

Russia's Nuclear Weapons Infrastructure

Operational Strategic Nuclear Weapons Facilities

- Silo-based Inter-Continental Ballistic Missiles (ICBMs)
- ⊠ Road-mobile ICBMs
- ◻ Rail-mobile ICBMs
- ★ Anti-Ballistic Missiles (ABMs)
- ⬢ Submarine-Launched Ballistic Missiles (SLBMs)
- ▲ Heavy Bombers carrying Air-Launched Cruise Missiles (ALCMs) or Gravity Bombs

SOURCES: START Memorandum of Understanding on Data (MOU), September 1990-January 1998.

Locations with Weapons-Usable Fissile Material for One or More Nuclear Bombs

- Plutonium Production
- ⊗ Uranium Enrichment/Processing
- ▣ Warhead Assembly/Dismantlement
- ⊙ Research Institute/Research Reactor
- ▣ Fuel Storage

SOURCE: Monterey Institute of International Studies, Monterey, CA; Natural Resources Defense Council, Washington, DC; U.S. Department of Energy, Washington, DC.





Carnegie Endowment for International Peace, *Tracking Nuclear Proliferation*, 1998

RUSSIA Chart 1: Nuclear Weapons Systems^a

TYPE	WEAPONS SYSTEMS (START I MOU/Current)	WARHEADS (START I MOU/Current)	CURRENT LOCATIONS	COMMENTS
I C B M s				
Total	1064/751	4278/3610		
SS-11	326/0	326/0		All SS-11s were dismantled by the end of 1995.
SS-13	40/0	40/0		All SS-13s have been dismantled.
SS-17	47/0	188/0		All SS-17s have been dismantled.
SS-18	204/180	2,040/1,800	Uzhur: 52 Aleysk: 30 Kartaly: 46 Dombaroskiy: 52	START I requires Russia to reduce its SS-18 deployment to 154 silos. START I attributes 10 warheads to each SS-18; some may carry fewer. START II requires elimination of all SS-18 ICBMs.
SS-19	170/165	1,020/990	Tatishchevo: 105 Kozel'sk: 60	START II would limit Russia to 105 deployed SS-19s, down-loaded to one warhead each.
SS-24	43/46	430/460	Bershet: 15 Kostroma: 12 Krasnoyarsk: 9 Tatishchevo: 10	Of the 46 SS-24s, 36 are rail-based and 10 are silo-based. Rail-based SS-24s were removed from alert status under the October 1991 Gorbachev initiative. START II requires elimination of these 10-warhead ICBMs.
SS-25	234/360	234/360	Irkutsk: 36 Kansk: 45 Novosibirsk: 45 Yoshkar-Ola: 36 Nizhniy Tagil: 45 Yur'ya: 45 Teykovo: 36 Vypolzovo: 18 Barnaul: 36 Drovyanaya: 18	To replace MIRVed ICBMs, whose elimination START II requires, Russia's land-based leg will rely more on single-warhead SS-25s, still being deployed, and on a new single-warhead ICBM, the Topol-M (SS-27), which was declared ready for deployment in July 1997; Russia expects to deploy 10 SS-27s by the end of 1998. ^b
B O M B E R S ^c				
Total	79/75	570/816		
Bear-H	28/64	448/734	Mozdok: 21 Ukrainka: 43	40 Bear-H bombers were transferred from Kazakhstan to Russia.
Blackjack	2/6	24/72	Engels: 6	
Bear-G	49/5	98/10	Ryazan: 5	5 additional Bear-Gs are awaiting elimination at Engels.

RUSSIA Chart 1 (cont'd.)

TYPE	WEAPONS SYSTEMS (START I MOU/Current)	WARHEADS (START I MOU/Current)	CURRENT LOCATIONS	COMMENTS
S L B M s^d				
Total	940/384	2804/1824		
SS-N-6	192/0	192/0	Rybachiy: 1 Yankee I sub	Although 16 SS-N-6s are accountable under START I, none are operationally deployed. ^e
SS-N-8	280/0	280/0	Ostrovnoy: 3 Delta I subs Rybachiy: 2 Delta I subs Yagel'naya: 2 Delta I subs 3 Delta II subs Pavlovskoye: 5 Delta I subs	Although 192 SS-N-8s are accountable under START I, none are operationally deployed. ^f
SS-N-17	12/0	12/0		All SS-N-17s have been destroyed.
SS-N-18	224/192	672/576	Rybachiy: 9 Delta III subs Yagel'naya 4 Delta III subs	Although 208 SS-N-18s are accountable under START I, only 192 are operational. ^g
SS-N-20	120/80	1,200/800	Nerpich'ya: 6 Typhoon subs	Although 120 SS-N-20s are accountable under START I, only 80 are operational. ^h
SS-N-23	112/112	448/448	Yagel'naya: 7 Delta IV subs	
OTHER NUCLEAR WEAPONS				
Tactical Nuclear Weapons		Estimates of the total number of tactical nuclear warheads in Russia range from 15,000 to upward of 20,000; the number deployed may be considerably lower. ⁱ	The number of tactical nuclear weapons deployment sites were reduced for security reasons in 1994. ^j	Approximately 4,000 tactical nuclear weapons were withdrawn to Russia from Belarus, Kazakhstan, and Ukraine. ^k
Strategic and Tactical Weapons in Storage and Dismantlement Facilities		The exact number of warheads in storage or dismantlement facilities is unknown.	Dismantlement Facilities: Sarov Zarechniy Lesnoy Trehgornyy	Russia has told the U.S. Department of Defense that it is dismantling over 2,000 warheads per year. ^l
Anti-Ballistic Missiles	100	100	ABMs deployed within a 100-km radius of Moscow.	Nuclear warheads on ABM interceptors near Moscow may have been replaced with conventional ordnance. ^m

NOTES (Russia Chart 1)

^aThe original "START I" numbers for Russia in this chart are derived from the September 1990 START Memorandum of Understanding (MOU) on Data, an annex to the START treaty that declared "baseline" numbers and locations of the strategic offensive forces of the United States and the Soviet Union as of September 1990. See "START-Related Facilities by Republic as Declared in MOU Data Exchange, Sept. 1, 1990," *Hearings on the START Treaty*, Committee on Foreign Relations, U.S. Senate, 102nd Cong., 2nd Sess., February 6, 1992, p. 497. The MOU data were updated by the five START parties after the treaty entered into force in December 1994, and at six-month intervals thereafter.

"Current" numbers indicate the effects of reductions under the first phase of START I implementation (although, in some cases, the current numbers may increase due to Russia's ongoing ICBM modernization or the withdrawal to Russia of moveable strategic systems from Belarus and Kazakhstan). The current numbers reflect the status of deployed operational systems in Russia as of July 1997, but may exclude deactivated systems, even if they have not yet been eliminated in treaty terms. The START I counting rules count deployed delivery systems and their attributable warheads as "deployed," until the systems have been eliminated (i.e., until missile launchers and heavy bombers slated for elimination are actually destroyed), even if the systems are known to be no longer operational. Current figures have been derived from subsequent START MOU updates, the latest available being that of January 1998, and various other open sources. See, for example, Carnegie Endowment for International Peace and Monterey Institute of International Studies, *Nuclear Successor States of the Soviet Union: Status Report on Nuclear Weapons, Fissile Materials, and Export Controls*, No. 5, March 1998; International Institute of Strategic Studies, *The Military Balance 1997/98* (London: Oxford University Press for IISS, 1997); "NRDC Nuclear Notebook," *The Bulletin of the Atomic Scientists*, March/April 1998, pp. 70-71.; and Thomas B. Cochran, et al., *Nuclear Weapons Databook—Volume IV: Soviet Nuclear Weapons*, (New York: Harper and Row, 1989).

The START I treaty parties were, as of December 1997, two full years ahead of the treaty reductions schedule, according to Robert Bell, the senior NSC official for defense and arms control, in his February 17, 1998 presentation to the Arms Control Association in Washington, D.C.

^bRussia stationed two experimental Topol-Ms in refurbished SS-19 silos at Tatishchevo in December 1997. Neither missile is thought to be armed with a nuclear warhead. See "DOD sees only one Russian SS-X-27 missile potentially operational," *Aerospace Daily*, January 13, 1998; "Russia inaugurates first Topol-M ICBM in refurbished silo," *Aerospace Daily*, January 7, 1998, p. 25.

^cCurrent totals reflect 64 Bear-H, 6 Blackjack, and 5 Bear-G bombers. Current bomber loadings are calculated using START II counting rules, and thus reflect the number of warheads for which the heavy bombers of a listed variant are actually equipped, rather than the number of warheads attributed to each aircraft by the START MOUs. The START MOUs intentionally undercount bomber loadings.

^dThe Yankee I, Delta II, Delta III, and Delta IV class submarines have 16 tubes each. The Delta I class submarine has 12 tubes and

Typhoon class submarines have 20 tubes. Under START I counting rules, SLBMs are accountable until their associated launch tubes are destroyed.

^eRobert S. Norris, "NRDC Nuclear Notebook," *The Bulletin of the Atomic Scientists*, March/April 1996, p. 62.

^f*Ibid.*, p. 62.

^g"NRDC Nuclear Notebook," *op. cit.*, pp. 70-71.

^hTwo Typhoon submarines with 20 tubes each are inoperable. *Ibid.*

ⁱSee Deputy Secretary of Defense John Deutch, U.S. Defense Department Briefing, September 22, 1994; and "Estimated Russian Nuclear Stockpile, September 1996," *The Bulletin of the Atomic Scientists*, September/October 1996, p. 17. Unfortunately, there is no authoritative baseline information on the number of tactical nuclear weapons deployed and stockpiled by the former Soviet Union as of 1991. Information released subsequently has been fragmentary and allows no reliable estimates either of the numbers or of the status of Russia's tactical nuclear weapons, whether deployed on launchers, stored but operationally ready for use by military units, retired from service but stored, or both retired and dismantled.

Alexei Arbatov, Russian Duma member, published a report listing the number of Soviet tactical nuclear weapons at 21,700 in 1991. Of these, 13,700 were, he suggested, subject to elimination under the 1991 reciprocal unilateral reductions declared by Presidents Gorbachev and Bush. An additional 4,200 from outside Russia would also have been subject to elimination. Arbatov claims that of the remaining weapons, perhaps 4,000, most are in storage. *Yadernye Vooruzheniya Rossii*, Alexei Arbatov, ed., (Moscow: IMEMO, 1997), p. 56. The U.S. Defense Department recently reported, however, that most Russian warhead dismantlement appears to have been of strategic rather than tactical nuclear warheads, and that relatively few of the 15,000 tactical warheads that were estimated to have been withdrawn from service under the 1991 unilateral initiative, and presumably subject to dismantlement, actually were dismantled. The report states that "Russia has not divulged specific information on warhead reductions." Office of the Secretary of Defense, *Proliferation: Threat and Response*, November 1997, p. 43.

^j"Tactical Nuclear Arms Removed from Vessels," *ITAR-TASS*, February 4, 1994, in *FBIS-SOV-93-022*, February 4, 1994, p. 1.

^kTestimony of Assistant Secretary of Defense Ashton Carter, before the Senate Armed Services Committee, April 28, 1994.

^lAshton Carter testimony, *op. cit.* These figures include the dismantlement of both tactical and strategic nuclear warheads. See note 9 above reflecting current Department of Defense skepticism that Russia's warhead dismantlement thus far has included a significant fraction of the tactical nuclear warhead inventory.

^mIn oral remarks, Col. Gen. Alexander Yesin, Deputy Secretary of the Security Council of the Russian Federation (and former chief of staff of the Strategic Rocket Forces) indicated at the Carnegie Endowment for International Peace, April 21, 1998, that Russia has been replacing nuclear with conventional warheads on the ABM system deployed around Moscow. This has not yet been confirmed publicly by official U.S. sources.

RUSSIA Chart 2: Locations with Weapons-Usable (Fissile) Material^a

NAME/ LOCATION OF FACILITY	ACTIVITY	PLUTONIUM	WEAPONS- GRADE URANIUM	COMMENTS
Sarov (Arzamas-16)	Weapons R&D, warhead assembly/ dismantlement, research reactors.	Yes	Yes	4 research reactors and more than a ton of fissile material.
Baltiyskiy Zavod, St. Petersburg	Construction of nuclear icebreakers and other ships.		Yes	Fresh fuel in storage for up to a year.
Beloyarsk, near Yekaterinburg	BN-600 fast breeder reactor.	Yes	Yes	Spent fuel plutonium present.
A.A. Bochvar Institute, Moscow	Research on weapons-grade materials.	Yes	Yes	In early 1994, parts of the facility were closed due to lax plutonium protection arrangements.
Ozersk, Mayak Production Association (Chelyabinsk-65)	Plutonium and tritium production reactors, reprocessing, MOX fuel production, warhead component production.	Yes	Yes	All plutonium production reactors closed, but reprocessing and tritium production continue.
Snezhinsk (Chelyabinsk-70)	Warhead design, prototype warhead fabrication, research reactors.	Yes	Yes	More than a ton of weapons- usable material present.
Scientific Research Institute for Atomic Reactors, Dmitrovgrad	Research and plutonium production reactors, MOX fuel fabrication, reprocessing, hot cells.	Yes	Yes	More than a ton of weapons- usable material present.
Joint Institute of Nuclear Research, Dubna	Research reactors.	Yes	No	About 100 kg plutonium.
Elektrostal Machine-Building Plant, Moscow	Fuel fabrication for naval propulsion, fast breeder, VVER and RBMK reactors.	No	Yes	Produces fuel assemblies for VVER and RBMK nuclear power reactors.
Institute of Physics and Power Engineering, Obninsk	Research reactors, research on weapons-grade materials.	Yes	Yes	4 research reactors and up to 18 critical assemblies; approximately 1,000 kg plutonium and 7 tons of HEU present.
Karpov Institute of Physical Chemistry, Obninsk	Research reactor.	No	Yes	VVR-Ts tank reactor and “substantial amounts” of HEU. ^b
Khlopin Radium Institute, St. Petersburg	Research on reprocessing technologies.	Yes	Yes	Current research on using ex- weapon plutonium as fast reactor fuel. ^c

RUSSIA Chart 2 (cont'd.)

NAME/ LOCATION OF FACILITY	ACTIVITY	PLUTONIUM	WEAPONS- GRADE URANIUM	COMMENTS
Zheleznogorsk (Krasnoyarsk-26)	Plutonium production reactor, spent fuel reprocessing.	Yes	Yes	Russia will convert the core of the ADE-2 plutonium producing reactor by 2000 so that it no longer produces weapons-grade plutonium. ^d
Zelenogorsk (Krasnoyarsk-45)	Uranium enrichment, LEU production.	No	Yes	Former HEU producer for weapons, now blends down ex-weapon HEU into LEU reactor fuel.
Krylov Central Scientific Research Institute, St. Petersburg	Research reactor and critical assemblies.	No	Yes	Research and design of nuclear submarine reactors, and testing of other naval reactors.
Kurchatov Institute, Moscow	Research reactors, critical and subcritical assemblies.	Yes	Yes	Nuclear energy research facility; estimated to possess hundreds of kgs of HEU for the 6 operable research reactors.
Luch Scientific Production Association, Podolsk	HEU fuel fabrication for space-based reactors, research reactors.		Yes	More than a ton of weapons- usable material present.
Lytkarino Research Institute for Instruments, near Moscow	Research reactors.	Possible ^e	Yes	Five pulse research reactors and 90% enriched HEU.
Moscow Engineering Physics Institute	Research reactor.	No	Yes	Pond-type research reactor and kilograms of 90% enriched HEU.
Moscow Institute of Theoretical and Experimental Physics	Heavy-water research reactor and critical assembly.		Yes	Heavy-water research reactor shut down, but critical assembly still operating.
Novosibirsk Chemical Concentrates Plant	Fuel fabrication for VVER-1000 reactors, research reactors, and Pu- production reactors.	No	Yes	Produces LEU fuel for VVER civilian power reactors and HEU fuel for research, and plutonium and tritium production reactors.
Zarechniy (Penza-19)	Component fabrication, warhead assembly and disassembly.	Yes	Yes	Manufactures nuclear warheads components and has on-site storage.
Scientific Research and Design Institute of Power Technology, Moscow	Research reactors, subcritical assemblies.		Yes	Designs reactors for power generation, naval propulsion, heat production, research, and space-based applications.
Sverdlovsk Scientific Research and Design Institute of Power Technolo- gy, Yekaterinburg	Research reactor, critical assemblies, hot cells.		Yes	Designs RBMK reactors and conducts safety tests; 15 MW pool reactor fueled with 1.7 kg 90% enriched HEU.

RUSSIA Chart 2 (cont'd.)

NAME/ LOCATION OF FACILITY	ACTIVITY	PLUTONIUM	WEAPONS- GRADE URANIUM	COMMENTS
Nuclear Physics Institute (formerly Lenin Institute of Physics), St. Petersburg	Research reactors, critical assemblies.		Yes	18 MW pool reactor fueled with 90% HEU; a 100 MWt tank reactor is under construction. ^f
Novouralsk Urals Electrochemical Integrated Plant (Sverdlovsk-44), Yekaterinburg	Former HEU for weapons production site, LEU production.	No	Yes	Produces and exports blended down LEU for nuclear power reactors; converts former weapons HEU to 4% LEU. ^g
Elektrokhimpribor Combine (Sverdlovsk-45), Lesnoy	Final warhead assembly and dismantlement.	Yes	Yes	One of Russia's largest dismantlement and storage sites; dismantles approximately 1500 warheads per year. ^h
Siberian Chemical Combine (Tomsk-7), Seversk	Plutonium production, uranium enrichment, reprocessing, dismantled weapons storage.	Yes	Yes	Large quantities of fissile material including tens of tons of plutonium and HEU from dismantled weapons; 2 operating plutonium production reactor cores will be converted by 2000. ⁱ
Tomsk Polytechnic University	Research reactor.		Yes	6 MW tank research reactor and HEU fuel; 1 kg of 90% HEU was discovered missing in 1995, and was possibly diverted. ^j
Trekhgornyy Instrument Making Plant (Zlatoust-36)	Final warhead assembly and dismantlement.	Yes	Yes	In addition to warhead dismantlement and storage, also produces ballistic missile reentry vehicles. ^k
Northern Fleet Naval Shipyards, Murmansk	Fresh and spent fuel storage, submarine refueling, submarine construction and decommissioning.	No	Yes	Large stocks of fresh and spent naval reactor fuel, including HEU enriched up to 92%.
Pacific Fleet, Kamchatka Peninsula and Vladivostok	Fresh and spent fuel storage, naval reactor maintenance, submarine decommissioning.	No	Yes	Large stocks of naval reactor fuel, HEU enriched up to 90%.

Abbreviations:

HEU	=	highly enriched uranium
LEU	=	low-enriched uranium
nat. U	=	natural uranium
MWe	=	millions of watts of electrical output
MWt	=	millions of watts of thermal output
KWt	=	thousands of watts of thermal output

NOTES (Russia Chart 2)

^aWeapons-usable fissile material includes uranium enriched to 90 percent or more in the isotope U-235 (referred to below as highly enriched uranium or HEU) and all forms of plutonium (Pu). About 15 kg of HEU or 5 kg of Pu are required for a nuclear weapon. None of these facilities are under IAEA safeguards.

Principal sources for this chart: Carnegie Endowment for International Peace and Monterey Institute of International Studies, *Nuclear Successor States of the Soviet Union: Status Report on Nuclear Weapons, Fissile Materials, and Export Controls*, No. 5, March 1998, Table I-E.; the NIS Nuclear Profiles Database, Center for Nonproliferation Studies, Monterey Institute of International Studies, 1997; *United States/Former Soviet Union: Program of Cooperation on Nuclear Material Protection, Control, and Accounting*, Department of Energy Nuclear Material Security Task Force, December 1996; and Department of Energy, Office of Nonproliferation and National Security, *MPC&A Program Strategic Plan*, January 1998.

^bFrom an interview conducted by the Center for Nonproliferation Studies with a Russian nuclear official in August 1997 as reported in *Nuclear Successor States of the Soviet Union*, No. 5, op. cit.

^cThis project is funded by an ISTC award. "Summary of 26 New ISTC Awards," *Post-Soviet Nuclear & Defense Monitor*, July 7, 1995, pp. 7-10. See section I-F in *Nuclear Successor States of the Soviet Union*, No. 5, op. cit. for more on the ISTC.

^dFor more information on the terms and status of the reactor core conversion agreement, see the section on Cessation of Production of

Plutonium at the Zheleznogorsk and Seversk Reactors in Table I-D, *Nuclear Successor States of the Soviet Union*, No. 5, op. cit.

^eAccording to an article in *Nucleonics Week*, there may be an inventory of separated plutonium at the Lytkarino facility. Mark Hibbs, "Gosatomnadzor Warned U.S. of Insider Threat at Lytkarino Lab," *Nucleonics Week*, August 14, 1997, p. 5.

^fConstruction on the reactor is expected to be complete by the end of 1998. It will be fueled with about 30 kg of 90 percent HEU. U.S. General Accounting Office, *Nuclear Safety: Concerns With Nuclear Facilities and Other Sources of Radiation in the Former Soviet Union (Letter Report)*, GAO/RCED, November 7, 1995, Appendix II, pp. 23-25.

^gCountries that have imported Russian LEU from Novouralsk include England, Belgium, Germany, Spain, France, Finland, and South Korea. "Uralskiy Elektrokhimicheskiy Krupniy Plan," *Atom-pressa*, Number 16, April 1997, pp. 2-3.

^hAccording to Viktor Mikhailov, head of Minatom, in *Megaoplis-Ekspress*, July 22, 1992, p. 12.

ⁱSee note 4.

^jInvestigations by the Tomsk Polytechnic faculty and Gosatomnadzor were inconclusive. The missing HEU in the form of a fresh fuel assembly, may have been accidentally shipped to Tomsk-7, but it was deemed impossible to find there. See *Nuclear Successor States of the Soviet Union*, No. 5, op. cit., Table I-E note 256 for more detail.

^k"Russia: Nuclear Weapons Facilities," NIS Nonproliferation Project, Center for Nonproliferation Studies, Monterey Institute of International Studies, August 1997.