

**NUCLEAR WEAPONS DATABOOK PROJECT
Working Paper**

**NWD 86-3
Known Soviet Nuclear Explosions,
1949-1985
Revised Preliminary List**

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This working paper provides a preliminary list of known nuclear explosions conducted by the Soviet Union from August 1949 through 31 December 1985.¹ It includes explosions announced by the United States, explosions not announced by the United States but detected by seismic means and reported by other scientific institutions, and a few explosions made public in recently declassified U.S. government documents.² Table 1 lists the explosions chronologically and provides, wherever possible, the time, location (including latitude and longitude), seismic data, yield range, type (atmospheric, underwater, or underground), and purpose (presumed military or civilian) of the explosions. Table 2 summarizes this information. Tables 3 and 4 provide distributions by month of the known explosions at the

¹ A revised list of Soviet nuclear explosions will appear as an appendix in the Nuclear Weapons Databook: Volume IV, Soviet Nuclear Weapons by Thomas B. Cochran, William M. Arkin, and Jeffrey I. Sands (Cambridge, Mass.: Ballinger Publishing Company, forthcoming 1987). Lynn R. Sykes of the Lamont-Doherty Geological Observatory and the Department of Geological Services of Columbia University and Steven Ruggi of the Department of Political Science of Columbia University, consultants to NRDC, have provided material on the Soviet program of underground nuclear testing. This material is far more comprehensive than the information contained herein, and will comprise a chapter and the major portion of the appendices in the Databook on Soviet nuclear testing. This working paper includes only that data from the material provided by Sykes and Ruggi that relates to the overall number and location of Soviet underground nuclear explosions; that is, wherever their material corrects the February 1986 version of the working paper by adding or deleting specific explosions. Readers' additions or corrections would be appreciated.

² With the exception of a handful of PNEs and early atmospheric tests, typically the Soviet Union does not announce its nuclear tests.

Semipalatinsk and Novaya Zemlya test sites, respectively, with a summary of this distribution in Table 5. Table 6 provides an estimate of the annual and cumulative yields of the known Soviet atmospheric nuclear explosions, including a summary of the cumulative yield of known Soviet atmospheric nuclear explosions as provided by Lynn Sykes and Steven Ruggi (see note 1).

The first Soviet test of a nuclear device occurred on 29 August 1949 on a tower variously reported to be in the vicinity of the Aral Sea in the Ustyurt Plateau, on the northeast shore of the Caspian Sea, or near Semipalatinsk. From 29 August 1949 to 31 December 1985 the Soviets have conducted some 600 known nuclear explosions, eighty percent of which are presumed to have been for military purposes. The U.S. has announced 363 nuclear events by date or test series (some dates are the dates of announcement, not necessarily shot dates), with an additional 22 tests known from declassified U.S. government documents by month or year. This leaves some 35 percent of the known Soviet explosions unannounced or unreported by the United States but reported by other scientific institutions.

Just over a quarter of the known explosions were conducted in the atmosphere or from above ground towers (176 tests, all tests from 1949 through 1962 except for eight tests), at least three tests were conducted underwater (one in September 1955 in the Barents Sea, another probably in September 1957 off the coast

of Novaya Zemlya,³ and the third in October 1961 also off the coast of Novaya Zemlya), and the remainder of the tests (429) have been conducted underground. The first four underground tests occurred in 1956 through 1958, with the first announced underground test taking place on 2 February 1962 at Semipalatinsk.⁴

Approximately two-thirds of the known Soviet tests have occurred at the two main test sites near Semipalatinsk in eastern Kazakhstan (47.5 percent) and on the island of Novaya Zemlya in the Arctic (19.4 percent). The center of the Semipalatinsk site is approximately 100 miles southwest of the city of Semipalatinsk on a latitude the same as that of Paris. With a few exceptions, almost three hundred tests have been exploded within a rectangle of 2150 square miles (49.700 to 50.125 North by 77.700 to 79.100

³ A 1958 intelligence document notes that three tests were associated with naval applications, two underwater and one surface burst, with certain of the tested configurations compatible with available air defense missiles; Central Intelligence Agency, Office of Scientific Intelligence, Appendix E, Impact of a September 1958 Nuclear Test Moratorium on Soviet Nuclear Weapons Capabilities, Prepared for the Ad Hoc Panel on Nuclear Test Limitations, 18 March 1958, p. 7. A September 1957 test off the coast of Novaya Zemlya could be the second underwater burst noted in this document.

⁴ The French Ministry of Defense estimates that 182 Soviet tests were conducted before 1963, 174 of which were conducted in the atmosphere and eight underground (Minister de la Defence, Direction de Centre d'Experimentations Nucleaire, Organization et Fonctionnement de Centre d'Experimentation Nucleaire, Dossier No. 1, "Essais Nuclaires, Tableau Recapitulatif Des Explosions Annonces Et Presumees," Piece No. 7/41, 31 January 1965). Three of these underground tests are assumed to have been conducted underwater. See also Table 1.

East) in three distinct areas: Shagan River, Degelen Mountain, and Konyastan.⁵

The second current test site is the island of Novaya Zemlya which from the 1958 through 1963 was the main Soviet test site. Of the 118 known tests that were held there, approximately 70 percent were atmospheric tests held during these years. Included in these test series were the largest thermonuclear bombs ever exploded by any nation. Since the Limited Test Ban Treaty entered force in 1963 prohibiting explosions in the atmosphere, the Soviets have conducted 32 known underground tests on Novaya Zemlya at two sites. The northern site, where 26 of these tests were conducted, is a 100 square mile area (73.300 to 73.400 North by 54.500 to 55.160 East) on the Matochkin Shar Strait (Proliv). Devices are probably transported by ship from the Kola Peninsula to a small dock at 73.385 North, 54.735 East on the channel. The other six tests took place at a small southern site in an area of approximately 75 square miles in the southwest part of the island (center 70.796 North, 53.992 East). All six were conducted during a two year period from the fall of 1973 to the fall of 1975.

⁵ The Konyastan area is from Marshall, P.D., T.C. Bache, and R.C. Lilwall, "Body Wave Magnitudes and Locations of Soviet Underground Explosions at the Semipalatinsk Test Site," Atomic Weapons Research Establishment, Report No. O 16/84, 1984, as cited in material supplied by Sykes and Ruggi, ibid. (see note 1). Degelen Mountain (Gora) is a plateau 2200 feet high, 500 to 1000 feet higher than the surrounding area. A nearby 5800 foot airfield (Degelen/Uzynbulak) may be used for transporting nuclear devices to this site.

Tests have occurred in every month of the year at Semipalatinsk though the concentration is in the second half of the year (65 percent versus 35 percent) (see Table 5). Because of the extreme climate at Novaya Zemlya (the sites are over 400 miles above the Arctic Circle), most of the underground tests there are conducted in September and October with only a handful held during the July, August, November and December. Historically, at the Semipalatinsk and Novaya Zemlya test sites, the Soviets have tested nearly three times as often in the second half of the year compared to the first half.

While specific yield data for most individual tests are unavailable,[•] it is possible to provide estimates of the cumulative yield (see Table 6). For all Soviet tests the combined yield is estimated to be more than 473 megatons which is 2.75 times that of the United States and some 70 percent of the world's total (see Table 6). Some 85 percent of the Soviet total is concentrated in 1961 and 1962. During a two month period from the beginning of September to the beginning of November 1961, 200 megatons were exploded, including the largest nuclear explosion thought to have occurred, a 58 megaton blast over Novaya Zemlya on 30 October 1961. Tests are now limited to a maximum yield of 150 kilotons under terms of the Threshold Test Ban Treaty signed by General Secretary Brezhnev on 3 July 1974 which entered into

[•] Estimates of the yields of specific underground nuclear explosions have been made by Sykes and Ruggi. These estimates will appear in Volume IV of the Databook.

force on 31 March 1976.

The Soviets have conducted an extensive Peaceful Nuclear Explosion (PNE) program. However, not enough information is available from either Soviet or Western sources to permit the PNE program to be fully evaluated. The Soviets have conducted 102 explosions (16.8% of all known explosions) which have been identified as explosions for peaceful purposes by Western sources or announced as PNEs by the Soviet Union (see Table 1). Many of these explosions, however, appear to have been included by Western sources simply because they were conducted outside the two known nuclear weapons test sites. While it is not known precisely just how many PNEs the Soviets have conducted, it is clear that the Soviet PNE program far outdistances the 27 devices the U.S. conducted during its Plowshare PNE program from 10 December 1961 through 17 May 1973. The Soviet program also continues to the present, with 2 of the 9 reported explosions conducted during 1985 described by Soviet sources as PNEs.⁷ The reported Soviet PNEs include a variety of projects. One project is at the Astrakhan natural gas field near where the Volga River joins the Caspian Sea, for which 31 explosions were used from 1975 through 1985. The purpose of the explosions is believed to be to create underground storage cavities for liquid gas condensates. A similar project has been going on in the Orenburg

⁷ Interview with Col. Gen. Chervov of the Soviet General Staff on Moscow Television Service, 2 April 1986; see FBIS-SOV-86-065, Vol. III, No. 065, 4 April 1986, p. A48.

gas field in the southern Urals where three explosions each in July 1983 and July 1984 were detonated. Other reported projects include canal excavation, creation of water reservoirs, underground mining, gas stimulation, the control of runaway oil wells, and seismic sounding of the deep crust and upper mantle.⁸

From the limited amount of information available it is possible to partially reconstruct the evolution of early Soviet warhead design through certain milestones in tests. The first Soviet test was on 29 August 1949. Named "Joe I" after Joseph Stalin, it was a plutonium bomb similar in design to the Nagasaki type FAT MAN bomb, with a comparable yield of approximately 10-20 kilotons (kt).⁹ Uranium-238 was in close proximity to the fissile material, indicative of a natural uranium tamper.¹⁰ The second test, Joe II, took place two years later on 24 September 1951. It was also a plutonium bomb, tested on or slightly underground. The efficiency of utilization of the plutonium was greater than that of Joe I and its yield was at least 25 kt.¹¹

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- 8 SIPRI Yearbook, 1972, pp. 464-468. See the forthcoming chapter by Sykes and Ruggi in the Databook (see note 1).
 - 9 Two reports from the Joint Atomic Energy Intelligence Committee -- Status of the Soviet Energy Program, 27 December 1950 and 8 January 1953 -- provide yield estimates of Joe I assuming a bomb model containing 6 kilograms of plutonium. The earlier report provides an estimate of 20 kt, and the latter 10-20 kt.
 - 10 See, Doyle L. Northrup, Director AFOAT-1, Memorandum for Major-General Nelson, 19 September 1949.
 - 11 Joint Atomic Energy Intelligence Committee, National Scientific Intelligence Estimate, Status of the Soviet Atomic Energy Program, NSIE-1 (CIA/SI 13-52), 8 January 1953.

Joe III was tested on 19 October 1951 GMT. Analysis of the debris indicated that the explosion did not occur close to the ground (the data were most consistent with an air burst) and that both plutonium and U-235 were used as the fissionable materials.¹² Joe III was the first test by the Soviet Union of the more efficient composite core design. The efficiency of utilization of the plutonium in the explosion was determined to be about 35 percent, but that of uranium was not determined.¹³ Assuming a core of 3.5 kg of plutonium and 7 kg of uranium (a ratio of uranium to plutonium lower than that employed in the U.S. B4 bomb at the time), the U.S. estimated the yield at about 50 kt.¹⁴

The Soviet Union did not test again until 12 August 1953 when Joe 4, the first Soviet thermonuclear device, took place. It was a tower shot with a yield of 200 to 300 kt. Joe 4 appears to have been a single stage boosted fission type configuration using U-235 as a fissile component and lithium deuteride as the fusion material.¹⁵

¹² Joint Atomic Energy Intelligence Committee, National Scientific Intelligence Estimate, Status of the Soviet Atomic Energy Program, NSIE-1 (CIA/SI 13-52), 8 January 1953. Production of highly enriched uranium by the gaseous diffusion method began in the Soviet Union in 1951.

¹³ Ibid.

¹⁴ Ibid. This assumes the efficiency of uranium utilization was 23 percent.

¹⁵ Although Joe 4 utilized the solid lithium-deuteride fuel, it was not a two stage thermonuclear device using an approach comparable to the Teller-Ulam design. York argues that

Joe 5 through 7 also occurred in August 1953, all possibly low yield fission weapons. According to a 28 August 1954 U.S. National Intelligence Estimate,

By the end of 1953, the USSR had tested small, medium, and large-yield nuclear weapons, and had employed thermonuclear boosting principles to produce energy yields in the range of the equivalent of a few thousand to at least one million tons of TNT. By the end of 1953, moreover, the USSR had reached a point in weapon technology at which it was capable of producing a wide variety of weapon types, and nuclear warheads for weapons other than bombs.¹⁴

"[i]t evidently involved one of several possible straightforward configurations for igniting relative small amounts of thermonuclear material (as compared to the U.S. Mike and Bravo devices) with a relative large amount of fissile material" (Herbert F. York, The Advisors: Oppenheimer, Teller and the Superbomb (San Francisco: W.H. Freeman and Company, 1976), p. 95). York elsewhere notes that Joe 4 was "a development step the United States bypassed in its successful search for a configuration that would make it possible to produce an arbitrarily large explosion with a relatively small quantity of fissionable material"; Herbert York, Scientific American, October 1975, p. 111. Thus the lithium-deuteride (Li-D) was probably contained within, or proximate to, the fissile core. Li-D is less effective than deuterium-tritium (D-T) in a boosted fission device because neutrons which otherwise would be used to increase the fission efficiency are required to breed tritium from the lithium. Joe 4 may have been designed to confirm that solid Li-D could be used as a fusion material rather than deuterium or deuterium and tritium in liquid or gaseous form. This was not confirmed in the U.S. program until the 28 February 1954 BRAVO test. Holloway argues that since Joe 18 was believed to be a "weaponized version" of Joe 4, the Joe 4 design was not merely a step in the development of the super but a third type of thermonuclear bomb (David Holloway, "Soviet Thermonuclear Development," International Security, Volume 4, Number 3, Winter 1979/80, p. 194).

¹⁴ Central Intelligence Agency, NIE 11-4-54, Soviet Capabilities and Probable Courses of Action Through Mid-1959, 28 August 1954, p. 52. Actually, the highest yield achieved by the end of 1953 was 200-300 kt, although yields up to one megatons were feasible using the

Little is known about the seven tests in the September-October 1954 tests series. More is known about the five tests of the 1955 tests series. The first two tests, Joe 15 and 16, were atmospheric bursts of fission devices using plutonium with yields of 5 and 25 kt respectively. Joe 17 was an underwater test (the first conducted by the Soviets) of a plutonium device with a yield on the order of 20 kt. Joe 18 was tested on 6 November 1955 and had a yield of 215 kt. The presence of a thermonuclear component was evident from the debris¹⁷ and it is believed to have been a weaponized version of the Joe 4, a boosted configuration reduced to a more easily deliverable size. Finally, Joe 19, tested on 22 November 1955, was the first Soviet two stage thermonuclear device employing something like the Teller-Ulam idea, the so-called "superbomb." Its yield was about 1.6 Mt. This thermonuclear weapons was the first superbomb to be delivered by aircraft. It was exploded at an altitude of several thousand feet.

Eleven high-yield thermonuclear tests were conducted from 1956 through 28 February 1958. The first five of these, through 16 April 1957, had rather low yield-to-weight ratios. Evidence of an improvement in yield-to-weight occurred beginning with the

thermonuclear boosting principle tested with Joe 4.

¹⁷ Joint Intelligence Committee, The JIC Semi-Annual Review of Trends in Communist Bloc Policy Including Communist China (1 October 1955 - 29 February 1956), JIC 133/3(56), 16 May 1956, p. 6.

sixth high-yield thermonuclear test on 22 August 1957.¹⁸ York claims that it took the Soviets "several more years following their 1955 test before they were able to match the explosions in [the U.S.] 1952 and 1954 tests."¹⁹

As of March 1958, the U.S. had determined that "at least three Soviet tests were associated with naval applications (two [del] underwater and one [del] surface burst), one test was conducted in conjunction with Army maneuvers, and two tests probably involved warheads in a surface-to-surface missile (SSM) and in an air-to-surface missile (ASM), respectively."²⁰

Although certain of the test configurations were compatible with available air defense missiles, there was no evidence at that time that the Soviet Union had conducted environmental effects tests using warheads compatible with air defense applications or very high or ultra-high altitude tests leading to anti-ICBM applications.²¹

¹⁸ Central Intelligence Agency, Office of Scientific Intelligence, Appendix E, Impact of a September 1958 Nuclear Test Moratorium on Soviet Nuclear Weapons Capabilities, 18 March 1958, p. 1.

¹⁹ York, The Advisors, p. 93.

²⁰ Central Intelligence Agency, Office of Scientific Intelligence, Appendix E, Impact of a September 1958 Nuclear Test Moratorium on Soviet Nuclear Weapons Capabilities, p. 7.

²¹ Ibid., pp. 7-8. On 6 September 1961, the Soviets conducted a high altitude burst over an experimental radar at Sary Shagan, presumably to test EMP effects on the radar. There were widespread but unconfirmed reports that this test was a live firing of an ABM warhead against a target (John Prados, The Soviet Estimate: U.S. Intelligence Analysis and Russian Military Strength (New York: Dial Press, 1982), p. 153).

The Soviets tested a 58 Mt multi-stage thermonuclear device on 30 October 1961, the largest yield device ever exploded. There is no evidence that such a high yield device was ever weaponized,²² though the U.S. believed that the device could have been delivered by the Bear long-range bomber.²³

Dr. Harold Brown, then DDR&E, argued that the Soviet's had not conducted a test of a live ABM interceptor; see Lawrence Freedman, US Intelligence and the Soviet Strategic Threat (Boulder, Colorado: Westview Press, 1977), p. 87, referencing Edward Randolph Jayne, The ABM Debate: Strategic Defense and National Security, MIT Center for International Studies, June 1969.

²² York, The Advisors, p. 93.

²³ Minutes of Meeting of the Status of U.S. and Soviet Nuclear Tests, February 2, 1962, presented to the President by representatives of the AEC, CIA, and DoD.

<u>DATE</u>	<u>TIME</u>	<u>LOCATION/COMMENTS</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>	<u>MB</u>	<u>MS</u>	<u>S</u>	<u>YIELD RANGE</u>	<u>TYPE</u>
08/29/49		Joe 1, announced by AEC on 09/23/49 At least until mid-1953, the AEC believed the test took place on or about 08/27/49 (j4/9/10/17); various locations are given for the test, including in Asia near Semipalatinsk (e5), in an area roughly centered on the northeast shore of the Caspian Sea (j9) [near to Kapustin Yar?], and in the vicinity of the Aral Sea (approx. 45N 60E) (j10)/near the Ustyurt Desert (h) [near to Tyurataa?]. It is possible (and reasonable to expect) that the first test took place at the proving ground which is within a few hundred miles of 46N 76E (j10) [i.e., Semi test site]. Time of the test reported as 1700 local time (j10). Test used plutonium as the fissionable material (j7).					j4	10 to 20 kt, assuming 6kg plutonium (j7); around 20 kt (j8)	atmosphere tower (e5)
09/24/51		Joe 2, announced by AEC on 10/03/51; Semi [see Joe 1] (j10) j4 Test used plutonium as the fissionable material, and occurred on or slightly under the surface of the ground (j7). Time of the test reported as 1500 local time (j10), 1015 [GMT?] 1515 local time (j11). Intensity of the acoustic signal was approximately of the same order of magnitude as those associated with April/May 1951 U.S. tests at Eniwetok when measured at comparable distances (j11).					j4	at least 25 kt, assuming 6 kg plutonium (j7)	atmosphere tower?
10/18/51		Joe 3, announced by AEC on 10/22/51; Semi [see Joe 1] (j10) j4 Announcement made "prematurely" and without full evaluation due to leak (j4). Test was a composite design using both plutonium and uranium-235 as the fissionable materials, with the efficiency of utilization of the plutonium about 35 percent (j7).					j4	about 50 kt, assuming 7kg U-235 and 3.5kg plutonium (j7)	atmosphere air burst (j7)
08/12/53		Joe 4, announced by AEC on 08/19/53. First Soviet thermonuclear test, a fusion reaction with a boosted configuration involving use of lithium deuteride (d); rain water samples contained tritium (j5). It is not known whether or not the device was a deliverable weapon (j5); test reported to have taken place in Siberia (h).					j4	thermonuclear (a,d) 200-300 kt (d)	atmosphere tower (e5)
08/23/53		Joe 5, 6 or 7 A series of four atmospheric tests -- Joe 4 through 7 -- took place in 1953 (j3,j6), one of which was a fission explosion on 08/23/53 (a,c1) with a yield equivalent to that of the type detonated at NTS (a). Interpretations of Joe 5, 6, and 7 are speculative, including designs for the conversion of large bombs to a large number of air defense missiles (j3). Joe 5 is the least clear of the series, especially in its motivation; it was probably an air drop but a shot on a wooden tower cannot be excluded (j6). One of the four tests, possibly Joe 4, was at first thought to have a force of one megaton (j12).					a,c1	equivalent to that detonated at NTS (a)	atmosphere

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09/14/54	53600.0	Ural A series of tests which began in mid-September at intervals was announced by the AEC on 10/26/54 (a1). This series presumably included test numbers 8 thru 14.	64.000	55.000			b1		atmosphere atmosphere
07/29/55		Soviet test number 15.					d	5 kt	atmosphere
08/02/55		Soviet test number 16. This series of tests was announced by the AEC on 08/04/55 (a1). Both probably used plutonium (d).					d	25 kt	atmosphere
09/21/55		Soviet test number 17. The test took place in the Barents Sea; the device, which probably used plutonium, was most likely moored at a depth of 100 feet or more (d). The test was announced by the AEC on 09/24/55 (a1,b1).					d	order of 20 kt	underwater
11/06/55		Soviet test number 18; Semi (j13). This test has been described as a "weaponized version of the 1953 boosted configuration [i.e., 08/12/53 test] reduced to a more easily deliverable size" and it is believed to have been a boosted fission weapon using a U-235 core as well as U-238 and lithium deuteride (d). Deliverable by aircraft (j13). The test was announced by the AEC on 11/10/55 (a1,b1). Reported to take place at about 0450Z somewhere between the Semi test site and a point 400 nautical miles to the East (j14).					d	215 kt	atmosphere airburst (j13)
11/22/55		Soviet test number 19; at Semi (d,j13). A two-stage thermonuclear weapon employing both U-235 and U-233 as well as U-238 and lithium deuteride was carried by an aircraft and set off at an elevation of several thousand feet (d). This thermonuclear weapon (j2) had a yield in the megaton range (a1), and was announced on 11/23/55 (a1,b1). It was the Soviet's first high yield thermonuclear test (j2).					d	1600 kt	atmosphere
Jan-Feb 1956		Tests possibly in northeastern Siberian area. Some relatively short-lived artificial radioactivity was detected in February 1956 suggesting further tests in the Soviet Union. This test series was still in progress at the end of February.					j13		
~03/20/56		A series announced by the AEC on 03/21/56 took place in the preceding few days before the announcement (a1,b1)							atmosphere
~03/30-04/1/56		A series announced by the AEC on 04/02/56 took place in the preceding few days before the announcement (a1,b1)							atmosphere
08/24/56		Siberia; part of a series of atmospheric tests (a).					a,b1	less than a megaton (a)	atmosphere
08/30/56		Siberia; part of a series of atmospheric tests (a). [Probably one of three high yield thermonuclear tests conducted from January 1956 through 4/15/57.]					a,b1	large (a)	atmosphere

<u>DATE</u>	<u>TIME</u>	<u>LOCATION/COMMENTS</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>	<u>NB</u>	<u>MS</u>	<u>S</u>	<u>YIELD RANGE</u>	<u>TYPE</u>
09/02/56		Part of a series of atmospheric tests (a)					a,bi		atmosphere
09/10/56		Part of a series of atmospheric tests (a) A series of tests was announced by the Soviet Union on 09/10/56 (a).					a,bi		atmosphere
11/17/56		Part of a series of atmospheric tests (a)					a,bi		atmosphere
01/19/57		Part of a series of atmospheric tests (a)					a,bi		atmosphere
03/08/57		Part of a series of atmospheric tests (a)					a,bi		atmosphere
04/03/57		Part of a series of atmospheric tests (a)					a,bi		atmosphere
04/06/57		Part of a series of atmospheric tests (a)					a,bi		atmosphere
04/10/57		[Probably one of three high yield thermonuclear tests conducted from January 1956 through 4/15/57.]					a,bi large (a)		atmosphere
04/12/57		Part of a series of atmospheric tests (a)					a,bi		atmosphere
04/16/57		Siberia; largest of test series (a). Fifth high yield thermonuclear device (j2). [One additional high yield thermonuclear test conducted between January 1956 and this date.]					a,bi large (a)		atmosphere
08/22/57		Siberia Test may have evidenced an improved yield-to-weight ratio for high yield thermonuclear device; test was the sixth of such a device (j2). yield-to-weight ratio (j2).					a,bi substantial (a)		atmosphere
September 1957		Siberia Test within within preceding two days of 09/09/57 announcement by AEC (a1).					a1,bi moderate (a1)		atmosphere
09/24/57	90000.0	NZ Arctic (a). Seventh high yield thermonuclear test, possibly evidencing an improved yield-to-weight ratio for such devices (j2).	73.000	55.000			bi	megaton range (a)	atmosphere (a)
09/26/57	50000.0	Semi, announced by JAEIC 12th test of current test series, four of this series in September 1957 (two at Semi and two off the east coast of NZ) (j1). [It is probable that this is the 12th test conducted in 1957.] The two tests conducted off the east coast of NZ were probably two of the three tests of devices for naval applications reported to have taken place by 03/18/58; if so, one of the September 1957 tests was conducted underwater and the other was a surface burst (j2).					j1	7 to 70 kt, preference to lower end	
10/06/57	85800.0	NZ Announced by USSR as a hydrogen device (a). Eighth test of a high yield thermonuclear device, possibly evidencing evidenced an improved yield-to-weight ratio for such devices (j2).	73.000	55.000			bi	substantial (a)	atmosphere (a)
10/10/57	65500.0	Arctic (a)					bi	small (a)	atmosphere (a)
12/28/57		Siberia					a,bi		atmosphere
02/23/58		NZ; Arctic (a)	73.000	55.000			bi	megaton range (a),	atmosphere

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02/27/58	75900.0	NZ; Arctic (a)	73.000	55.000				b1 megaton range (a)	atmosphere
02/27/58	102400.0	NZ; Arctic (a)	73.000	55.000				b1 large (a)	atmosphere
		CIA concludes that 11 thermonuclear tests conducted by 02/28/58 overall since first device of 11/22/55, three of which (numbers nine through eleven) occurred in the last week of February, 1958 (j2).							
03/14/58		NZ; Arctic (a)	73.000	55.000				b1 below megaton range (a)	atmosphere
03/14/58		Arctic (a); Siberia (b1) [?]						b1 below megaton range (a)	atmosphere
03/15/58		Arctic (a); Siberia (b1) [?]						b1 below megaton range (a)	atmosphere
03/20/58		NZ; Arctic (a)	73.000	55.000				b1 small (a)	atmosphere
03/21/58		Siberia						a,b1 larger than 03/20/58 (a)	atmosphere
03/22/58		NZ; Arctic (a)	73.000	55.000				b1 medium range (a)	atmosphere
09/20/58		NZ	73.000	55.000				b1	[atmosphere?]
09/30/58	75000.0	NZ; Arctic (a)	73.000	55.000				b1 moderate to high (a)	atmosphere
09/30/58	95500.0	NZ; Arctic (a)	73.000	55.000				b1 moderate to high (a)	atmosphere
10/02/58	80000.0	NZ; Arctic (a)	73.000	55.000				b1 moderate (a)	atmosphere
10/02/58	90100.0	NZ; Arctic (a)	73.000	55.000				b1 moderate (a)	atmosphere
10/05/58	60000.0	NZ; Arctic (a)	73.000	55.000				b1 smaller than 4ABV(a,sic)	atmosphere
10/10/58	75100.0	NZ; Arctic (a)	73.000	55.000				b1 relatively large (a)	atmosphere
10/12/58	75300.0	NZ; Arctic (a2)	73.000	55.000				b1 probably MT range (a2)	atmosphere
10/15/58	75100.0	NZ; Arctic (a2)	73.000	55.000				b1 probably MT range (a2)	atmosphere
10/18/58	95100.0	NZ; Arctic (a2)	73.000	55.000				b1 probably MT range (a2)	atmosphere
10/19/58	72700.0	NZ; Arctic (a)	73.000	55.000				b1 small (a)	atmosphere
10/20/58	82000.0	NZ; Arctic (a2)	73.000	55.000				b1 probably MT range (a2)	atmosphere
10/22/58	82100.0	NZ; Arctic (a2)	73.000	55.000				b1 probably MT range (a2)	atmosphere
10/24/58	80300.0	NZ; Arctic (a2)	73.000	55.000				b1 probably MT range (a2)	atmosphere
10/25/58	82000.0	NZ; Arctic (a)	73.000	55.000				b1 relatively large (a)	atmosphere
11/01/58		Siberia						a,b1 relatively low (a)	atmosphere
11/03/58		Siberia						a,b1 relatively low (a)	atmosphere
		Eleven tests occurred between 09/30/58 and 10/17/58 (j16), leaving three unaccounted for.							
09/01/61		Semi (a,b1) Announced by White House (a)	50.000	78.000				b1 intermediate range (a) 150 kt (e4)	atmosphere
09/04/61		Semi (a,b1) Announced by AEC (a)	50.000	78.000				b1 low kiloton range (a) 10-80 kt (e4)	atmosphere
09/05/61		Semi (a,b1) Announced by AEC (a)	50.000	78.000				b1 low to intermediate (a)	atmosphere
09/06/61		Stalingrad East of Stalingrad, announced by AEC (a). High altitude burst over experimental ABM radar at Sary Shagan, probably to test EMP effects on the radar (e6).	48.450	44.300				b1 low to intermediate (a)	atmosphere
09/10/61	90000.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 several megatons (a)	atmosphere
09/10/61		NZ(a,b1); announced by AEC(a) [unknown which 9/10/61 test]	73.000	55.000				b1 low to intermediate kt(a)	atmosphere
09/12/61	100800.0	NZ(a,b1); announced by AEC(a)	73.480	54.000			~7.8	g	
09/12/61		NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 several megatons (a)	atmosphere
09/13/61		NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 low to intermediate (a)	atmosphere
09/13/61		Semi (a,b1) Announced by AEC (a)	50.000	78.000				b1 low to intermediate (a)	atmosphere

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09/14/61	95616.7	NZ(a,b6); announced by AEC(a)	74.600	51.100				b6 several megatons (a)	atmosphere (a)
			74.000	53.480	~5.96			g	
09/16/61	90800.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 order of a MT (a)	atmosphere
09/17/61		Semi (a,b1) Announced by AEC (a)	50.000	78.000				b1 intermediate (a)	atmosphere
09/18/61	75936.8	NZ(a,b6); announced by AEC(a)	74.000	52.000				b6 order of a MT (a)	atmosphere (a)
09/20/61	81200.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 order of a MT (a)	atmosphere
09/22/61	80100.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 order of a MT (a)	atmosphere
10/02/61	103100.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 order of a MT (a)	atmosphere
10/04/61	73054.8	NZ(a,b6); announced by AEC(a)	73.700	53.800				b6 order of several MTs (a)	atmosphere (a)
10/06/61	70000.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 several megatons (a)	atmosphere
			73.240	54.540	~6.22			g	
10/08/61		NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 low yield range (a)	atmosphere
10/11/61	74000.0	Central Asia						b1	atmosphere
10/12/61		Semi Announced by AEC (a)	50.000	78.000				b1 low to intermediate (a)	atmosphere
10/20/61		NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 several megatons (a)	atmosphere
10/23/61	83122.1	NZ(a,b6); announced by AEC(a)	73.900	53.800				b6 about 25 megatons (a)	atmosphere (a)
			73.240	54.540	~35.40			g	
10/23/61	103048.8	NZ; South of NZ (a) Announced by AEC(a); (at least the third underwater test)	70.700	53.500				b6 low yield (a)	underwater (a)
10/25/61	83300.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 intermediate to high, probably less than a MT(a)	atmosphere
10/27/61	83026.6	NZ(a,b6); announced by AEC(a)	70.700	53.500				b6 low to intermediate (a)	atmosphere (a)
10/30/61	83300.0	NZ(a,b1); announced by AEC(a) Reportedly occurred on 10/31/61 GMT (h). Weapon could be delivered by the Bear bomber (j15).	73.000	55.000	74.420	75.180	~79.750	b1 58 megatons (a)	atmosphere vicinity of 1200 ft (a)
								g	
10/31/61	82900.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 several megatons (a)	atmosphere
10/31/61	83800.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 intermediate to high, probably below a MT (a)	atmosphere
11/02/61	84100.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 low to intermediate (a)	atmosphere
11/02/61		NZ(a,b1); announced by AEC(a)	73.000	55.000				b1 low to intermediate (a)	atmosphere
11/04/61	72000.0	NZ(a,b1); announced by AEC(a) AEC announced 12/09/61 in a preliminary analysis that USSR conducts approx. 50 atmospheric tests in recent test series (a) [31 tests announced in 1961, leaving ~19 unannounced and ~18 unaccounted for]. The total yield of the 50 tests reportedly exceeded the cumulative total of all previous tests of all nations (e4). This test series included a number of systems tests and at least four atmospheric effects tests (including 6 September and 6 October), and several were very advanced in yield to weight ratios and efficiency (j15).	73.000	55.000				b1 several megatons (a)	atmosphere
02/02/62	75957.8	Semi (a,b6) Announced by AEC, test reportedly conducted well above the threshold of underground detectability even by a single national system (a); no acoustic signals, indicating	49.700	78.100				b6	underground (a)

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		underground test (a), [the first reported by the United States].							
August 1962		AEC announces on 08/06/62 that tests in the low kiloton range had been conducted a few days prior to 08/03/62 test(a)							
08/05/62	90900.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				30 megatons (a)	atmosphere
			74.120	52.300	~17.71				
08/07/62	93000.0	Semi Central Siberia (a); announced by AEC (a)	50.000	78.000				low kiloton (a)	atmosphere
08/10/62	90000.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				less than 1 Mt (a)	atmosphere
08/20/62	90214.1	NZ(a,b6); announced by AEC(a)	74.300	51.500				order of several Mts (a)	atmosphere (a)
			74.120	52.300	~3.36				
08/22/62	90000.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				low megaton (a)	atmosphere
			74.120	52.300	~4.64				
08/25/62	54000.0	Semi (a,b1) Announced by AEC (a)	50.000	78.000				low (a)	atmosphere
08/25/62	90000.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				order of several Mts(a)	atmosphere
			74.120	52.300	~5.04				
08/27/62	90000.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				several megatons (a)	atmosphere
			74.120	52.300	~5.43				
09/01/62	124000.0	NZ	73.000	55.000					atmosphere
09/02/62		NZ(a,b1); announced by AEC(a)	73.000	55.000				intermediate (a)	atmosphere
09/08/62	101800.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				megaton range (a)	atmosphere
		AEC announces this as 10th in current series with all detected tests are not specifically announced and a number of additional tests had been conducted (a).							
09/15/62	80213.9	NZ(a,b6); announced by AEC(a)	74.400	51.500				several megatons (a)	atmosphere (a)
09/16/62	105900.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				several megatons (a)	atmosphere
09/18/62	82902.7	NZ(a,b6); announced by AEC(a)	73.200	54.700				a few megatons (a)	atmosphere (a)
09/19/62	110056.4	NZ(a,b6); announced by AEC(a)	73.800	53.800				multimegaton (a)	atmosphere (a)
		2nd largest atmospheric test in current series and 4th multimegaton test in past five days (a)						[approx. 20 MT]	
09/21/62	80100.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				a few megatons (a)	atmosphere
09/25/62	130300.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				multimegaton, slightly larger than 09/19/62 test (a)	atmosphere
								[approx. 25 MT]	
09/27/62	80316.4	NZ(a,b6); announced by AEC(a)	74.300	52.400				less than 30 MT (a)	atmosphere (a)
10/07/62	163200.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				intermediate (a)	atmosphere
10/14/62		Semi (a,b1) Announced by AEC (a)	50.000	78.000				low yield range (a)	atmosphere
10/22/62	34100.0	Semi Central Asia, announced by AEC (a)	50.000	78.000				a few hundred kt (a)	atmosphere (b1) high altitude (a)
10/22/62	90600.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				several megatons (a)	atmosphere
10/27/62	73500.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				intermediate (a)	atmosphere
10/28/62		Semi Central Asia, announced by AEC (a)	50.000	78.000				intermediate (a)	atmosphere (b1) high altitude (a)
10/28/62	44100.0	Semi (a,b1) Announced by AEC (a)	50.000	78.000				low (a)	atmosphere
		[either 10/28/62 test could be the HA test]							
10/29/62	73500.0	NZ(a,b1); announced by AEC(a)	73.000	55.000				intermediate (a)	atmosphere (b1)

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10/30/62		NZ(a,b1); announced by AEC(a)	73.000	55.000			b1	intermediate (a)	atmosphere (b1)
11/01/62	63000.0	NZ(a,b1); announced by AEC(a)	73.000	55.000			b1	intermediate (a)	atmosphere
11/01/62	92000.0	Semi (b1); Central Asia (a)	50.000	78.000			b1	intermediate (a)	high altitude (a)
11/03/62	93100.0	NZ(a,b1); announced by AEC(a)	73.000	55.000			b1	intermediate (a)	atmosphere
11/03/62		NZ(a,b1); announced by AEC(a)	73.000	55.000			b1	intermediate (a)	atmosphere
11/04/62		Semi (a,b1)	50.000	78.000			b1	intermediate (a)	atmosphere
11/17/62		Announced by AEC (a) Semi (a,b1)	50.000	78.000			b1	low (a)	atmosphere
12/18/62		Announced by AEC (a) NZ(a,b1); announced by AEC(a)	73.000	55.000			b1	intermediate (a)	atmosphere
12/19/62		NZ(a,b1); announced by AEC(a)	73.000	55.000			b1	intermediate (a)	atmosphere
12/20/62		NZ(a,b1); announced by AEC(a)	73.000	55.000			b1	intermediate (a)	atmosphere
12/22/62		NZ(a,b1); announced by AEC(a)	73.000	55.000			b1	intermediate (a)	atmosphere
12/23/62	111500.0	NZ(a,b1); announced by AEC(a)	73.000	55.000			b1	low to a few megatons(a)	atmosphere
		AEC 12/26 announcement notes a number of atmospheric tests 12/23 to 12/25; largest (12/24) about 20 megatons, others low to a few megatons (a)							
12/24/62	104421.9	NZ	74.200	52.300			b6		[atmosphere?]
12/24/62	111142.0	NZ(a,b6); announced by AEC(a)	73.600	57.500			b6	about 20 megatons (a)	atmosphere (a)
		[time of AEC announced test unknown]							
12/25/62	133557.2	NZ(a,b6); announced by AEC(a)	73.400	56.500			b6	low to a few megatons(a)	atmosphere (a)
03/15/64	90000.0	Semi (b1,h)	50.000	78.000	6.2(h)		b1		underground
05/16/64	60059.1	Semi (b6,h)	49.900	78.300	5.6		b6		underground
					6.2(h)				
07/19/64	60000.0	Semi (b1,h)	50.000	78.000	6.0(h)		b1		underground
09/18/64	75954.8	NZ(a,b6); announced by ACDA(a)	72.900	55.200	4.3		b6	low (a)	underground
10/25/64	75958.8	NZ(a,b6); announced by ACDA(a)	73.500	53.700	4.9		b6	low (a)	underground
					5.4(h)				
11/16/64	60000.0	Semi (a,b1)	50.000	78.000	6.1(h)		b1	low to low intermed. (a)	underground
		Announced by AEC (a)							
01/15/65	55958.4	Outside main test areas (f4)	49.880	78.960	5.8		b3	intermediate (a)	underground
		Announced as PNE by USSR (f4)							
		[Announced by AEC as at Semi(a)]			7.0(h)				
		Released radioactivity (h)							
03/03/65	61500.0	Semi (a,b1)	50.000	78.000	6.0(h)		b1	low to low intermed. (a)	underground
		Announced by AEC (a)							
05/11/65	83957.8	Semi	49.800	77.900	5.2		b6		underground
06/17/65	34500.0	Semi (b1,h)	50.000	78.000	5.8(h)		b1		underground
07/29/65	30500.0	Semi	50.000	78.000			b1		underground
09/17/65	35957.2	Semi (b3,h)	49.780	78.150	5.2		b3		underground
					5.5(h)				
10/08/65	55958.2	Semi (a,b3)	49.920	78.170	5.4		b3	low to low intermed. (a)	underground
		Announced by AEC (a)			5.8(h)			20-200 kt (h)	
11/21/65	45758.2	Semi (a,b3)	49.860	78.040	5.6		b3	low to low intermed. (a)	underground
		Announced by AEC (a)			6.1(h)				
12/24/65	50000.0	Semi	50.000	78.000			b1		underground

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02/13/66	45757.9	Semi (a,b6) Announced by AEC (a)	49.900	78.100	5.2 6.5(h)		b6	low intermediate (a) 20-100 kt (h)	underground
03/20/66	55000.0	Semi (a,b1) Announced by AEC (a)	50.000	78.000			b1	to intermediate (a)	underground
04/21/66	35757.9	Semi (a,b6) Announced by AEC (a)	49.800	78.100	5.4 5.3(h)		b6	low (a)	underground
04/22/66	25804.0	N. Caspian Sea (b8,h) Probably PNE to regulate water (h); PNE (il)	47.900	57.700	4.7(h)		b8		underground
05/07/66	35758.2	Semi	49.740	77.950	4.8		b3		underground
06/29/66	65758.0	Semi William C. Foster states on 7/7/66 that as recently as 8 days ago US recorded seismic signals from the Soviet nuclear testing area (a)	49.900	78.000	5.6		b6	low intermediate (a)	underground
07/21/66	35757.6	Semi (b6,h)	49.700	78.000	5.4 5.9(h)		b6		underground
08/05/66	35757.9	Semi (b3,h)	49.830	78.050	5.4 6.1(h)		b3		underground
08/19/66	35301.4	Semi (b3,h)	50.500	77.860	5.1 4.6(h)		b3		underground
09/07/66	35100.0	Semi	50.000	78.000			b1		underground
09/30/66	55952.8	Turkmen (a); Uzbekistan (h) PNE to plug fire in Urta bulak gas field near Bukhara (h); PNE (il)	38.800	64.500	5.1 5.3(h)		b6		underground
10/19/66	35757.8	Semi (a,b3) Announced by AEC (a)	49.770	78.030	6.3		b3	low intermediate (a) 20-200 kt (h)	underground
10/27/66	55757.9	NZ(a,b3); announced by AEC(a) Vented (h) Northern site	73.400	54.570	6.4 6.5(h) 6.39 4.70 f2 ±.108±.108		b3	intermediate to high(a) 420±4 kt	underground
12/03/66	50200.0	Semi (b1,h)	50.000	78.000	4.9(h)		b1		underground
12/18/66	45800.0	Semi (a,b1) Announced by AEC (a); vented (h)	50.000	78.000	6.5(h)		b1	intermediate (a)	underground
01/30/67		Semi					h		underground
02/26/67	35800.0	Semi (a,b1) Announced by AEC (a)	50.000	78.000	6.6(h)		b1	intermediate (a) 200-1000 kt (h)	underground
03/25/67	55600.0	Semi (b1,h)	50.000	78.000	5.9(h)		b1		underground
04/20/67	40757.6	Semi (a,b6) Announced by AEC (a)	49.700	78.000	5.7 6.3(h)		b6	low intermediate (a)	underground
05/28/67	40757.7	Semi (b3,h)	49.810	78.110	5.4 6.2(h)		b3		underground
06/03/67	92059.0	Eastern Kazakhstan	50.000	77.000	4.5		F4	1.5 kt	underground
06/29/67	25700.0	Semi	50.000	78.000			b1		underground
07/15/67	32657.6	Semi (b3,h)	49.880	78.160	5.4 6.0(h)		b3		underground
08/04/67	65758.0	Semi (b3,h)	49.820	78.050	5.3 5.8(h)		b3		underground

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09/15/67	40358.2	Semi (b3,h)	50.010	77.900	5.3		b3		underground
					6.0(h)				
09/22/67	50357.9	Semi (b4,h)	50.000	77.600	5.3		b6		underground
					6.0(h)				
10/06/67	70002.0	Ural (a,h) PNE, engineering experiment in oil fields (h) East of Urals, PNE (il)	57.690	65.270			b8		underground
					4.7(h)				
10/17/67	50358.0	Semi (a,b6) Announced by AEC (a)	49.800	78.100	5.7		b6	low intermediate (a)	underground
					6.1(h)				
10/21/67	45958.4	NZ(a,b3); announced by AEC(a) May have vented (h) Northern site	73.400	54.420	5.9		b3	low end intermediate (a)	underground
					6.0(h)				
					5.92	3.99	f2	69±8 kt	
					±.056±.090				
10/30/67	60357.9	Semi (b6,h)	49.800	78.100	5.5		b6		underground
					6.0(h)				
11/22/67	40357.1	Semi	49.900	77.300	4.8		b6		underground
12/08/67	60357.1	Semi	49.800	78.200	5.2		b6		underground
01/07/68	34657.6	Semi	49.740	78.320	5.1		b3		underground
04/24/68	103557.3	Semi (a,b3) Announced by AEC (a)	49.840	78.070	5.0		b3	low (a)	underground
							a		underground
05/21/68	35900.0	Bukhara (b5,il), Uzbekistan (h) PNE (h,il), plug runaway oil well (h)			5.6(h)		b5		underground
06/11/68	30600.0	Semi (a,b1) Announced by AEC (a)	50.000	78.000	5.8(h)		b1	low (a)	underground
06/19/68	50557.4	Semi (a,b3) Announced by AEC (a)	49.960	79.050	5.4		b3	low intermediate (a)	underground
					6.5(h)				
07/01/68	40200.9	North of Caspian Sea(a,b3,il) Announced by AEC (a) PNE (h,il); storage cavity in salt dome (h)	47.850	47.720	5.5		b3	low intermediate (a)	underground
					5.7(h)				
07/12/68	120757.2	Semi	49.670	78.117	5.4		b6		underground
					5.9		h		
08/20/68	40558.1	Semi	50.000	77.996	4.8		b6		underground
09/05/68	40600.0	Semi (a,b1) Announced by AEC (a)	50.000	78.000	6.2(h)		b1	low intermediate (a)	underground
09/29/68	34257.5	Semi	49.800	78.200	5.8		b6		underground
					6.3		h		
11/07/68	100205.3	NZ(a,b6), northern site (f2) Announced by AEC (a); may have vented (h)	73.400	54.900	6.0		b6	low end intermediate (a)	underground
					6.02	4.30	f2	124±35 kt	
					±.025±.076				
11/09/68	25357.7	Semi	49.760	78.060	4.9		b3		underground
12/18/68	50200.0	Semi (a,b1) Announced by AEC (a)	50.000	78.000	5.7(h)		b1	low (a)	underground
03/07/69	82700.0	Semi (a,b1) Announced by AEC (a)	50.000	78.000	6.3(h)		b1	low intermediate (a)	underground
05/16/69	40257.1	Semi (a,b6) Announced by AEC (a)	49.800	78.100	5.3		b6	low intermediate (a)	underground
					6.0(h)				

<u>DATE</u>	<u>TIME</u>	<u>LOCATION/COMMENTS</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>	<u>MB</u>	<u>MS</u>	<u>S</u>	<u>YIELD RANGE</u>	<u>TYPE</u>
10/09/71	50257.1	Semi (a,b6) Announced by AEC (a)	50.000	77.700	5.4		b6	20 to 200 kt (a)	underground
10/21/71	60300.0	Semi (a,b1) Announced by AEC (a)	50.000	78.000			b1	20 to 200 kt (a)	underground
10/22/71	50000.4	Ural (a,b6) Announced by AEC (a)	51.600	54.500	5.3		b6	20 to 200 kt (a)	underground
11/29/71	60300.0	Semi (a,b1) Announced by AEC (a)	50.000	78.000			b1	20 to 200 kt (a)	underground
12/15/71	75300.0	Semi	50.000	78.000			b1		underground
12/22/71	70000.0	N. of Caspian Sea (a,b1); announced by AEC(a)					b1	200 kt to 1 Mt (a)	underground
12/30/71	62057.5	Semi (a) Announced by AEC (a)	49.800	78.100	5.8		b6	20 to 200 kt (a)	underground
02/10/72	50257.3	Semi (a,b6); E. Kazakh (i2) Announced by AEC (a)	50.000 49.986	78.900 78.886	5.5 6.3		b6 i2	20 to 200 kt (a)	underground
03/10/72	45657.4	Semi (a,b6); E. Kazakh (i2) Announced by AEC (a)	49.800 49.755	78.200 78.180	5.5 5.8		b6 i2	20 to 200 kt (a)	underground
03/28/72	42200.0	Semi (a,b1) Announced by AEC (a)	50.000 49.730	78.000 78.186			b1 i2	20 to 200 kt (a)	underground
04/11/72	60000.0	Turkmen (h,i2); PNE (i2)	37.400	62.000	4.8		bi(time),h,i2		underground
06/07/72	12800.0	Semi (a,b1); E. Kazakh (i2) Announced by AEC (a)	50.000 49.761	78.000 78.175			b1 i2	20 to 200 kt (a)	underground
07/06/72	10257.7	Semi; E. Kazakh (i2)	49.700	78.000	4.4		b6	20 to 200 kt (i2)	underground
07/09/72	70000.0	North of Black Sea (b1,i2) PNE (i2)	49.724 49.900	77.979 35.200	4.8 5.0	2.8	i2 b1(time);i2(other)		underground
07/14/72	150000.0	North of Caspian Sea(b6,i2) PNE (i2)	50.000 53.800	46.400 47.400			b1 i2		underground
08/16/72	31700.0	Semi (a,b1); E. Kazakh (i2) Announced by AEC (a)	50.000 49.759	78.000 78.146	3.6 5.6		b1 i2	20 to 200 kt (a)	underground
08/20/72	25957.9	North of Caspian Sea (a,b6) Announced by AEC (a)	49.500 49.462	48.200 78.179	5.7 6.3	3.4	b6 i2	20 to 200 kt (a)	underground
08/26/72	34700.0	W Kazakh (i2); PNE (i2) Semi (a,b1); E. Kazakh (i2) Announced by AEC (a)	50.000 49.994	78.000 77.781			b1 i2	20 to 200 kt (a)	underground
08/28/72	55956.5	NZ(a,b6,i2);northern site(f2) Announced by AEC (a)	73.300 73.336	55.100 55.085	6.3 4.7	4.7	b6 i2	about 1 Mt (a)	underground
					6.3		f1		
					6.33	4.76	f2	400±70 kt	
					±.021±.037				
09/02/72	85657.6	Semi (b6,h); E. Kazakh (i2)	50.000	77.700	5.1		b6		underground
			49.957	77.726	5.3		i2		
09/04/72	70003.6	W. Russia (b6,i2) PNE (i2)	67.700 67.689	33.400 33.445	4.6		b6		underground
						3.0	i2		
09/21/72	90001.2	N. Caspian Sea (b6,h); Ural area (a); W. Russia (i2) Announced by AEC (a), PNE(i2)	52.100 52.127	52.000 51.994	5.1 5.2		b6 i2	20 to 200 kt (a)	underground
10/03/72	90000.0	NW. Caspian Sea (b1,h,i2) (b1) S. of Volgograd, announced by AEC (a)	46.848	45.010	6.1	3.0	i2	200 kt to 1 Mt (a)	underground

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11/02/72	12657.6	Semi (a,b6); E. Kazakh (i2) Announced by AEC (a)	49.900 49.913	78.800 78.837	6.2		b6 4.1 i2	200 kt to 1 Mt (a) 200 to 1000 kt	underground
11/24/72	90008.0	Ural (a,b6); W. Kazakh (h); W. Russia (i2); announced by AEC (a); PNE (i2)	52.800 52.779	51.100 51.067	4.7		b6 5.1 i2	20 to 200 kt (a)	underground
11/24/72	95957.8	W. Kazakh, PNE (i2)	51.800 51.843	64.200 64.152	5.2		b6 i2	20 to 200 kt	underground
12/10/72	42657.7	Semi (a,b6); E. Kazakh (i2) Announced by AEC (a)	49.800 49.847	78.100 78.099	5.7		b6 i2	20 to 200 kt (a)	underground
12/10/72	42708.4	Semi (a,b6); E. Kazakh (i2) Announced by AEC (a)	50.100 50.114	78.800 78.808	6.7		b6 4.3 i2	200 kt to 1 Mt (a)	underground
12/29/72	42700.0	Eastern Kazakhstan Semi [Source F4 gives 12/29/72; sources b1,h,i2 give 12/28	51.700	77.200	4.9		b1 4.9 h,i2		underground
02/16/73	50300.0	Semi (a,b1); E. Kazakh (i2) Announced by AEC (a)	50.000 49.835	78.000 78.232			b1 i2	20 to 200 kt (a)	underground
04/19/73	43257.6	Semi (a,b6); E. Kazakh (i2) Announced by AEC (a)	50.000 50.006	77.700 77.725	5.4		b6 i2	20 to 200 kt (a)	underground
07/10/73	12657.6	Semi (a,b6); E. Kazakh (i2) Announced by AEC (a)	49.800 49.780	78.100 75.058	5.4		b6 i2	20 to 200 kt (a)	underground
07/23/73	12300.0	Semi (a,b1); E. Kazakh (i2) Announced by AEC (a)	50.000 49.986	78.000 78.853			b1 7.1 4.4 i2	200 kt to 1 Mt (a)	underground
08/15/73	15957.8	NW of Tashkent(a,b6); Central Kazakh(i2); announced by AEC (a)	42.700 42.711	67.400 67.410	5.3		b6 5.6 3.4 i2	20 to 200 kt (a)	underground
08/28/73	30000.0	N. Kazakh (b1); Kazakh Desert (a); Central Kazakh (i2). Announced by AEC (a), PNE (i2)	50.550	68.395	5.5	3.4	i2	20 to 200 kt (a)	underground
09/12/73	70000.0	NZ(a,b1,i2), northern site(f2) Announced by AEC (a)	73.000 73.302	55.000 55.161			b1 5.8 i2	6 megatons (a) 3 to 6 Mt	underground
09/19/73	30000.0	Central Kazakh(b1,i2); Kazakh Desert (a) Announced by AEC(a). PNE (i2)	45.635	67.850	5.2	3.3	i2	20 to 200 kt (a)	underground
09/27/73	70000.0	NZ(a,b1,i2), southern site(f2) Announced by AEC (a)	73.000 70.756	55.000 53.872			b1 5.9 3.9 i2	20 to 200 kt (a)	underground
09/30/73	50000.0	S. Ural(b1);Ural area(a);W Russia (i2) Announced by AEC (a). PNE(i2)	51.608	54.582	5.7	3.3	i2	20 to 200 kt (a)	underground
10/26/73	42700.0	Semi (a,b1); E. Kazakh (i2) Announced by AEC (a)	50.000 49.765	78.000 78.196	5.5		b1 i2	20 to 200 kt (a)	underground
10/26/73	55957.6	S. Ural(b6,i2), Ural area(a) Announced by AEC (a),PNE(i2)	53.700 53.565	55.400 55.375	4.8		b6 i2	less than 20 kt (a)	underground
10/27/73	65957.4	NZ(a,b6,i2), southern site(f2) Announced by AEC (a)	70.800 70.779	54.200 54.177	6.9	5.5	b6 5.9 i2	3 to 6 Mt (a)	underground
							6.94 5.51 f2	3450±610 kt	
							±.018±.052		

<u>DATE</u>	<u>TIME</u>	<u>LOCATION/COMMENTS</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>	<u>NB</u>	<u>MS</u>	<u>S</u>	<u>YIELD RANGE</u>	<u>TYPE</u>
12/14/73	74700.0	Semi (a,b1), E. Kazakh (i2) Announced by AEC (a)	50.000 50.036	78.000 79.011			b1 i2	200 kt to 1 Mt (a)	underground
01/30/74	45700.0	Semi	50.000	78.000			b1	20 to 200 kt (a)	underground
			49.894	77.993	4.6		i2		
	45702.1	Semi	49.800	78.100	5.4		b6		underground
			49.835	78.079	5.5		i2	20 to 200 kt	
		2 tests conducted (F4), only 1 of which was announced by AEC (a); [source i2 lists 2 tests and 20 tests in 1974 on preliminary data, though revised list has only 19 tests for 1974]							
04/16/74	55300.0	Semi	50.000	78.000			b1		underground
		E Kazakh	49.994	78.924	5.2		i2		
05/16/74	30257.3	Semi (a,b6); E. Kazakh (i2) Announced by AEC (a)	49.743	78.150	5.3		b6	20 to 200 kt (a)	underground
					5.6	3.6	i2		
05/31/74	32657.4	Semi (a,b6); E. Kazakh (i2) Announced by AEC (a)	49.952	78.944	5.9		b6	20 to 200 kt (a)	underground
					6.7		i2		
06/25/74	35657.6	Semi	49.889	78.115	4.7		b6		underground
		E Kazakh			5.0		i2		
07/08/74	60001.7		53.800	55.200			b6		underground
		Ural Mountains, PNE			5.3		i2		
07/10/74	25657.5	Semi	49.789	78.139	5.3		b6		underground
		E Kazakh			5.7		i2		
07/22/74	13221.5	NZ	70.682	53.545	4.4		b3,i2	[no Mb in i2]	underground
08/14/74	145958.3	Tazovskiy Penin. (a); W. Siberia (i2); announced by AEC(a); PNE	68.913	75.899	5.5		b6	20 to 200 kt (a)	underground
					5.2		i2		
08/29/74	95955.6	NZ(a,b6,i2), northern site(f2) Announced by AEC (a)	73.366	55.094	6.4	5.0	b6	1 to 3 megatons (a)	underground
						5.4	i2		
					6.43	4.88	f2	570±70 kt	
					±.021±.027				
08/29/74	145959.2		67.223	62.119	5.2		b6		underground
		Ural Mountains, PNE			5.2		i2		
09/13/74	30257.8	Semi	49.820	78.091	5.2		b6		underground
		E Kazakh	50.000	78.000	5.5		i2		
10/16/74	63257.5	Semi (a,b6); E. Kazakh (i2) Announced by AEC (a)	49.972	78.960	5.5		b6	20 to 200 kt (a)	underground
					6.7		i2		
11/02/74	45956.7	Semi [sic]; NZ(a,i2), southern site(f2); announced by AEC(a)	70.817	54.063	6.7	5.3	b6	3 to 4 megatons (a)	underground
						5.4	i2		
					6.78	5.29	f2	1890±210 kt	underground
					±.020±.040				
12/07/74	55956.9	Semi	49.908	77.648	4.7		b6,i2		underground
12/16/74	62302.4	Semi	49.755	78.064	5.0		b6		underground
		E Kazakh	50.400	77.100	5.3		i2		
12/16/74	64102.4	Semi	49.824	78.117	4.8		b6		underground
		E Kazakh	50.300	77.300	5.0		i2		
12/27/74	54656.8	Semi (a,b6); E. Kazakh(i2) Announced by AEC (a)	49.960 50.200	79.046 78.900	5.6	4.7	b6	20 to 200 kt (a)	underground
							i2		

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02/20/75	53257.6	Semi (a,b3); E. Kazakh (i3) Announced by AEC (a)	49.760 49.820	78.090 78.078	5.7 6.1		b3 i3	20 to 200 kt (a)	underground
03/11/75	54257.6	Semi (a,b6); E. Kazakh (i3) Announced by AEC (a)	49.800 49.787	78.300 78.251	5.4 5.9		b6 i3	20 to 200 kt (a)	underground
04/25/75	650003.0	[sic on time] W Russia, PNE [Probably to build storage cavities in Astrakhan natural gas field.]	48.100 47.500	47.200 47.500	4.7 4.9		b3 i3		underground
04/27/75	53657.2	Semi (a,b3); E. Kazakh (i3) Announced by AEC (a)	49.940 49.990	79.020 79.994	5.6 6.7	3.9	b3 i3	20 to 200 kt (a)	underground
06/08/75	32657.6	Semi (a,b3); E. Kazakh (i3) Announced by AEC (a)	49.750 49.764	78.080 78.089	5.5 6.0	3.6	b3 i3	20 to 200 kt (a)	underground
06/30/75	32657.0	Semi E Kazakh	50.000	78.999	4.8 5.9		b6 i3		underground
08/07/75	35657.5	Semi (a,b6); E. Kazakh (i3) Announced by AEC (a)	49.813	79.240	5.2 5.4		b6 i3	20 to 200 kt (a) 20 to 200 kt	underground
08/23/75	95957.9	NZ(a,b6,i3);northern site(f2) Announced by AEC (a)	73.369	54.641	6.4	4.9	b6 i3	multi-megaton (a)	underground
					6.42	4.72	f2	460+20 kt	underground
09/29/75			69.600	90.460	4.8		b3		underground
		Central Siberia, PNE	69.592	90.396	4.4		i3		
10/05/75	42743.9	Semi E Kazakh	55.800	75.100	4.6 4.6		b2 i3		underground
10/18/75	85956.5	NZ(a,b3,i3);southern site(f2) Announced by AEC (a)	70.840 70.843	53.530 53.690	6.7 5.2	5.1	b3 i3	multi-megaton (a)	underground
					6.66	4.92	f2	990+290 kt	
10/21/75	115957.7	NZ(a,b3,i3);northern site(f2) Announced by AEC (a)	73.320 73.351	54.930 54.641	6.6 5.9		b3 i3	multi-megaton (a)	underground
					6.43	4.78	f2	500+3 kt	underground
10/29/75	44657.5	Semi (a,b6); E. Kazakh (i3) Announced by AEC (a)	49.984	78.975	5.8		b6	20 to 200 kt (a)	underground
12/13/75	45657.5	Semi E Kazakh	49.910 49.798	79.240 78.196	5.1 5.2	3.6	i3 i3		underground
12/25/75	51657.2	Semi (a,b6); E. Kazakh (i3) Announced by AEC (a)	50.043	78.899	5.8 6.9	5.2	b6 i3	20 to 200 kt (a) 20 to 200 kt	underground
01/15/76	44657.2	Semi E Kazakh	49.800 49.870	78.250 78.246	5.2 5.5		b3 i4	14 kt	underground
04/21/76	45757.9	Semi E Kazakh	49.840 49.818	78.180 78.198	5.1 5.4		b3 i4	10 kt	underground
04/21/76	50257.4	Semi (a,b6); E. Kazakh (i4) Announced by ERDA (a);[time?]	49.932	78.824	5.3		b6	20 to 150 kt (a)	underground
05/19/76	25657.9	Semi E Kazakh	49.856	78.007	5.0 5.2		b6 i4	<20 kt	underground
06/09/76	30257.5	Semi (a,b3); E. Kazakh (i4) Announced by ERDA as 06/08/76	49.980 50.023	79.070 79.080	5.3 5.9		b3 i4	20 to 150 kt (a) 25 kt	underground

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		which is probably same as 06/09/76 test due to time difference (a)							
07/04/76	25657.5	Semi (a,b3); E. Kazakh (a) Announced by ERDA (a)	49.850 49.915	78.970 78.952	5.8 7.0		b3 4.2 i4	90 kt	underground
07/23/76	23257.9	Semi E Kazakh	49.791	78.051	5.1 5.4		b6 i4	10 kt	underground
07/29/76	45958.0	N. of Caspian Sea (a,b3); W Kazakh, PNE announced by ERDA (a) [Probably to build storage cavities in Astrakhan natural gas field.]	47.810 47.782	48.100 48.120	5.9 6.4	4.4 4.2	b3 i4	150 kt	underground
08/04/76	25658.8	Semi E Kazakh	49.900	77.700			b2 i4	2 kt	underground
08/28/76	25657.6	Semi (a,b3); E. Kazakh (a) Announced by ERDA (a)	49.950 49.959	78.980 79.001	5.8 6.8	3.5	b3 i4	91 kt	underground
09/29/76	25957.7	NZ(a,b3);announced by ERDA(a)	73.410 73.404	54.500 54.817	5.8 6.5	3.8	b3 i4	130 kt	underground
10/20/76	75957.7	NZ(a,b6);announced by ERDA(a) NZ	73.420	54.567	5.1		b6 3.4 i4	11 kt	underground
10/30/76	45702.5	Semi E Kazakh	49.980 50.200	78.200 78.100	4.9 4.5		b3 i4	3 kt	underground
11/05/76	35956.7	Siberia;Central Siberia(a,i4) Announced by ERDA(a);PNE(i4)	61.528	112.712	5.3 5.4		b6 i4	13 kt	underground
11/23/76	50257.4	Semi (a,b6); E. Kazakh (i4) Announced by ERDA (a)	49.991	79.005	5.9 6.7		b6 i4	120 kt	underground
12/07/76	45657.5	Semi (a,b3); E. Kazakh (i4) Announced by ERDA as 12/06/76	49.870 49.884	78.890 78.905	5.9 7.1		b3 i4	110 kt	underground
		which is probably same as 12/07/76 test date to time difference (a)							
12/30/76	35657.5	Semi E Kazakh	49.900	78.135	5.1 5.5	4.2	b6 i4	10 kt	underground
03/29/77	35657.8	Semi (a,b3); E. Kazakh (i4) Announced by ERDA (a)	49.790	78.150	5.4		b3		underground
04/25/77	40657.8	Semi E Kazakh	49.837	78.159	5.1 5.3		b6 i4		underground
05/29/77	25657.8	Semi (a,b6); E. Kazakh (i4) Announced by ERDA (a)	49.944	78.846	5.6 7.0	5.0 3.7	b6 i4		underground
06/29/77	30657.8	Semi (a,b3); E. Kazakh (i4) Announced by ERDA (a)	49.960 50.034	78.910 78.927	5.3 6.4	5.2	b3 i4		underground
07/26/77	165957.8	Siberia;Central Siberia(a,i4) Announced by ERDA(a);PNE(i4)	69.540 69.532	90.510 90.583	5.0 4.6		b3 i4		underground
07/30/77	15657.8	Semi E Kazakh	49.730 49.777	78.090 78.163	5.1 5.6		b3 i4		underground
08/10/77	220200.3	Baykal	50.950	110.780	5.2		b3		underground
08/17/77	42657.7	Semi E Kazakh	49.814	78.151	5.0 5.3		b6 i4		underground
08/20/77	215958.7	Siberia;Central Siberia(a,i4) Announced by ERDA(a);PNE(i4)	64.223	99.577	5.0 4.8		b6 i4		underground

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09/01/77	25957.5	NZ(a,b6,i4) Announced by ERDA (a)	73.376	54.581	5.7		b6		underground
09/05/77	30257.9	Semi (a,b3); E. Kazakh (i4) Announced by ERDA (a)	50.050	78.930	5.8	3.7	b3		underground
09/10/77	150003.3	Baykal	57.290	106.230	4.8		b3		underground
09/30/77	65955.6	W.Kazakh(b6,i4); N of Caspian Sea, ann. by ERDA(a);PNE(i4) [Probably to build storage cavities in Astrakhan natural gas field.]	47.800	48.145	5.1	3.6	b6		underground
10/09/77	105958.9	NZ NZ	73.470	54.000	4.5		b3		underground
10/29/77	30657.7	Semi (a,b3); E. Kazakh (i4) Announced by DOE (a)	49.790	78.160	5.5		b3		underground
10/29/77	30702.9	Semi (a,b6); E. Kazakh (i4) Announced by DOE (a)	50.059	78.907	5.6	3.9	b6		underground
11/30/77	40657.5	Semi (a,b6); E. Kazakh (i4) Announced by DOE (a)	49.957	78.931	5.9	3.5	b6		underground
12/26/77	40257.7	Semi E Kazakh	49.881	78.141	4.9		b6		underground
03/19/78	34657.4	Semi (a,b6); E. Kazakh (i5) Announced by DOE (a)	49.972	77.755	5.2		b6		underground
03/26/78	35657.6	Semi (a,b6); E. Kazakh (i5) Announced by DOE (a)	49.734	78.074	5.5		b6		underground
04/22/77	30657.7	Semi (a,b3); E. Kazakh (i5) Announced by DOE (a)	49.720	78.180	5.2	4.04	b3		underground
05/29/78	45657.6	Semi E Kazakh	49.890	78.200	4.7	3.6	b3		underground
06/11/78	25157.7	Semi (a,b6); E. Kazakh (i5) Announced by DOE (a)	49.879	78.838	5.9	3.3	b6		underground
07/05/78	24657.5	Semi (a,b3); E. Kazakh (i5) Announced by DOE (a)	49.840	78.910	5.8	4.3	b3		underground
07/28/78	24657.6	Semi (a,b6); E. Kazakh (i5) Announced by DOE (a)	49.744	78.168	5.7	4.14	b6		underground
08/09/78	175958.1	Siberia;E.Siberia(a); C. Siberia(i5); announced by DOE (a); PNE (i5)	63.650	125.340	5.1	3.28	b3		underground
08/10/78	75957.7	NZ(a,b6,i5) Announced by DOE (a)	73.335	54.792	5.9	3.7	b6		underground
08/24/78	180004.0	Siberia;N. Central Siberia(a) C.Siberia(i5); announced by DOE (a); PNE (i5)	65.870	112.560	5.1	3.96	b3		underground
08/29/78	23658.0	Semi	49.820	78.100	5.2	3.67	b3		underground

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08/29/78	23706.4	E Kazakh Semi (a,b3,f3,i5); E.Kazakh(i5) announced by DOE (a) [time unknown]	49.839 49.980 50.008	78.008 79.020 78.996	5.4 5.9 6.9		i5 4.0 b3 3.9 i5		underground
					5.967 ±.012	3.637 ±.107		f3	
09/15/78	23657.3	[time unknown] Semi (a,b6,f3,i5); E.Kazakh(i5) Announced by DOE (a)	49.898	78.925	6.0	4.4	b6 3.77 b11		underground
					5.963 ±.015	3.831 ±.032		f3	
09/20/78	50257.0	Semi E Kazakh	49.890	78.400	4.3		i5 b3		underground
09/21/78	145957.6	Siberia; NW Siberia(a); C. Siberia(i5); announced by DOE (a); PNE (i5)	66.530 66.541	86.260 86.252	5.2 4.9		b3 i5		underground
09/27/78	20458.2	NZ (a,b6,i5) Announced by DOE (a)	73.380	54.559	5.6 6.3	4.5 4.2	b6 i5	3.59 b11	underground
								4.02 b11	
10/07/78	235957.0	Siberia Central Siberia, PNE	61.530 61.600	112.870 112.890	5.2 5.5		b3 i5		underground
10/08/78	80853.7	Outside Main Test Areas	41.280	32.530	5.2		F4	17 kt	underground
10/15/78	53657.0	Semi E Kazakh	49.697 49.756	78.242 78.261	5.1 5.5		b6 i5		underground
10/17/78	45956.5	W.Kazakh(b3,i5); N of Caspian Sea, ann. by DOE(a); PNE (i5) [Probably to build storage cavities in Astrakhan natural gas field.]	47.818 47.906	48.114 48.209	5.8 6.3	4.6 4.3	b6 i5		underground
								4.01 b11	
10/17/78	135958.0	Ural; Far NW Siberia(a); E.Ural (i5); ann. by DOE (a); PNE(i5)	63.210 63.207	63.260 63.194	5.5 5.9	3.7 3.6	b3 i5		underground
								3.61 b11	
10/31/78	41657.8	Semi (a,b3); E. kazakh (i5) Announced by DOE (a)	49.760 49.886	78.120 78.137	5.2 5.6		b3 i5		underground
								3.91 b11	
11/04/78	50557.5	Semi (a,b6,f3); E. Kazakh(i5) Announced by DOE (a)	50.046 50.019	78.983 79.024	5.6 6.5	4.2 3.9	b6 i5		underground
					5.576 ±.018	3.582 ±.024		f3	
11/29/78	43258.1	Semi (a,b3); E. Kazakh (i5) Announced by DOE (a) Data tape not available (f3)	49.860 49.920	78.050 78.089	5.3 5.6		b3 i5		underground
11/29/78	43302.9	Semi (a,b3,f3); E. Kazakh(i5) Announced by DOE (a)	49.930 50.004	78.770 78.951	6.0 7.1	4.3 4.2	b3 i5		underground
					5.996 ±.017	n.a.		f3	
12/14/78	44257.6	Semi E Kazakh	49.897 49.897	78.199 78.199	4.8 5.0		b6 i5		underground
12/18/78	75956.3	W.Kazakh(b3,i5); N of Caspian Sea, ann. by DOE (a); PNE(i5) [Probably to build storage cavities in Astrakhan natural gas field.]	47.780 47.872	48.140 48.258	5.9 6.4	5.2 5.0	b3 i5		underground
								4.89 b11	

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12/20/78	43257.3	Semi	49.885	78.172	4.7		b6, i5		underground
01/10/79	80000.0	W. Kazakh, PNE (i6)			5.0		b2		underground
01/17/79	75955.7	W. Kazakh (b6, i6); N of Caspian Sea, ann. by DOE (a); PNE (i6) [Probably to build storage cavities in Astrakhan natural gas field.]	47.883	48.128	6.0		b6		underground
			47.985	48.212	6.5		i6		
								4.12 b11	
02/01/79	41257.7	Semi (a, b6); E. Kazakh (i6)	50.111	78.881	5.4		b6		underground
		Announced by DOE (a)	50.125	78.944	6.4		i6		
								3.23 b11	
02/16/79	40357.9	Semi (a, b6); E. Kazakh (i6)	49.971	77.746	5.4		b6		underground
		Announced by DOE (a)	50.018	77.781	5.8		i6		
05/06/79	31657.6	Semi	49.900	78.120	5.2		b3		underground
		E Kazakh	49.869	78.247	5.6		i6		
05/24/79	40700.0	Semi; E. Kazakh (i6)	50.000	78.000	4.9		b2		underground
05/31/79	55457.5	Semi	49.855	78.193	5.2		b6		underground
		E Kazakh	49.837	78.237	5.4		i6		
								3.42 b11	
06/23/79	25657.6	Semi (a, b6, f3); E. Kazakh (i6)	49.918	78.915	6.3	4.4	b6		underground
		Announced by DOE (a)	49.935	78.971	7.2		i6		
					6.215	3.991		f3	
					±.013	±.022			
								4.02 b11	
07/07/79	34657.5	Semi (a, b3, f3); E. Kazakh (i6)	50.050	79.060	5.8	5.0	b3		underground
		Announced by DOE (a)	50.062	79.110	6.7		i6		
					5.839	4.027		f3	
					±.020	±0.232			
								4.04 b11	
07/14/79	5955.2	W. Kazakh (b3, i6); Semi (a)	47.810	48.070	5.6	5.3	b3		underground
		Announced by DOE (a); PNE (i6)	47.835	48.249	6.2		i6		
		[Probably to build storage cavities in Astrakhan natural gas field.]						3.68 b11	
07/18/79	31702.6	Semi	49.900	77.830	5.2	4.2	b3		underground
		E Kazakh	49.966	77.927	5.2		i6		
								3.45 b11	
08/04/79	35657.3	Semi (a, b3, f3); E. Kazakh (i6)	49.860	78.940	6.1	5.5	b3		underground
		Announced by DOE (a)	49.866	78.957	7.2		i6		
					6.161	4.052		f3	
					±.013	±.022			
								3.84 b11	
08/12/79	175957.4	Siberia	61.872	122.185	4.9		b6		underground
		Central Siberia, PNE	61.909	122.087	5.4		i6		
08/18/79	25157.3	Semi (a, b3, f3); E. Kazakh (i6)	49.930	78.980	6.1	4.3	b3		underground
		Announced by DOE (a)	49.961	79.020	7.2		i6		
					6.170	3.772		f3	
					±.015	±.072			
09/06/79	175957.7	Siberia	64.060	99.620	4.9		b3		underground
		Central Siberia, PNE	64.126	99.554	4.6		i6		
09/14/79	73300.0	Semi	50.000	78.000	5.2		b2		underground

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09/15/79	40700.0	E Kazakh Semi	50.000	78.000	5.2		i6		
09/24/79	32958.4	E Kazakh NZ(a,b6,i6) Announced by DOE (a)	73.370 73.335	54.580 54.729	4.6 5.7 6.5		b2 b3 i6		underground
09/27/79	41257.4	Semi	49.743	78.051	4.5		b6	4.15 b11	underground
10/04/79	155958.0	E. Kazakh Siberia;W. Siberia(i6);East of Ural Mts, announced by DOE (a); PNE (e1,i6) believed designed to hasten the flow of oil in the Salya oil field (e1)	60.060 60.650	71.440 71.525	5.4 5.8	3.8	b3 i6		underground
10/07/79	205956.9	Semi [sic?] Central Siberia, PNE	61.854 61.839	113.090 113.059	4.9 5.3		b6 i6	3.78 b11	underground
10/18/79	41657.6	Semi	49.783	78.118	5.2		b6		underground
10/18/79	70958.3	E Kazakh NZ (a,b6,i6) Announced by DOE (a)	73.338	54.807	5.4 5.8 6.6		i6 b6 i6	3.90 b11	underground
10/24/79	55956.6	W.Kazakh(b6,i6); N.of Caspian Sea, ann. by DOE (a); PNE(i6) [Probably to build storage cavities in Astrakhan natural gas field.]	47.806 47.769	48.158 48.177	5.8 6.4		b6 i6	3.95 b11	underground
10/28/79	31656.9	Semi (a,b6,f3); E. Kazakh(i6) Announced by DOE (a)	49.967 49.941	79.059 79.041	6.0 6.6 5.990 ±.016	4.4 i6 3.974	b6 i6	f3	underground
11/30/79	45257.8	Semi E Kazakh	49.810 49.840	78.210 78.269	4.5 4.9		b3 i6	4.10 b11	underground
12/02/79	43657.5	Semi (a,b6,f3); E. Kazakh(i6) Announced by DOE (a)	49.894 49.868	78.843 78.824	6.0 7.2 5.998 ±.013	4.4 i6 4.080	b6 i6	f3	underground
12/21/79	44156.8	Semi	49.794	78.347	4.7		b6	4.24 b11	underground
12/23/79	45657.6	E Kazakh Semi (a,b6,f3); E. Kazakh(i6) Announced by DOE (a)	49.964	78.827	5.0 6.1 7.2 6.170 ±.017	4.1 b6 i6	b6	f3	underground
04/04/80	52357.3	Semi	49.385	77.937	4.9		b6		underground
04/10/80	40657.6	E Kazakh Semi E Kazakh	49.968 49.792 49.813	77.777 78.128 78.140	5.1 5.0 5.3		i7 b6 i7		underground

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04/25/80	35657.4	Semi (a,b3); E. Kazakh (i7) Announced by DOE (a)	49.960 49.946	78.810 78.808	5.5 6.5		b3 i7		underground
05/22/80	35657.8	Semi (a,b3); E. Kazakh (i7) Announced by DOE (a)	49.750 49.759	78.110 78.102	5.5 5.8		b3 i7		underground
06/12/80	32657.5	Semi (a,b6); E. Kazakh (i7) Announced by DOE (a)	49.994 49.990	79.038 79.027	5.6 6.1		b6 i7		underground
06/29/80	23257.8	Semi (a,b3,f3); E. Kazakh(i7) Announced by DOE (a)	49.910 49.923	78.860 78.860	5.7 6.8	3.7	b3 i7		underground
					5.707 ±.019	3.400 ±.087		f3	
07/13/80	81000.0	Semi; E. Kazakh (i7)	50.000	78.000	5.0		b2		underground
07/31/80	33258.0	Semi E Kazakh	49.810 49.812	78.140 78.169	5.3 5.5		b3 i7		underground
09/14/80	24239.3	Semi (a,b3,f3); E. Kazakh(i7) Announced by DOE (a)	49.940 49.979	78.860 78.883	6.2 7.3	4.2	b3 i7		underground
					6.213 ±.030	4.043 ±.019		f3	
09/20/80	104000.0	Semi; E. Kazakh (i7)	50.000	78.000	4.9		b2		underground
09/25/80	62110.6	Semi E Kazakh	49.752 49.713	78.027 77.986	4.7 4.9		b6 i7		underground
09/30/80	55700.0	Semi; E. Kazakh (i7)	50.000	78.000	4.6		b2		underground
09/30/80	55700.0	Semi; E. Kazakh (i7)	50.000	78.000	5.2		b2		underground
10/08/80	55957.3	SW Russia W Kazakh, PNE [Probably to build storage cavities in the Astrakhan natural gas field.]	46.790 46.748	48.290 48.288	5.2 5.7	3.7	b3 i7		underground
10/11/80	70957.2	NZ (a,b3); Semi (a) [sic] Announced by DOE (a)	73.360 73.313	54.820 55.021	5.7 6.6	4.0	b3 i7		underground
10/12/80	33414.3	Semi (a,b3,f3); E. Kazakh(i7) Announced by DOE (a)	49.940 49.912	79.100 79.050	5.9 6.2	4.2	b3 i7		underground
					5.918 ±.019	4.094 ±.015		f3	
11/01/80	125957.8	Siberia;C.Siberia(i7);N.C. Siberia,ann.by DOE(a);PNE(i7)	60.822 61.000	97.568 98.000	5.2 4.7		b6 i7		
12/10/80	65957.3	Siberia W Siberia, PNE	61.686 61.713	66.999 67.018	4.6 4.8	3.7	b6 i7		underground
12/14/80	34706.5	Semi (a,b3,f3); E. Kazakh(i7) Announced by DOE (a)	49.870	78.970	5.9 7.0	4.1	b3 i7		underground
					5.953 ±.019	3.934 ±.038		f3	
12/26/80	40707.5	Semi E Kazakh	50.001	77.973	4.5 4.6		b6 i7		underground
12/27/80	40908.5	Semi (a,b3,f3); E. Kazakh(i7) Announced by DOE (a)	50.010	79.030	5.9 6.9		b3 i7		underground
					5.872 ±.023	3.758 ±.144		f3	
03/29/81	40350.1	Semi (a,b3); E. Kazakh (i7) Announced by DOE as 03/28/81	49.980 49.960	79.020 78.936	5.6 6.3		b3 i7		underground

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		which is probably same as 03/29/81 test due to time difference(a)							
03/31/81	75156.0	Eastern Kazakhstan	50.000	79.000	3.6		F4	0.09 kt	underground
04/22/81	11711.4	Semi (a,b3,f3); E.Kazakh (i7)	49.870	78.900	6.0	4.7	b3		underground
		Announced by DOE as 04/21/81	49.915	78.879	7.0		i7		
		which is probably same as 04/22/81 test due to time difference(a)			5.954	4.070	f3		
					±.015	±.020			
05/25/81	45957.3	W.Russia;Eur. USSR (i7);NW	68.205	53.656	5.5		b6		underground
		USSR, ann. by DOE (a);PNE(i7)	68.182	53.689	5.8		i7		
05/27/81	35812.3	Semi (a,b3); E. Kazakh (i7)	49.940	79.010	5.5	3.4	b3		underground
		Announced by DOE as 05/26/81	49.963	78.992	6.1		i7		
		which is probably same as 05/27/81 test due to time difference (a)							
06/05/81	32200.0	Semi; E. Kazakh (i7)	50.000	78.000	4.7		b2		underground
06/30/81	15712.7	Semi	49.736	78.082	5.0		b6		underground
		E Kazakh	49.706	78.022	4.6		i7		
07/05/81	35900.0	Semi; E. Kazakh (i7)	50.000	78.000	4.6		b2		underground
07/17/81	23715.7	Semi	49.790	78.170	5.2		b3		underground
		E Kazakh	49.778	78.220	5.3		i7		
08/14/81	22712.9	Semi	49.750	78.070	5.0		b3		underground
		E Kazakh	49.779	78.078	5.3		i7		
09/02/81	40004.0	Ural	60.590	55.700	4.4		b3		underground
		Ural Mountains, PNE			4.6		i7		
09/13/81	21718.4	Semi (a,b3,f3); E. Kazakh(i7)	49.890	78.980	6.1	4.9	b3		underground
		Announced by DOE as 09/12/81	49.882	78.791	7.0		i7		
		which is probably same as 09/13/81 test due to time difference(a)			6.064	4.206	f3		
					±.017	±.026			
09/26/81	45957.5	SW Russia	46.820	48.280	5.2		b3		underground
		W Kazakh, PNE	46.778	48.242	5.5		i7		
09/26/81	50357.0	SW Russia	46.790	48.270	5.3		b3		underground
		W Kazakh, PNE	46.714	48.240	5.6		i7		
		[Series of two tests in the Astrakhan natural gas field, probably to build storage cavities.]							
09/30/81	125500.0	Semi; E. Kazakh (i7)	50.000	78.000	4.6		b2		underground
10/01/81	121456.9	NZ (a,b3,i7)	73.320	54.550	6.0	3.8	b3		underground
		Announced by DOE (a)	73.297	54.381	5.8		i7		
10/18/81	35702.7	Semi (a,b3,f3); E. Kazakh(i7)	49.880	78.890	6.1	4.7	b3		underground
		Announced by DOE as 10/17/81	49.981	78.877	7.1		i7		
		which is probably same as 10/18/81 test due to time difference(a)			6.033	4.094	f3		
					±.019	±.020			
10/22/81	135957.5	Siberia	63.790	97.540	5.1		b3		underground
		Central Siberia, PNE	63.755	97.570	4.6		i7		
11/20/81	45702.5	Semi	49.736	78.183	4.9		b6		underground
		E Kazakh	49.757	78.201	5.2		i7		
11/29/81	33508.6	Semi (a,b6); E. Kazakh (i7)	49.860	78.857	5.6	4.0	b6		underground
		Announced by DOE as 11/28/81			6.7		i7		
		which is probably same as 11/29/81 test due to time difference (a)							
12/22/81	43102.6	Semi	49.840	78.210	5.1		b3		underground
		E Kazakh			4.9		i7		

<u>DATE</u>	<u>TIME</u>	<u>LOCATION/COMMENTS</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>	<u>MB</u>	<u>MS</u>	<u>S</u>	<u>YIELD RANGE</u>	<u>TYPE</u>
12/27/81	34314.2	Semi (a,b3,f3); E. Kazakh(i7) Announced by DOE as 12/26/81 which is probably same as 12/27/81 test due to time difference(a)	49.900	78.860	6.2	4.4	b3		underground
					7.3		i7		
					6.242	4.106	f3		
					±.028	±.030			
02/19/82	35511.0	Semi E Kazakh	49.801	78.116	5.4		b6		underground
			49.809	78.102	5.4		i8		
04/25/82	32305.5	Semi (a,b3,f3); E. Kazakh(i8) Announced by DOE as 04/24/82 which is probably same as 04/25/82 due to time difference (a)	49.870	78.920	6.1	4.6	b3		underground
			49.889	78.976			i8		
					6.089	4.026	f3		
					±.021	±.009			
06/11/82	105900.0	Semi E Kazakh	50.000	78.000			b2		underground
					4.7		i8		
06/25/82	20304.2	Semi E Kazakh	49.795	78.158	4.9		b6		underground
			49.783	78.197	4.7		i8		
07/04/82	11714.4	Semi (a,b6,f3); E. Kazakh(i3) Announced by DOE as 07/03/82 which is probably same as 07/04/82 test due to time difference (a). Surface waves masked by an earthquake (f3)	49.995	78.856	6.1	4.9	b6		underground
			50.047	78.799	7.0		i8		
					6.222	n.a.	f3		
					±.026				
07/12/82	102900.0	Semi E Kazakh	50.000	78.000	7.0		b2		underground
					4.6		i8		
07/30/82	210002.2	Baykal Central Siberia, PNE	53.813	104.132	5.1	3.8	b6		underground
			62.000	113.000	5.0		i8		
07/31/82	70800.0	W. Kazakh; PNE (i8) [Probably to build storage cavities at Astrakhan natural gas field.]	47.000	48.000	4.0		b2		underground
08/23/82	24304.2	Semi E Kazakh	49.747	77.971	4.7		b6		underground
			50.000	78.000	5.0		i8		
08/28/82	90900.0	W. Kazakh; PNE (i8) [Probably to build storage cavities at Astrakhan natural gas field.]	47.000	48.000	4.0		b2		underground
08/31/82	13100.5	Semi (a,b6); E. Kazakh (i8) Announced by DOE as 08/30/82 which is probably same as 08/31/82 due to time difference (a)	49.920	78.812	5.4	3.5	b6		underground
			49.901	78.834	6.3		i8		
08/31/82	84000.0	W. Kazakh; PNE (i8) [Astrakhan natural gas field]	47.000	48.000	4.6		b2		underground
09/04/82	54700.0	Semi	50.000	78.000	4.1		b2,i8		underground
09/04/82	175958.4	Siberia NW Siberia	69.206	81.647	5.2	3.5	b6		underground
			69.175	81.691	5.2		i8		
09/15/82	43300.0	Semi E Kazakh	50.000	78.000	5.2		b2		underground
					5.1		i8		
09/21/82	25700.8	Semi E Kazakh	49.854	78.216	5.2		b6		underground
			49.909	78.229	5.5		i8		
09/25/82	176957.1	Siberia Central Siberia, PNE	64.313	91.834	5.1		b6		underground
			64.311	91.859	4.7		i8		
10/01/82	131000.0	W. Kazakh; PNE (i8) [Probably to build storage cavities at Astrakhan natural gas field.]	47.000	48.000	4.0		b2		underground

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10/10/82	45956.7	Siberia	61.553	112.864	5.3		b6		underground
		Central Siberia, PNE	61.555	112.833	5.3		i8		
10/11/82	71458.2	NZ (a,b6,i8)	73.392	54.559	5.6	3.6	b6		underground
		Announced by DOE	73.368	54.532	6.3		i8		
10/16/82	55957.1	N. Caspian Sea	46.730	48.197	5.2	3.0	b6		underground
		W Kazakh, PNE	47.000	48.000	5.4		i8		
10/16/82	60457.2	N. Caspian Sea	46.748	48.215	5.2	3.0	b6		underground
		W Kazakh, PNE	47.000	48.000	5.3		i8		
10/16/82	60957.1	N. Caspian Sea	46.754	48.270	5.2	3.1	b6		underground
		W Kazakh, PNE	47.000	48.000	5.5		i8		
10/16/82	61457.3	N. Caspian Sea	46.743	48.213	5.4	3.1	b6		underground
		W Kazakh, PNE	47.000	48.000	5.6		i8		
		Series of four tests at five minute intervals; [probably to build storage cavities at Astrakhan natural gas field]. [incorrectly] as a project to build a new waterway at the Ural River (e2).					e2	5.9-6.2 Richter	Reported underground
10/27/82	72900.0	W. Kazakh; PNE (i8)	47.000	48.000	4.0		b2		underground
		W Kazakh, PNE	47.000	48.000	4.0		i8		
		[Probably to build storage cavities at Astrakhan natural gas field.]							
11/21/82	61000.0	Ural;S.Ural, PNE (i8)	55.000	50.000	4.4		b2		underground
11/29/82	191900.0	Ural;S.Ural, PNE (i8)	55.000	50.000	4.1		b2		underground
11/30/82	94900.0	W. Kazakh; PNE (i8)	47.000	48.000	4.5		b2		underground
		[Probably to build storage cavities at Astrakhan natural gas field.]							
12/05/82	33712.6	Semi (a,b6); E. Kazakh (i8)	49.928	78.869	6.1	4.4	b6		underground
		Announced by DOE as 12/04/82	50.000	78.000	7.1		i8		
		which is probably same as 12/05/82 due to time difference (a)							
12/25/82	42305.6	Semi (a,b6); E. Kazakh (i8)	49.871	78.095	4.8	3.4	b6		underground
		Announced by DOE (a)	50.000	78.000	4.9		i8		
12/26/82	33514.1	Semi	50.066	79.043	5.7		b6		underground
		E Kazakh	50.000	78.000	6.7		i8		
02/01/83	135500.0	NCaspian Sea;W.Kazakh,PNE(i9)	47.000	48.000	4.3		b2		underground
02/24/83	141100.0	NCaspian Sea;W.Kazakh,PNE(i9)	47.000	48.000	4.3		b2		underground
02/25/83	65300.0	W. Kazakh; PNE (i9)	47.000	48.000	4.2		b2		underground
		[Probably to build storage cavities at Astrakhan natural gas field.]							
03/02/83	84530.0	W. Kazakh (b9,i9)	48.000	49.000	3.8		b9		underground
		PNE	47.000	48.000	4.1		i9		
		[Probably to build storage cavities at Astrakhan natural gas field.]							
03/30/83	41700.0	Semi	49.000	79.000	5.0		b2		underground
		E. Kazakh	50.000	78.000	5.0		i9		
04/12/83	34105.2	Semi	49.815	78.222	4.9		b2		underground
		E. Kazakh	49.815	78.222	5.0		i9		
05/30/83	33344.5	Semi (a,b6); E. Kazakh (i9)	49.740	78.206	5.4		b6		underground
		Announced by DOE as 05/30/83	49.740	78.210			i9		
		which is probably same as 05/30/83 due to time difference (a)							

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06/12/83	23643.6	Semi (a,b6); E. Kazakh (i9) Announced by DOE as 06/11/83	49.906 49.894	78.981 78.964	6.1	4.6	b6 i9		underground	
		which is probably same as 06/12/83 due to time difference (a)								
06/24/83	25611.1	Semi E. Kazakh	49.810 50.000	78.107 78.000	4.7		b6 i9		underground	
07/10/83	35957.1	Ural S. Ural Mountains, PNE	51.308 51.327	53.273 53.286	5.3		b6 i9		underground	
	40457.1	Ural S. Ural Mountains, PNE	51.340 51.336	53.270 53.290	5.3		b6 i9		underground	
	40957.1	Ural S. Ural Mountains, PNE	51.344 51.357	53.291 53.301	5.2		b6 i9		underground	
		Series of three tests at five minute intervals; (probably to build storage cavities at Orenburg natural gas field). Reported [incorrectly] to be used to build a new waterway at the Ural River (e2)							e2 5.9-6.2 Richter	underground
07/28/83	34100.0	Semi E. Kazakh	49.000 50.000	79.000 78.000	5.0		b2 i9		underground	
08/18/83	160958.6	NZ (a,b6,i9) Announced by DOE (a)	73.383 73.373	54.913 54.839	5.9	4.2	b6 i9		underground	
09/11/83	63310.4	Semi E. Kazakh	49.878 49.801	78.183 78.244	4.8		b6 i9		underground	
09/24/83	45957.1	Ural N of Caspian Sea, PNE	46.816 46.773	48.291 48.300	5.1		b6 i9	50-75 kt (e7)	underground	
09/24/83	50457.2	Ural N of Caspian Sea, PNE	46.817 46.763	48.279 48.281	5.0		b6 i9	50-75 kt (e7)	underground	
09/24/83	50957.5	Ural N of Caspian Sea, PNE	46.860 46.872	48.272 48.214	4.9		b6 i9	50-75 kt (e7)	underground	
09/24/83	51457.1	Ural N of Caspian Sea, PNE	46.780 46.748	48.300 48.299	5.2		b6 i9	50-75 kt (e7)	underground	
09/24/83	51957.1	Ural N of Caspian Sea, PNE	46.796 46.722	48.297 48.267	5.2		b6 i9	50-75 kt (e7)	underground	
09/24/83	52457.4	Ural N of Caspian Sea, PNE	46.837 46.758	48.231 48.257	5.2		b6 i9	50-75 kt (e7)	underground	
		Series of six tests at five minute intervals; (probably to build storage cavities at Astrakhan natural gas field). Reported [incorrectly] to be used to build a new waterway at the Ural River (e2)							e2 5.9-6.2 Richter	underground
09/25/83	130957.7	NZ (a,b6,i9) Announced by DOE (a)	73.348 73.341	54.495 54.501	5.8		b6 i9		underground	
10/06/83	14706.5	Semi (a,b6); E. Kazakh (i9) Announced by DOE as 10/05/83	49.932 49.933	78.843 78.833	6.0		b6 i9		underground	
		which is probably same as 10/06/83 due to time difference (a)								
10/26/83	15504.8	Semi (a,b6); E. Kazakh (i9) Announced by DOE as 10/25/83	49.921 49.833	78.907 78.856	6.1	4.6	b6 i9		underground	
		which is probably same as 10/26/83 due to time difference (a)								
11/20/83	32704.4	Semi (a,b6); E. Kazakh (i9) Announced by DOE as 11/19/83	50.066 50.000	79.036 78.000	5.5		b6 i9		underground	
		which is probably same as 11/20/83 due to time difference (a)								
11/29/83	21906.5	Semi (a,b6); E. Kazakh (i9) Announced by DOE as 11/28/83	49.764 50.000	78.169 78.000	5.4		b6 i9		underground	

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12/26/83	42906.8	which is probably same as 11/29/83 due to time difference (a) Semi (a,b6); E. Kazakh (i9) Announced by DOE as 12/25/83 which is probably same as 12/26/83 due to time difference (a)	49.838 50.000	78.218 78.000	5.5 5.7		b6 i9		underground
02/19/84	35700.0 35703.4	Semi (a,b2); E. Kazakh(i10) 251 stations E. Kazakh Announced by DOE as 02/18/84 which is probably same as 02/19/84 due to time difference (a)	49.908 49.888	78.807 78.788	5.8 7.0	4.3	k i10		underground
03/07/84	23906.3 23906.4	Semi (a,b6) 249 stations E. Kazakh Announced by DOE as 03/06/84 which is probably same as 02/19/84 due to time difference (a)	50.022 50.061 50.022	78.978 79.003 78.978	5.6 5.7 6.6		b6 k i10		underground
03/29/84	51900.0 51908.2	Semi (a,b2); announced by DOE (a) 268 stations E. Kazakh	49.937 49.934	79.017 79.013	5.9	4.3	b2 k i10		underground
04/15/84	31700.0 31709.1	Semi (a,b2) 244 stations E. Kazakh Announced by DOE as 04/14/84 which is probably same as 04/15/84 due to time difference (a)	49.740 49.766	78.163 78.133	5.7 5.9	4.1	b2 k i10		underground
04/25/84	10903.5 10903.5	Semi (a,b6) 291 stations E. Kazakh Announced by DOE as 04/24/84 which is probably same as 04/25/84 due to time difference (a)	49.934 49.953	78.915 78.940	6.0 5.9 7.0	5.0	b6 k i10		underground
05/26/84	31300.0 31312.4	Semi (a,b2) 325 stations E. Kazakh Announced by DOE as 05/25/84 which is probably same as 05/26/84 due to time difference (a)	49.980 49.949	79.060 79.060	6.6 6.0 6.6		b2 k i10		underground
06/23/84	25700.0	Semi E. Kazakhstan	50.000	79.000		4.4	b9 i10		underground
07/14/84	10910.5 10910.5	Semi 316 stations E. Kazakhstan Announced by DOE as 07/13/84 which is probably same as 07/14/84 due to time difference (a)	49.981 49.891 49.902	78.963 78.963 78.988	6.2 6.2 7.2	4.6	b6 k i10		underground
07/21/84	25957.1	W. Kazakh(b6);Eur. USSR(k) 141 stations(k); PNE	51.356 51.366	53.249 53.253	5.4		b6,k i10		underground
07/21/84	30500.0 30457.0	W. Kazakh Eur. USSR, 176 stations PNE	51.374 51.384	53.257 53.271	5.3	4.0	b2 k i10		underground
07/21/84	30957.0	W. Kazakh(b6);Eur. USSR (k) 166 stations (k);PNE PNEs, series of three tests at five minute intervals; all announced by DOE as 07/20/84 which is probably	51.353 51.366	53.271 53.276	5.3		b6 i10		underground

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		same as 07/21/84 due to time difference (a) [Probably to build storage cavities at Oregung natural gas field.]							
07/21/84	74106.0	Outside Main Test Areas	48.000	49.000	3.9		F4	0.62 kt	underground
08/11/84	190000.0	Ural;NW USSR (a);Ural NTs(i10)			5.1		b2		underground
	185957.8	174 stations	65.025	55.187	5.3		k		
		Announced by DOE(a); PNE(i10)	65.079	55.287	4.4		i10		
08/25/84	185958.6	W. Siberia(b6,i10);NC USSR(a)	61.876	72.092	5.4		b6,k		underground
		209 stations (k); PNE	61.889	72.149	5.2		i10		
08/28/84	25955.5	Ural Mts(b6,k);23 stations(k)	60.826	57.472	4.4		b6,k		underground
		PNE	61.000	56.000	4.4		i10		
	30459.0	Ural	61.000	58.000	4.5		b9		underground
	30455.2	Ural Mts, 24 stations	60.791	57.544	4.3		k		
		PNE	61.000	56.000	4.4		i10		
		[Series of two PNEs at five minute intervals]							
09/09/84	25906.3	Semi	49.873	78.208	5.0		b6		underground
	25906.4	E. Kazakh, 79 stations	49.869	78.176	5.0		k		
		E. Kazakh			5.1		i10		
09/15/84	61500.0	Semi			5.2		b2		underground
		E. Kazakh	50.000	79.000	5.2		i10		
09/17/84	205947.4	C. Siberia (b6,i10)	55.835	87.408	4.9		b6		underground
	205957.5	C USSR, 124 stations	55.870	87.446	4.9		k		
		PNE			4.5		i10		
10/18/84	45700.0	Semi	50.000	80.000	4.5		b9		underground
	45705.7	E. Kazakh, 22 stations	49.800	78.141	4.5		k		
		E. Kazakh	49.787	78.004			i10		
10/25/84	63000.0	NZ				4.4	b2		underground
	62957.5	NZ, 269 stations	73.370	54.955	5.9	4.7	k		
		NZ	73.365	54.979			i10		
		Announced by DOE (a)							
10/27/84	15010.6	Semi	49.950	78.842	6.2	4.4	b6,i10		underground
	15010.6	376 stations	49.949	78.834	6.2	4.4	k		
		Announced by DOE as 10/26/84 which is probably same as 10/27/84 due to time difference (a); NZ (a) [sic]							
10/27/84	55958.6	W. Kazakh	47.044	47.919	4.8		b6		underground
	55957.1	SW USSR, 107 stations	46.857	48.098	5.0		k		
10/27/84	60500.0	W. Kazakh					b2		underground
	60456.1	SW USSR, 100 stations	46.842	48.083	5.0		k		
			46.843	48.023			i10		
		Series of two PNEs (i10) at five minute intervals. [Probably to build storage cavities at Astrakhan natural gas field]							
11/23/84	35500.0	Semi	50.000	79.000	4.5		b2,i10		underground
	35504.8	E. Kazakh, 30 stations	48.897	78.132	4.7		k		
12/02/84	31906.2	Semi (a,b6)	49.989	79.091	5.8	3.8	b6		underground
	31906.3	283 stations	49.993	79.072	5.8	4.6	k		
		E. Kazakh	50.000	79.000	4.5		i10		
		Announced by DOE as 12/01/84 which is probably same as 12/02/84 due to time difference (a)							
12/16/84	33500.0	Semi (a,b2)				4.5	b2		underground

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	35502.7	312 stations E. Kazakh	49.957 50.000	78.962 79.000	6.1	4.6	k i10		
		Announced by DOE as 12/15/84 which is probably same as 12/02/84 due to time difference (a)							
12/29/84	35010.5	Semi (a,b6)	49.853	78.785	6.0		b6		underground
	35010.7	306 stations E. Kazakhstan	49.861 50.000	78.752 79.000	6.0 7.3	4.1	k i10		
		Announced by DOE as 12/27/84 which is probably same as 12/28/84 due to time difference (a)							
02/10/85	32707.5	Semi	49.869	78.818	5.9	4.4	b6,b10	(7.2 MB in b10)	underground
	32707.6	Semi	49.877	78.816			c		
		[Announced by DOE c]							
04/19/85	135358.7	Outside Main Test Areas [presumed PNE?]	44.440	57.930	4.7		F4	5.2 kt	underground
04/25/85	5706.5	Semi	49.907	78.932	5.9	4.1	b6,b10	(6.9 MT in b10)	underground
		[Announced by DOE c]							
06/15/85	5700.0	Semi	50.000	79.000	7.2	4.5	b2		underground
	5700.7	Semi	49.878	78.888	7.2	4.5	b10		
		Semi; announced by DOE as 06/14/85 test, 205700.0 EDT							
06/30/85	23900.0	Semi	50.000	79.000	7.1	4.4	b2		underground
	23902.7	Semi	49.854	78.693	7.1	4.4	b10		underground
		[Announced by DOE c]							
07/11/85	22700.0	Eastern Kazakhstan	50.000	78.000	4.0		F4	0.05 kt	underground
					3.5		k1		
07/18/85	211457.5	W. Russia Eur.USSR	65.965	40.754	5.0		b6		underground
					5.5	3.6	b10		
		[presumed PNE?]							
07/20/85	5300.0	Semi	50.000	79.000	6.7		b2		underground
	5314.5	Semi	49.951	78.847	6.8		b10		
07/25/85	31100.0	Semi	50.000	79.000	5.3		b2		underground
	31106.6	Semi	49.862	78.099	5.3		b10		

[Nine tests, two of which were PNEs, reported to have taken place in 1985 by Col. Gen. Chervov of the Soviet General Staff e8]

Notes to Table 1

Time = Hour, minutes, seconds, tenths of a second
S = Source
Semi = Semipalatinsk
NZ = Novaya Zemlya
Mb = body wave magnitude(s)
Ms = surface wave magnitude(s)
FNE = peaceful nuclear explosion

Sources:

- a. DoE, Summary of Foreign Nuclear Detonations, Through December 31, 1983 (published 9 January 1984), and Through December 31, 1984 (published May 22, 1985).
 - a1. Date of announcement - not necessarily shot date.
 - a2. AEC announced 10/24/58 that these tests were high yield, probable MT range.
 - a3. Denotes that explosion was in Soviet territory but the test site was not identified.
- b. Swedish National Defence Research Institute (Forsvarets Forskningsanstalt or FOA), Nuclear Explosions 1945 - August 17, 1985.
 - b1. DoE.
 - b2. Hagfors Observatory.
 - b3. International Seismological Centre.
 - b4. Seismological bulletins.
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Table 2

Summary of Known Soviet Nuclear Explosions, 1949-1985

Year	Number	PRESUMED PURPOSE		LOCATION			Cumulative Total	Announced by U.S. Government
		Military	Peaceful	Semi	NZ	Other ¹		
1949	1	1	0	0	0	1	1	1
1950	0	0	0	0	0	0	0	0
1951	2	2	0	2	0	0	3	2
1952	0	0	0	0	0	0	3	0
1953	4	4	0	4	0	0	7	2
1954	7	7	0	0	0	7	14	1
1955	5	5	0	2	0	3	19	4
1956	9\	9\	0	0	0	9	28	7
1957	15 +18 ²	15 +18 ²	0	2	4	9	43	13
1958	29/	29/	0	0	26	3	90 ²	25
1959	0	0	0	0	0	0	90	0
1960	0	0	0	0	0	0	90	0
1961	50	50	0	6	24	20	140	50
1962	44	44	0	10	32	2	184	40
1963	0\	0\	0	0	0	0	184	0
1964	6 :	6 :	0	4	2	0	190	3
1965	9 :	8 :	1	8	0	1	199	4
1966	15 :	13 :	2	12	1	2	214	7
1967	17 :	16 :	1	15	1	1	231	4
1968	13 :	11 :	2	10	1	2	244	7
1969	16 :	12 :	4	10	1	5	260	12
1970	17 +12 ³	15 +12 ³	2	9	1	7	277	10
1971	19 :	15 :	4	11	1	7	296	14
1972	22 :	14 :	8	12	1	9	318	14
1973	14 :	10 :	4	6	3	5	332	14
1974	19 :	16 :	3	13	3	3	351	8
1975	15 :	13 :	2	10	3	2	366	10
1976	17 :	15 :	2	13	2	2	383	10
1977	18/	15/	3	11	2	5	413 ³	11
1978	28	21	7	18	2	8	441	20
1979	29	21	8	19	2	8	470	15
1980	21	18	3	17	1	3	491	10
1981	22*	16	5	16	1	5	513	9
1982	31	15	16	14	1	16	544	6
1983	27*	14	13	12	2	13	571	9
1984	28	18	10	16	1	11	599	17
1985	9	7	2	7	0	2	608	4
Totals 608		506	102	289	118	171+	608*	363

Notes to Table 2

1. All tests outside the main test areas near Semipalatinsk in eastern Kazakhstan and on Novaya Zemlya, including all explosions announced as for peaceful purposes and explosions whose locations are unknown.
2. The Stockholm International Peace Research Institute (SIPRI) and the Swedish National Defence Research Institute list 57 Soviet explosions from 1949 through 1958, and SIPRI notes that an additional 33 tests took place during this period whose dates are unknown (see Table 1; World Armaments and Disarmament, SIPRI Yearbook, 1975, pp. 510-511, 1976, pp. 416-417). These additional tests are apparently included in a classified Swedish list. Table 1 lists 72 tests during this period, leaving at least 18 of the 33 tests unaccounted for. All of these tests presumably took place in 1956-1958 since the tests through 1955 are numbered and were for weapons related purposes. The locations of these tests are unknown. Hence, the cumulative totals reflect an additional 18 weapons related tests from 1958 on. The French Ministry of Defense estimates that 182 Soviet tests were conducted before 1963, 174 of which were conducted in the atmosphere and eight underground (Minister de la Defence, Direction de Centre d'Experimentations Nucleaire, Organization et Fonctionnement de Centre d'Experimentation Nucleaire, Dossier No. 1, "Essais Nuclaires, Tableau Recapitulatif Des Explosions Annonces Et Presumees," Piece No. 7/41, 31 January 1985). Thus, there may be only 16 tests unaccounted for in the period prior to 1963.
3. The French MoD reports an additional 12 tests from 1963 through 1977; ibid. These tests are assumed to be for weapons related purposes. Hence, the cumulative totals reflect an additional 16 weapons related tests from 1977 on.
4. The French MoD reports 23 tests in both 1981 and 1983; ibid. Accounting for these tests and the earlier discrepancy in the totals before 1963, the overall number of Soviet nuclear explosions would range from 602 to 609.

Table 3

Known Nuclear Explosions at Semipalatinsk By Month

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1949													0
1950													0
1951									1	1			2
1952													0
1953								4					4
1954													3
1955											2		2
1956													0
1957									2				2
1958													0
1959													0
1960													0
1961									5	1			6
1962		1						2		4	3		10
1963													0
1964			1		1		1				1		4
1965			1		1	1	1		1	1	1	1	8
1966		1	1	1	1	1	1	2	1	1	1	2	12
1967	1	1	1	1	1	2	1	1	2	2	1	1	15
1968	1			1		2	1	1	2		1	1	10
1969			1		2		2		1	1	1	2	10
1970	1		1		1	1	2		1	1	1	2	9
1971			1	1	1	3				2	1	2	11
1972		1	2			1	1	2	1		1	3	12
1973		1		1			2			1		1	6
1974	2			1	2	1	1		1	1		4	13
1975		1	1	1	1	2		1		2		2	10
1976	1			2	1	1	2	2		1	1	2	13
1977			1	1	1	1	1	1	1	2	1	1	11
1978			2	1	1	1	2	2	2	2	3	2	18
1979		2			3	1	2	2	3	2	1	3	19
1980				3	1	2	2		5	1		3	17
1981			2	1	1	2	2	1	2	1	2	2	16
1982		1		1		2	2	2	3			3	14
1983			1	1	1	2	1		1	2	2	1	12
1984		1	2	2	1	1	1		2	2	1	3	16
1985		1		1		2	3						7
Total	6	11	18	20	20	29	31	23	37	30	24	40	289

Table 4

Known Nuclear Explosions at Novaya Zemlya By Month

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1949													0
1950													0
1951													0
1952													0
1953													0
1954													0
1955													0
1956													0
1957									2	2			4
1958		3	5						3	15			26
1959													0
1960													0
1961									9	12	3		24
1962								6	10	5	3	8	32
1963													0
1964									1	1			2
1965													0
1966										1			1
1967										1			1
1968											1		1
1969										1			1
1970										1			1
1971									1				1
1972								1					1
1973									2	1			3
1974							1	1			1		3
1975								1		2			3
1976									1	1			2
1977									1	1			2
1978								1	1				2
1979									1	1			2
1980										1			1
1981										1			1
1982										1			1
1983								1	1				1
1984										1			1
1985													0
Total	3	5					1	11	33	49	8	8	118

Table 5

Summary of Explosions at Semipalatinsk and Novaya Zemlya

Month	1949-1985						1964-1985					
	Numbers			Percentages			Numbers			Percentages		
	Semi	NZ	Tot	Semi	NZ	Total	Sem	NZ	Tot	Semi	NZ	Total
January	6	0	6	2.1	0.0	1.5	6	0	6	2.3	0.0	2.0
February	11	3	14	3.8	2.5	3.4	10	0	10	3.8	0.0	3.4
March	18	5	23	6.2	4.2	5.7	18	0	18	6.8	0.0	6.1
April	20	0	20	6.9	0.0	4.9	20	0	20	7.6	0.0	6.8
May	20	0	19	6.9	0.0	4.7	20	0	20	7.6	0.0	6.8
June	29	0	28	10.0	0.0	6.9	29	0	29	11.0	0.0	9.8
July	31	1	31	10.7	0.8	7.6	31	1	32	11.8	3.1	10.8
August	23	11	34	8.0	9.3	8.4	17	5	22	6.5	15.6	7.5
September	37	33	70	12.8	28.0	17.2	29	9	38	11.0	27.1	12.9
October	30	49	79	10.4	41.5	19.4	24	15	39	9.1	46.9	13.2
November	24	8	32	8.3	6.8	7.9	19	2	21	7.2	6.3	7.1
December	40	8	49	13.8	6.8	12.0	40	0	40	15.2	0.0	13.6
Totals	289	118	407	71.0	29.0	100.0	263	32	295	89.2	10.8	100.0

Table 6

Known Soviet Nuclear Tests By Year With Estimated Yield: 1949-1962¹
and Cumulative Yield for 1963-1985²

Year	Number	Cumulative Total	Yield (kt)	Cumulative Yield (kt)
1949	1	1	15	15
1950	0	1	0	15
1951	2	3	75	90
1952	0	3	0	90
1953	4	7	360	450
1954	7	14	260	710
1955	5	19	1865	2575
1956	9\	28	6135	8500 ⁴
1957	15 1+18 ³	43	10500	19000
1958	29/	90 ³	31500	50500
1959	0	90	0	50500
1960	0	90	0	50500
1961	50	140	200000	250500
1962	44	184	201500	452000

1964-1985 ²			~21000	~473000

Notes

1. Specific yield information for most individual atmospheric tests are unavailable. The above annual yields for 1949 through 1962 are based on the following pieces of information:
 - a. Yields of individual tests as given in Table 1;
 - b. The following estimates for fission yield from 1949 through 1958 were presented to Congress in 1958: 1949-51, 60 kt; 1952-54, 500 kt; 1955-56, 4 Mt; 1957-58, 21 Mt (Joint Committee on Atomic Energy, Fallout from Nuclear Weapons Tests, Hearings, Volume I, May 5-8, 1959, p. 23).
 - c. The former Chairman of the Atomic Energy Commission, Glenn T. Seaborg, has estimated that the cumulative yield of the 1961 test series was nearly 200 megatons (Glenn T. Seaborg with the assistance of Benjamin S. Loeb, Kennedy, Khrushchev, and the Test Ban, (Berkeley, Calif.: University of California Press, 1981), p. 90).
 - d. The French Ministry of Defense cumulative estimate of 452 megatons for atmospheric tests through 1962 (Minister de la Defense, Direction de Centre d'Experimentations Nucleaire, Organization et Fonctionnement de Centre d'Experimentation Nucleaire, Dossier No. 1, "Essais Nuclaires, Tableau Recapitulatif Des Explosions Annoncees Et Presumees," Piece No. 7/41, 31 January 1985).

The annual yields for 1949, 1951, 1953, and 1955 are thus derived from specific yield estimates for individual tests. There were no tests in 1950 and 1952. The estimate for 1954 is derived by taking the estimated cumulative fission yield for 1952-54 (500 kt) and

subtracting the annual yield value for 1953. It was assumed that half of the total yield of the thermonuclear device on 8/12/53 was fission yield. The same methodology is used to derive the estimates for 1956, 1957, and 1958. For example, the 1956 yield was determined by subtracting from the estimated 1955-56 cumulative yield (4 Mt) the known yields of the 1955 test series. For the 1957-58 period, it was also assumed that the annual cumulative yields are at a ratio of one to three, which is the approximate ratio of high yield tests during the two years. The estimate for 1961 is that provided by Seaborg, and the estimate for 1962 is the remaining amount needed to reach the French MoD estimate for the cumulative total through 1962 (ignoring the presumed relatively small cumulative total from the three underwater and five underground tests conducted before 1963).

2. Lynn Sykes and Steven Ruggi have calculated the yields for known Soviet underground nuclear explosions. Their estimates will appear in The Nuclear Weapons Databook: Volume IV, Soviet Nuclear Weapons. Nearly 12 megatons of the cumulative 21 megaton total for the period 1963-1985 (some 57 percent) are accounted for by the eleven tests which have a yield of 200 kt or above. Overall, the cumulative percentage of known Soviet underground nuclear explosions during the period as reported by Sykes and Ruggi is as follows: < 1 kt (10.9%); 1-5 kt (13.3%); 5-20 kt (39.7%); 20-200 kt (32.7%); 200-1000 kt (1.5%); above 1 Mt (1.2%).
3. See Note 1, Table 2.
4. Rounded to the nearest 100.

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