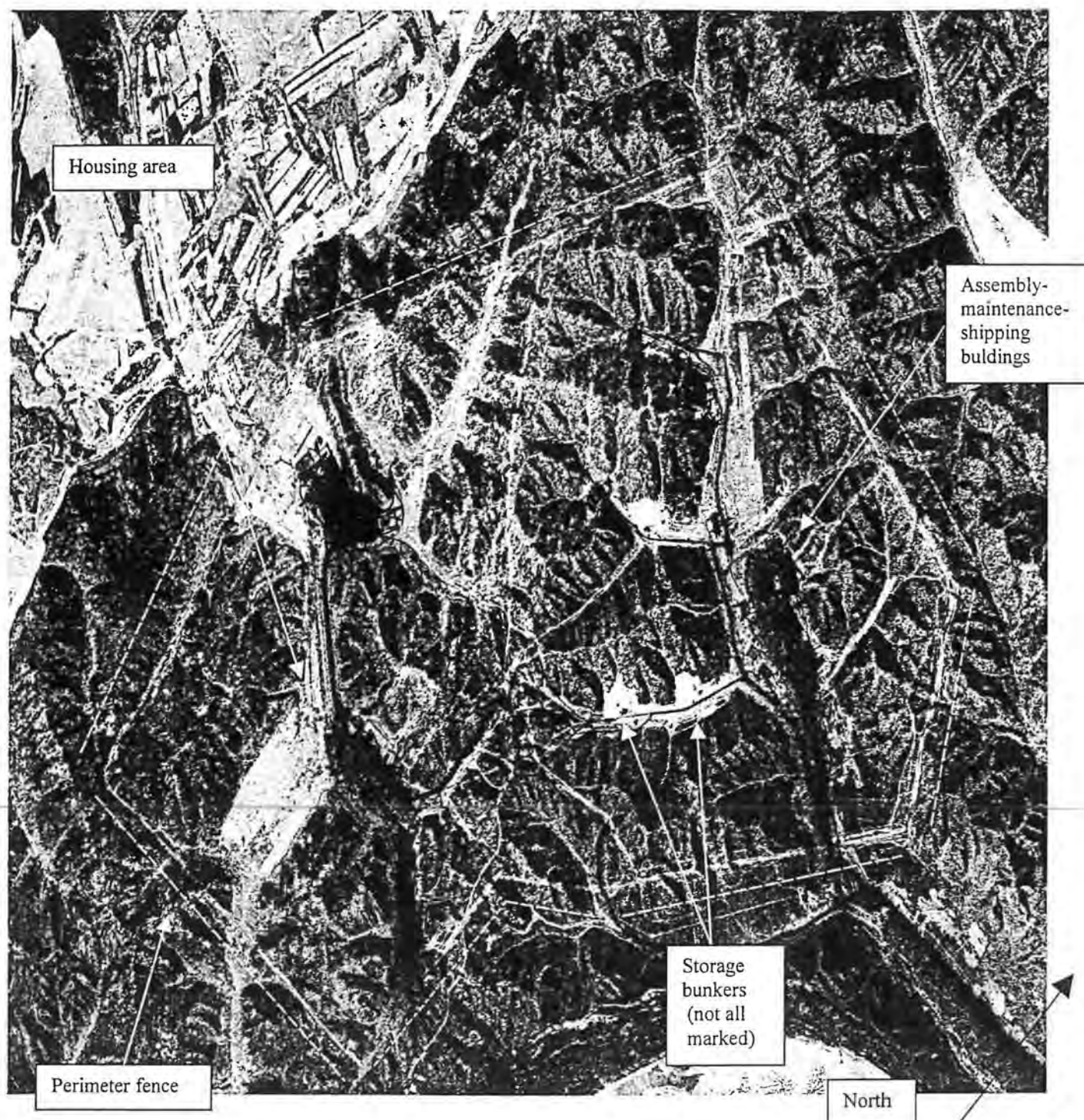
**Figure 9:** Malaya Sazanka National-level Nuclear Weapons Storage Facility, Russian Far East.  
Approx. 51 15'N; 128 01'E; 10 miles SWS of Svobodnyy.  
Image from: Corona Mission No. 1108-1, 6 December 1969.



**Figure 10:** Malaya Sazanka National-level Nuclear Weapons Storage Facility, Russian Far East.  
Approx. 51 15'N; 128 01'E; 10 miles SWS of Svobodnyy.  
Image from: Corona Mission No. 1112-1, 20 November 1970.



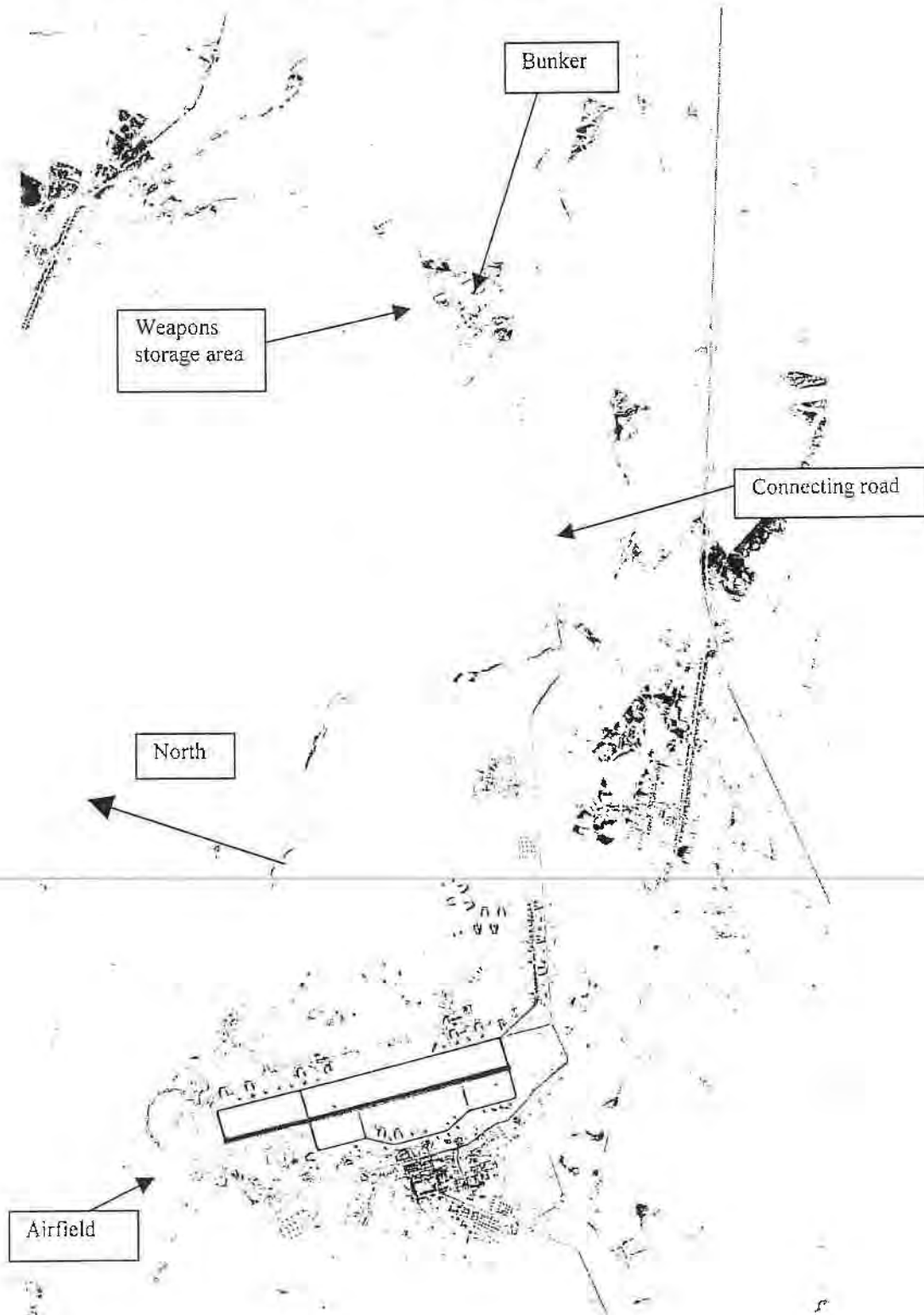
**Figure 11:** Malaya Sazanka National-level Nuclear Weapons Storage Facility, Russian Far East. Approx. 51 15'N; 128 01'E; 10 miles SWS of Svobodnyy. Image from: U-2 Mission 6011, 1 March 1958.



**Figure 12:** Ukrainka Strategic Bomber Base and Associated AF RTB Nuclear Weapons Storage Facility, Russian Far East.

Approx. 51 10'N; 128 27'E; SE of Svobodnyy.

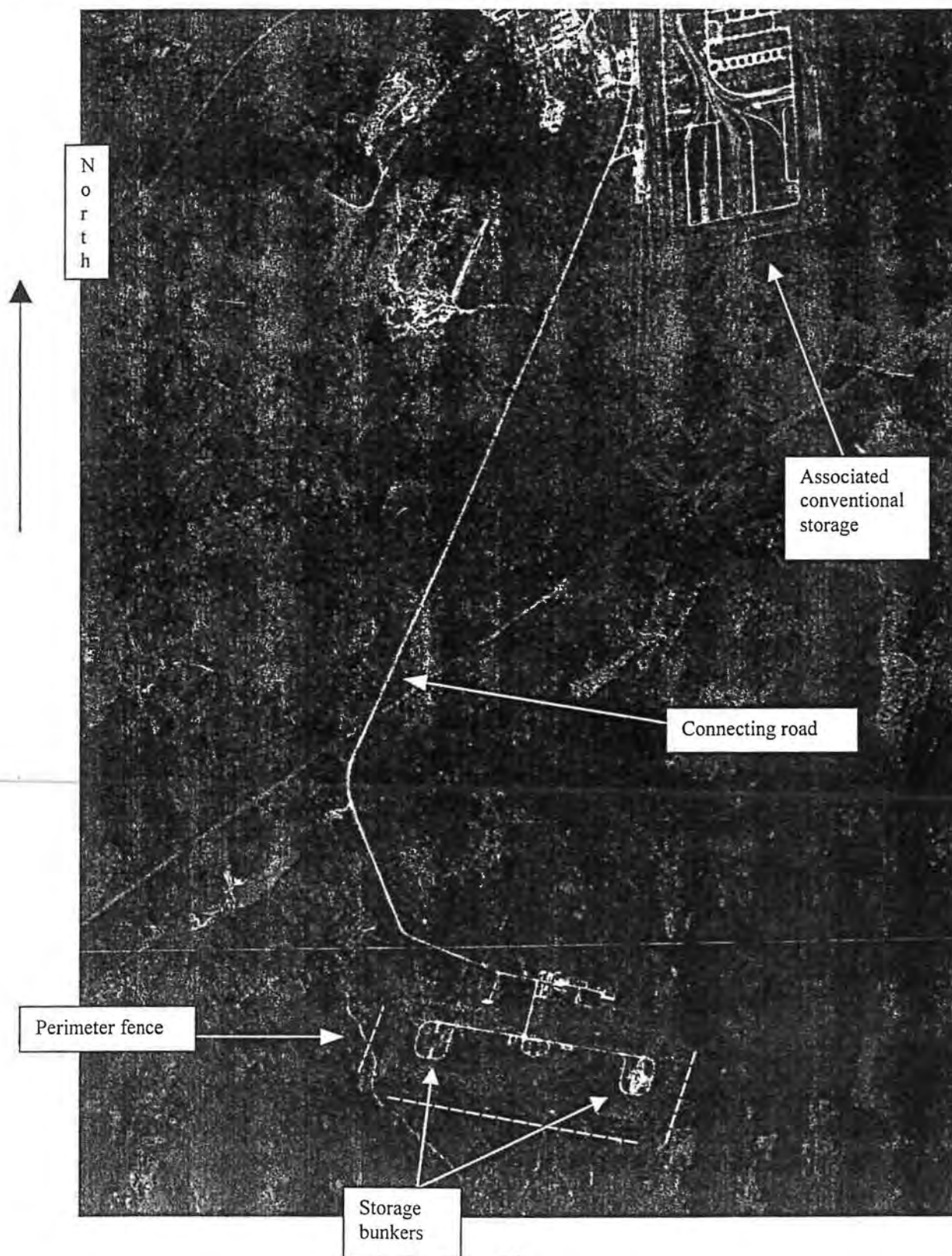
Image from: Corona Mission No. 1108-1, 6 December 1969.



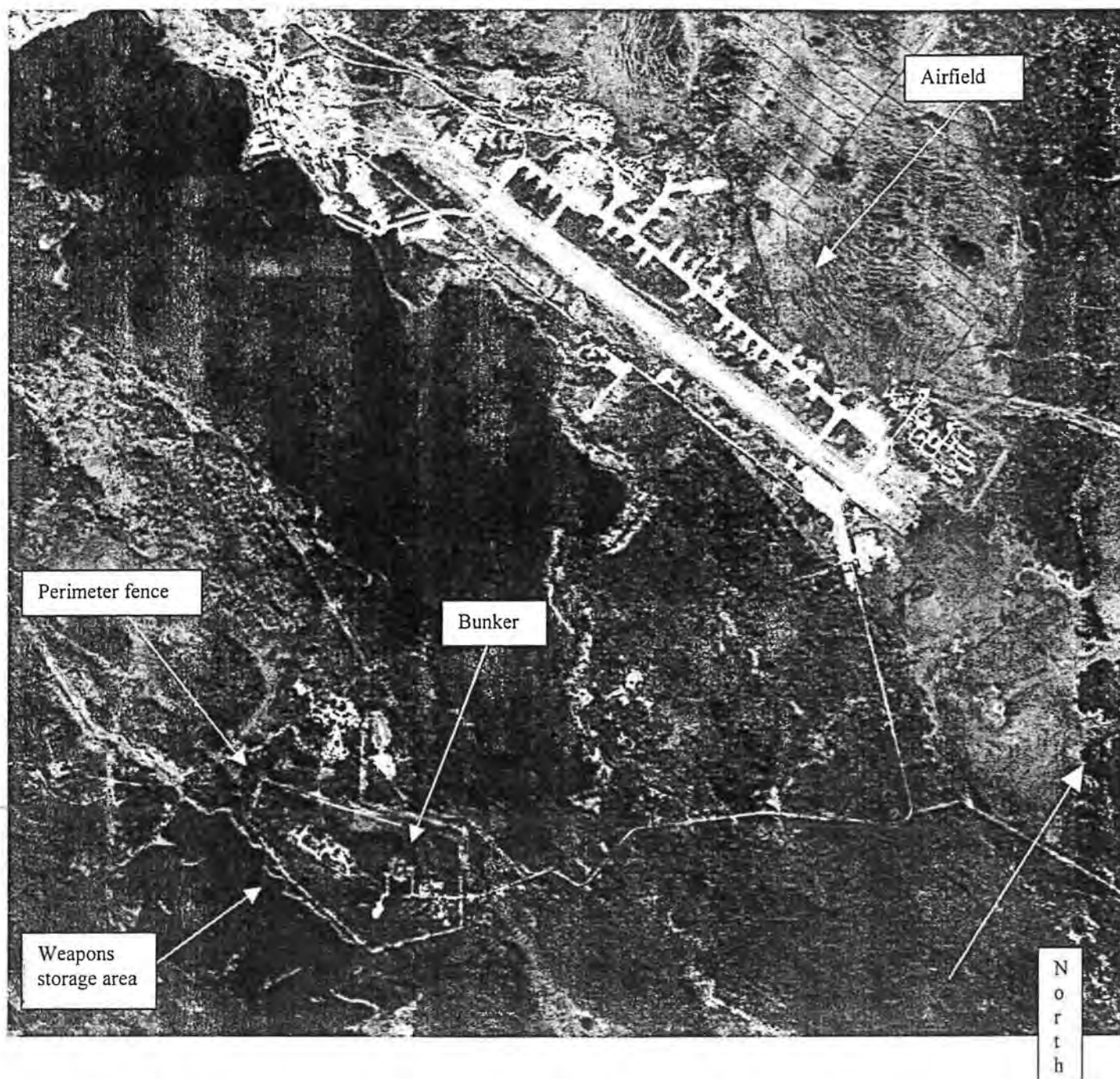
**Figure 13:** Surovatikha Strategic Rocket Forces RTB Regional Nuclear Weapons Storage Site and Associated Conventional Military Storage.

Approx. 55 42'N; 43 53'E, 40 miles south of Nizhniy Novgorod.

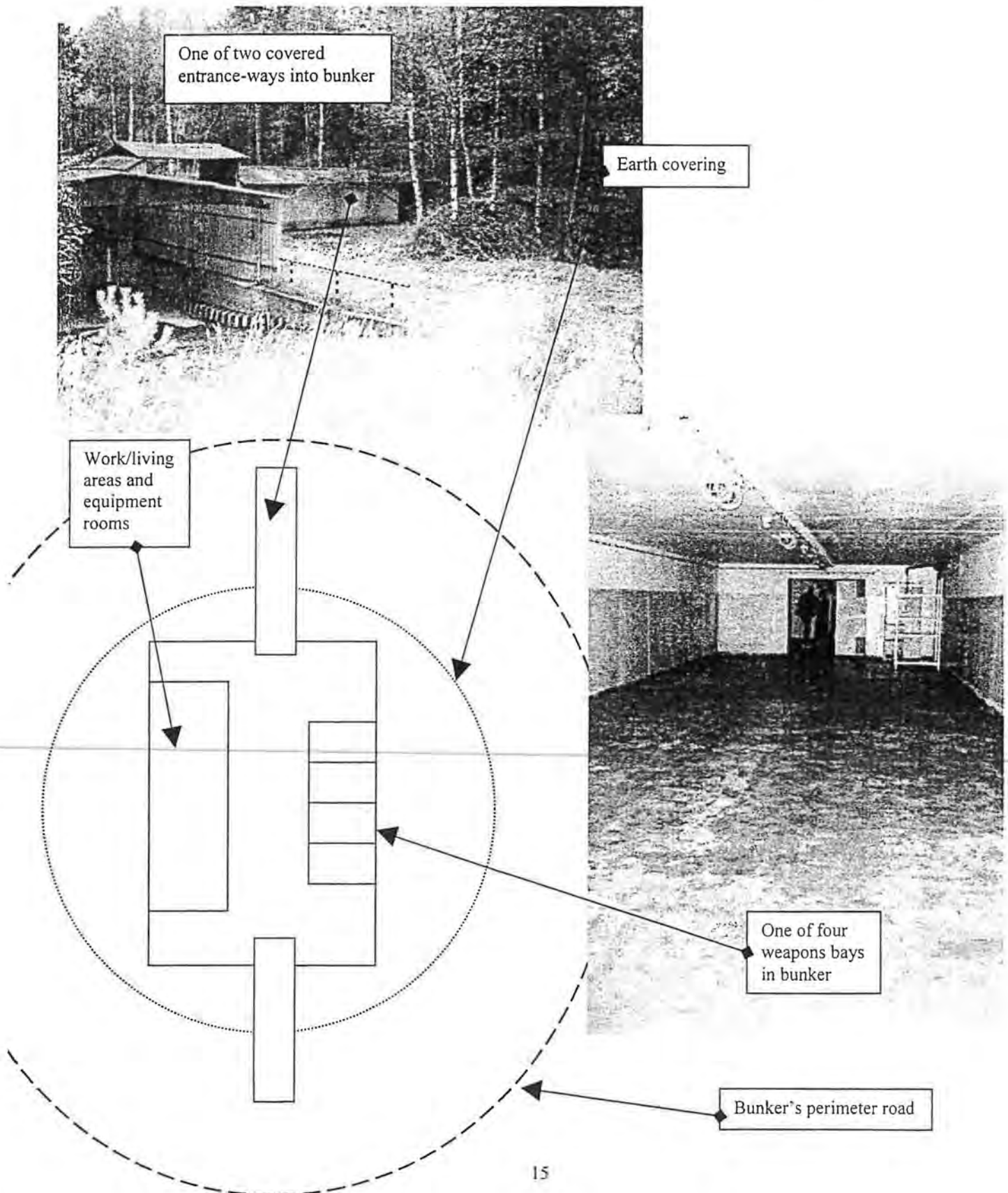
Image from: Corona Mission No. 1116-2, 6 May 1972.



**Figure 14:** Kholm Air Base and nearby Service-level RTB Nuclear Weapons Storage Facility. Approx. 64 22'N;40 42'E; northern Russia, about 12-13 miles SSE of Arkhangelsk. Image from: Corona Mission No. 1115-2, 18 September 1971.



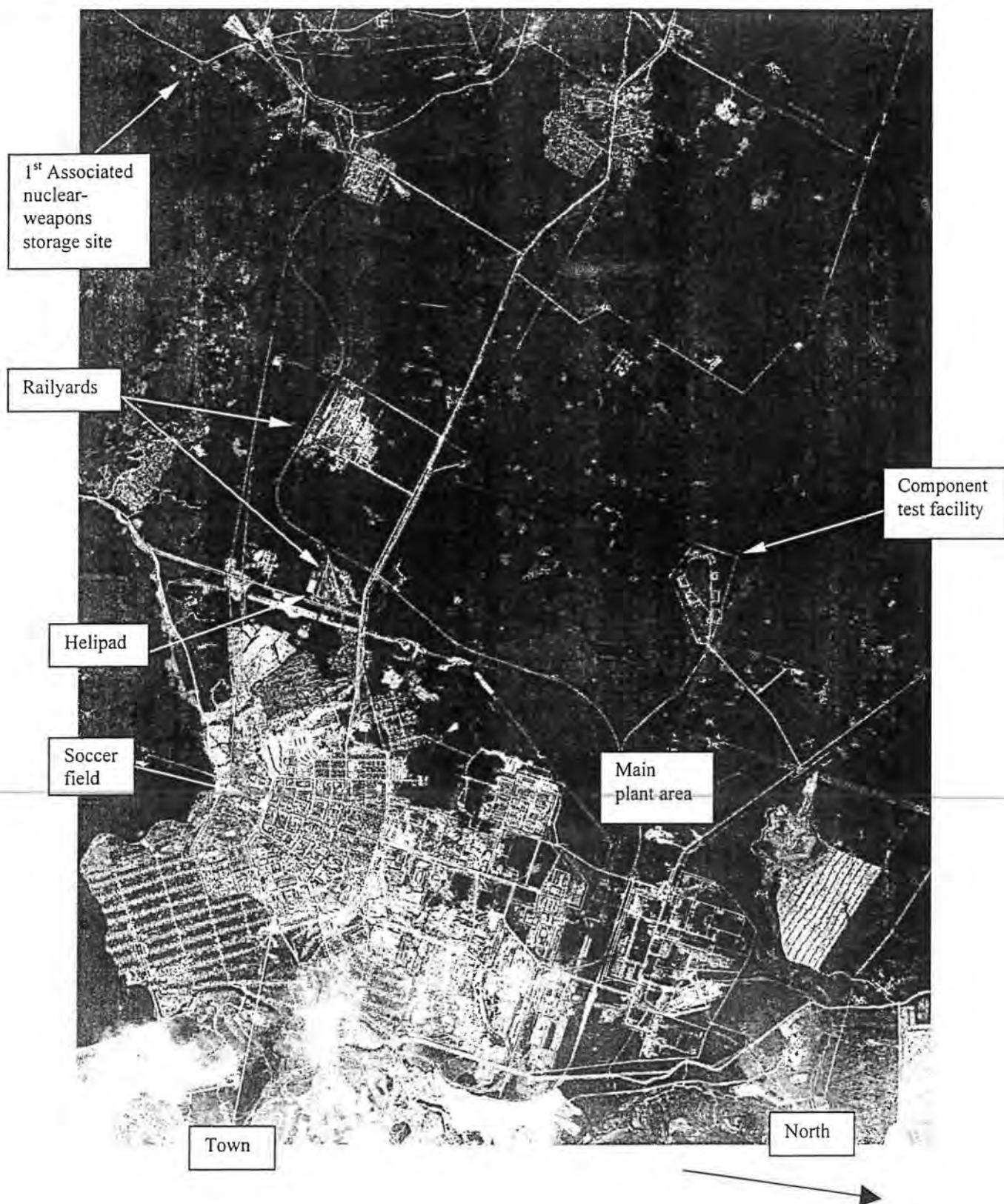
**Figure 15:** Loading dock, entrance, and weapons storage bay of one of two nuclear-weapons storage bunkers located on abandoned Soviet Ground Forces RTB nuclear weapons storage facility north of Berlin, Germany, October 1997.



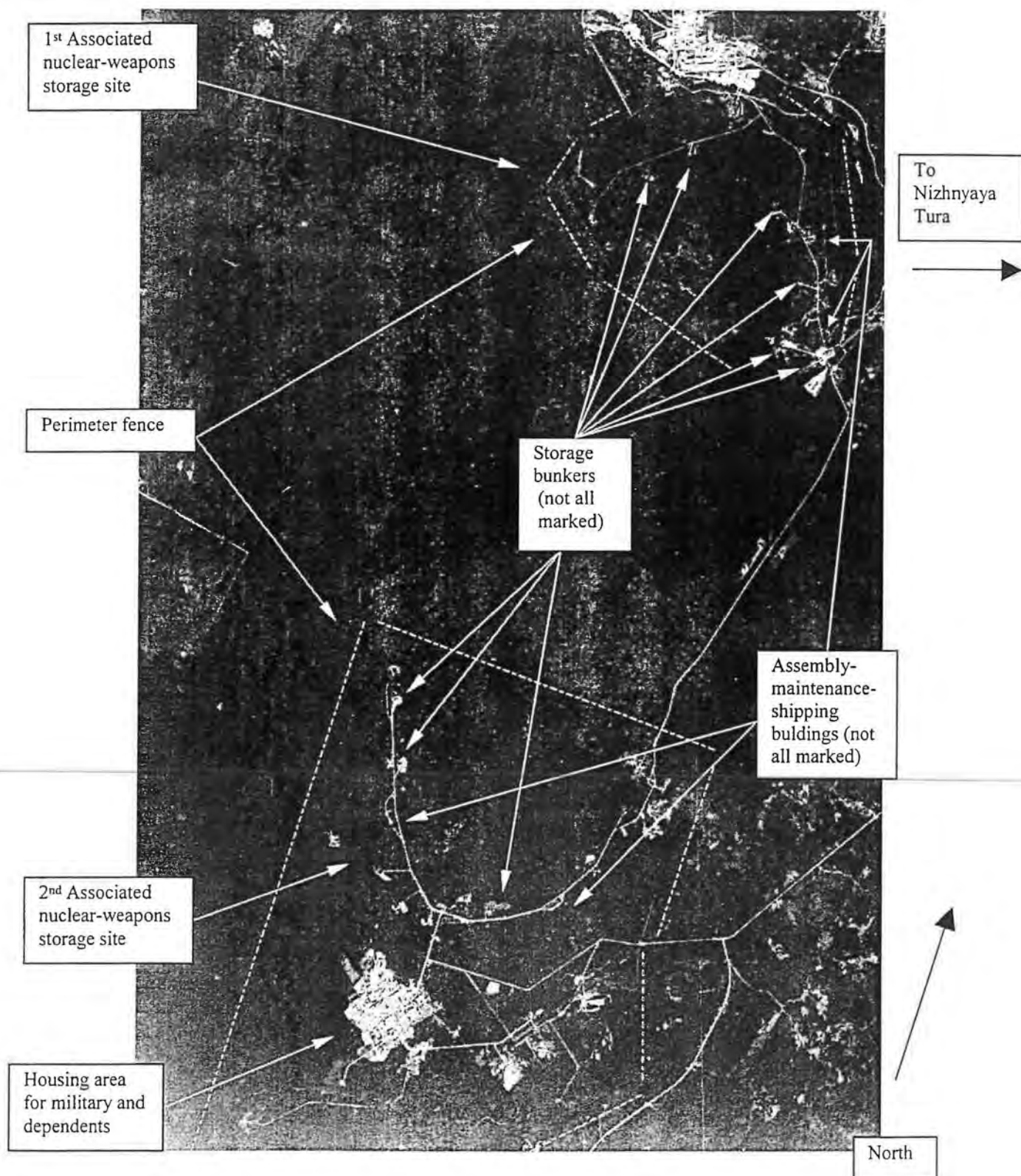
**Figure 16:** Sverdlovsk-45/Nizhnyaya Tura Nuclear Weapons Assembly/Disassembly Plant and Associated National-level Nuclear Weapons Storage Facility, Ural region.

Approx. 58 41'N; 59 48'E.

Image from: Corona Mission No. 1111-1, 24 July 1970.



**Figure 17:** Two National-level Nuclear Weapons Storage Facilities Associated with the Nizhnyaya Tura Nuclear Weapons Assembly-Disassembly Plant, Ural region.  
Approx. 58 37'N; 59 37'E and 58 34'N; 59 34'E.  
Image from: Corona Mission No. 1111-1, 24 July 1970.



**Figure 18:** Zlatoust-36/Yuryuzan Nuclear Weapons Assembly/Disassembly Plant. (approx. 54 52'N; 58 26'E) and Associated National-level Nuclear Weapons Storage Facility (approx. 54 47'N; 58 30'E; 5-7 miles southeast of Zlatoust-36), Ural Region. Image from: Corona Mission No. 1115-2, 20 September 1971.

