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, 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.

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

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1 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.

2 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'Esperimentations Nucleaire, Organization et Functionnement de Centre d'Esperimentation Nucleaire, Dossier No. 1, "Essais Nucleaires, Tableau Recapitulatif Des Explosions Annoncees Et Presumees," Piece No. 7/41, 31 January 1985). 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. 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 Matokhin 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.

The Konyastan area is from Marshall, F.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. 0 16/34, 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 (16.6% 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. 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

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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.

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).\(^7\) Uranium-238 was in close proximity to the fissile material, indicative of a natural uranium tamper.\(^8\) 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.\(^9\)

\(^7\) SIPRI Yearbook, 1972, pp. 464-468. See the forthcoming chapter by Sykes and Ruggi in the Databook (see note 1).

\(^8\) 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.

\(^9\) See, Doyle L. Northrup, Director AFOAT-1, Memorandum for Major-General Nelson, 19 September 1949.

Joint Atomic Energy Intelligence Committee, National Scientific Intelligence Estimate, Status of the Soviet Atomic Energy Program, NSIE-1 (CIA/5/13-52), 8 January 1953. Production of highly enriched uranium by the gaseous diffusion method began in the Soviet Union in 1951.¹² 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


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
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.  

"[It 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).  

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,
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 debris 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.

sixth high-yield thermonuclear test on 22 August 1957. 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." "

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." 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.  

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19 York, The Advisors, p. 93.


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, though the U.S. believed that the device could have been delivered by the Bear long-range bomber.


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.
<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>LOCATION/COMMENTS</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
<th>MR</th>
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<th>YIELD RANGE</th>
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<tbody>
<tr>
<td>08/29/49</td>
<td></td>
<td>Joe 1, announced by AEC on 09/23/49</td>
<td>j4</td>
<td></td>
<td></td>
<td></td>
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<td>10 to 20 kt, assuming 6kg plutonium (j7); around 20 kt (j9)</td>
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<td>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 Usturt Desert (h) [near to Tyrataa?]). 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 48N 76E (j10) [i.e., Sem test site]. Time of the test reported as 1700 local time (j10). Test used plutonium as the fissionable material (j7).</td>
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<tr>
<td>09/24/51</td>
<td></td>
<td>Joe 2, announced by AEC on 10/03/51; Seli [see Joe 1] (j10) j4</td>
<td>j4</td>
<td></td>
<td></td>
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<td></td>
<td>at least 25 kt, assuming 6 kg plutonium (j7) tower?</td>
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<tr>
<td></td>
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<td>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 Eniwetak when measured at comparable distances (j11).</td>
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<tr>
<td>10/19/51</td>
<td></td>
<td>Joe 3, announced by AEC on 10/22/51; Seli [see Joe 1] (j10) j4</td>
<td>j4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>about 50 kt, assuming 7 kg U-235 and 3.5 kg plutonium (j7)</td>
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<td>Announcement made &quot;prematurely&quot; 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).</td>
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<tr>
<td>08/12/53</td>
<td></td>
<td>Joe 4, announced by AEC on 08/19/53.</td>
<td>j4</td>
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<td>thermonuclear (a,d) 200-300 kt (d) tower (e5)</td>
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<td>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). Joe 5, 6 or 7</td>
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<tr>
<td>08/23/53</td>
<td></td>
<td>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).</td>
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<tr>
<td>09/14/54</td>
<td>53600.0</td>
<td>Ural</td>
<td>64.000</td>
<td>55.000</td>
<td>b1</td>
<td></td>
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<td></td>
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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.

<table>
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<tr>
<td>07/29/55</td>
<td></td>
<td>Soviet test number 15.</td>
<td></td>
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<td>d</td>
<td>5</td>
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<tr>
<td>08/02/55</td>
<td></td>
<td>Soviet test number 16.</td>
<td></td>
<td></td>
<td>d</td>
<td>25</td>
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<td>atmosphere</td>
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</table>

This series of tests was announced by the AEC on 08/04/55 (a1). Both probably used plutonium (d).

<table>
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<th>LOCATION/COMMENTS</th>
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<th>LONGITUDE</th>
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<tr>
<td>09/21/55</td>
<td></td>
<td>Soviet test number 17.</td>
<td></td>
<td></td>
<td>d</td>
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<td>underwater</td>
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</table>

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).

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<th>DATE</th>
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<tr>
<td>11/06/55</td>
<td></td>
<td>Soviet test number 18; Semi (j13).</td>
<td></td>
<td></td>
<td>d</td>
<td>215</td>
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</table>

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).

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<tr>
<th>DATE</th>
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<th>TYPE</th>
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<tr>
<td>11/22/55</td>
<td></td>
<td>Soviet test number 19; at Semi (d,j13).</td>
<td></td>
<td></td>
<td>d</td>
<td>1600</td>
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<td>atmosphere</td>
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</table>

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).

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.

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<tr>
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<td>03/30-04/1/56</td>
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</table>

A series announced by the AEC on 03/21/56 took place in the preceding few days before the announcement (a1,b1).

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<tr>
<td>08/24/56</td>
<td></td>
<td>Siberia: part of a series of atmospheric tests (a).</td>
<td></td>
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</tr>
<tr>
<td>08/30/56</td>
<td></td>
<td>Siberia: part of a series of atmospheric tests (a).</td>
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</table>

[Probably one of three high yield thermonuclear tests conducted from January 1956 through 4/15/57.]
<table>
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<tr>
<th>DATE</th>
<th>TIME</th>
<th>LOCATION/COMMENTS</th>
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<th>LONGITUDE</th>
<th>MB</th>
<th>MS</th>
<th>%</th>
<th>YIELD RANGE</th>
<th>TYPE</th>
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<td>A series of tests was announced by the Soviet Union on 09/10/56 (a).</td>
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<td>a,b1</td>
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<td>a,b1 large (a)</td>
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<td>atmosphere</td>
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<td>a,b1</td>
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<td></td>
<td>atmosphere</td>
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<tr>
<td>04/16/57</td>
<td></td>
<td>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.]</td>
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<td>a,b1 large (a)</td>
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<tr>
<td>08/22/57</td>
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<td>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).</td>
<td></td>
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<td>a,b1 substantial (a)</td>
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</table>

**September 1957**

- Siberia Test within within preceding two days of 09/09/57 announcement by AEC (a1).
- 09/24/57 90000.0 NZ 73.000 55.000 Arctic (a). Seventh high yield thermonuclear test, possibly evidencing an improved yield-to-weight ratio for such devices (j2).
- 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).
- 10/06/57 35800.0 NZ 73.000 55.000 Announced by USSR as a hydrogen device (a). Eighth test of a high yield thermonuclear device, possibly evidencing evidencing an improved yield-to-weight ratio for such devices (j2).
- 10/10/57 65500.0 Arctic (a) b1 small (a) atmosphere (a)
- 12/28/57 65500.0 Siberia a,b1 atmosphere (a)
- 02/23/58 NZ; Arctic (a) 73.000 55.000 b1 megaton range (a), atmosphere (a)
<table>
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<tr>
<th>DATE</th>
<th>TIME</th>
<th>LOCATION/COMMENTS</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
<th>NR</th>
<th>MS</th>
<th>S</th>
<th>YIELD RANGE</th>
<th>TYPE</th>
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<td>55.000</td>
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<td>large (a)</td>
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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).

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<th>LONGITUDE</th>
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<th>S</th>
<th>YIELD RANGE</th>
<th>TYPE</th>
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<td>probably MT range (a2)</td>
<td>atmosphere</td>
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<td>probably MT range (a2)</td>
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<tr>
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</table>

Eleven tests occurred between 09/30/58 and 10/17/58 (j16), leaving three unaccounted for.

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<th>NR</th>
<th>MS</th>
<th>S</th>
<th>YIELD RANGE</th>
<th>TYPE</th>
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<tr>
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<td></td>
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<td>b1</td>
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</table>

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).

<table>
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<tr>
<th>DATE</th>
<th>TIME</th>
<th>LOCATION/COMMENTS</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
<th>NR</th>
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<th>S</th>
<th>YIELD RANGE</th>
<th>TYPE</th>
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<td></td>
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<td>several megatons (a)</td>
<td>atmosphere</td>
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<tr>
<td>09/10/61</td>
<td></td>
<td>NZ(a,b1); announced by AEC(a) 73.000</td>
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<td>low to intermediate kiloton (a)</td>
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<tr>
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Announced by AEC (a)
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<td>55.000</td>
<td>b1</td>
<td>several megatons (a)</td>
<td>atmosphere</td>
</tr>
<tr>
<td>10/23/61</td>
<td>83122.1</td>
<td>NZ(a,b); announced by AEC(a)</td>
<td>73.900</td>
<td>53.800</td>
<td>b6</td>
<td>about 25 megatons (a)</td>
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<tr>
<td>10/23/61</td>
<td>103048.8</td>
<td>NZ: South of NZ (a)</td>
<td>70.700</td>
<td>53.500</td>
<td>g</td>
<td>low yield (a)</td>
<td>underwater (a)</td>
</tr>
<tr>
<td>10/25/61</td>
<td>83300.0</td>
<td>NZ(a,b); announced by AEC(a)</td>
<td>73.000</td>
<td>55.000</td>
<td>b1</td>
<td>intermediate to high,</td>
<td>atmosphere</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[at least the third underwater test]</td>
<td></td>
<td></td>
<td></td>
<td>probably less than a MT (a)</td>
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<tr>
<td>10/27/61</td>
<td>83302.6</td>
<td>NZ(a,b); announced by AEC(a)</td>
<td>70.700</td>
<td>53.500</td>
<td>b1</td>
<td>low to intermediate (a)</td>
<td>atmosphere</td>
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<tr>
<td>10/30/61</td>
<td>83300.0</td>
<td>NZ(a,b); announced by AEC(a)</td>
<td>73.000</td>
<td>55.000</td>
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<td>50 megatons (a)</td>
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<td></td>
<td></td>
<td>Reported occurred on</td>
<td>74.420</td>
<td>75.180</td>
<td>g</td>
<td>vicinity of</td>
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<td></td>
<td></td>
<td>10/31/61 GMT (h). Weapon could be delivered</td>
<td>77.750</td>
<td></td>
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<td>1200 ft (a)</td>
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<td>11/02/61</td>
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<td>55.000</td>
<td>b1</td>
<td>several megatons (a)</td>
<td>atmosphere</td>
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<td>11/02/61</td>
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<td>NZ(a,b); announced by AEC(a)</td>
<td>73.000</td>
<td>55.000</td>
<td>b1</td>
<td>low to intermediate (a)</td>
<td>atmosphere</td>
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<tr>
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<td>55.000</td>
<td>b1</td>
<td>several megatons (a)</td>
<td>atmosphere</td>
</tr>
</tbody>
</table>

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 (a4). 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).
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 08/05/62 test(a).

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>LOCATION/COMMENTS</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
<th>MP</th>
<th>MS</th>
<th>TYPE</th>
</tr>
</thead>
</table>
| 08/05/62 | 90900.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 17.71 | g
|          |        | Central Siberia (a); announced by AEC (a) |          |           |    |    |       |
| 08/07/62 | 93000.0| Semi 50.000 78.000                       |          |           |    |    |       |
| 08/10/62 | 90000.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 3.36  | g
| 08/20/62 | 90214.1| NZ(a,b); announced by AEC(a) 74.300 51.500 |          |           |    |    |       |
| 08/22/62 | 90000.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 4.64  | g
| 08/25/62 | 54000.0| Semi (a,b); announced by AEC (a) 50.000 78.000 |          |           |    |    |       |
| 08/27/62 | 90000.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 5.04  | g
| 09/01/62 | 12400.0| NZ 73.000 55.000                       |          |           |    |    |       |
| 09/02/62 |        | NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 5.43  | g
| 09/08/62 | 101800.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          |           |    |    |       |
|          |        | 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,b); announced by AEC(a) 74.400 51.500 |          | 74.120    | 52.300 | 5.04  | g
| 09/16/62 | 105900.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 5.43  | g
| 09/18/62 | 22920.2| NZ(a,b); announced by AEC(a) 73.200 54.700 |          |           |    |    |       |
| 09/19/62 | 110056.4| NZ(a,b); announced by AEC(a) 73.800 53.800 |          | 74.120    | 52.300 | 5.43  | g
|          |        | 2nd largest atmospheric test in current series and 4th multigigaton test in past five days (a) |
| 09/21/62 | 80100.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 5.43  | g
| 09/25/62 | 130300.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 5.43  | g
|          |        | 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). |
| 09/27/62 | 80316.4| NZ(a,b); announced by AEC(a) 74.300 52.400 |          | 74.120    | 52.300 | 5.43  | g
| 10/07/62 | 165200.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 5.43  | g
| 10/14/62 |          | Semi (a,b); announced by AEC (a) 50.000 78.000 |          |           |    |    |       |
| 10/22/62 | 34100.0| Semi 50.000 78.000                       |          |           |    |    |       |
|          |        | Central Asia, announced by AEC (a) |          |           |    |    |       |
| 10/22/62 | 90600.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 5.43  | g
| 10/27/62 | 72700.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 5.43  | g
| 10/28/62 |          | Semi 50.000 78.000                       |          |           |    |    |       |
|          |        | Central Asia, announced by AEC (a) |          |           |    |    |       |
| 10/28/62 | 44100.0| Semi (a,b); announced by AEC (a) 50.000 78.000 |          |           |    |    |       |
|          |        | Central Asia, announced by AEC (a) |          |           |    |    |       |
| 10/29/62 | 72700.0| NZ(a,b); announced by AEC(a) 73.000 55.000 |          | 74.120    | 52.300 | 5.43  | g

*either 10/28/62 test could be the HA test*

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).
<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>LOCATION/COMMENTS</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
<th>YIELD RANGE</th>
<th>TYPE</th>
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<td>10/30/62</td>
<td></td>
<td>NZ(a,b1); announced by AEC(a) 73.000</td>
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<td>b1 intermediate (a)</td>
<td>atmosphere (b1)</td>
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<td>NZ(a,b1); announced by AEC(a) 73.000</td>
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<td>atmosphere</td>
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<tr>
<td>11/01/62</td>
<td>92000.0</td>
<td>Semi (b1); Central Asia (a) 50.000</td>
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<td>high altitude (a)</td>
</tr>
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<td>atmosphere</td>
</tr>
<tr>
<td>11/03/62</td>
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<td>b1 intermediate (a)</td>
<td>atmosphere</td>
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<td>Semi (a,b1) 50.000 78.000</td>
<td>50.000</td>
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<td>b1 intermediate (a)</td>
<td>atmosphere</td>
</tr>
<tr>
<td>11/17/62</td>
<td></td>
<td>Semi (a,b1) 50.000 78.000</td>
<td>50.000</td>
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<td>b1 low (a)</td>
<td>atmosphere</td>
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<td>NZ(a,b1); announced by AEC(a) 73.000</td>
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<td>b1 intermediate (a)</td>
<td>atmosphere</td>
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<td>atmosphere</td>
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<td>12/22/62</td>
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<td>NZ(a,b1); announced by AEC(a) 73.000</td>
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<td>b1 intermediate (a)</td>
<td>atmosphere</td>
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<td>12/23/62</td>
<td>111500.0</td>
<td>NZ(a,b1); announced by AEC(a) 73.000</td>
<td>55.000</td>
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<td>b1 low to a few megatons (a)</td>
<td>atmosphere (a)</td>
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<tr>
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<td>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)</td>
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<tr>
<td>12/24/62</td>
<td>104421.9</td>
<td>NZ 74.200 52.300</td>
<td>74.200</td>
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<td>b6 about 20 megatons (a)</td>
<td>atmosphere (a)</td>
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<tr>
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<td>b6 low to a few megatons (a)</td>
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<tr>
<td>03/15/64</td>
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<td>Semi (b1,h) 50.000 78.000</td>
<td>50.000</td>
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<td>b1 low to low intermed. (a)</td>
<td>underground</td>
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<tr>
<td>05/16/64</td>
<td>60000.0</td>
<td>Semi (b6,h) 49.900 78.300</td>
<td>49.900</td>
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<td>b6 low to low intermed. (a)</td>
<td>underground</td>
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<tr>
<td>07/19/64</td>
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<td>Semi (b1,h) 50.000 78.000</td>
<td>50.000</td>
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<td>b1 low to low intermed. (a)</td>
<td>underground</td>
</tr>
<tr>
<td>09/18/64</td>
<td>75954.8</td>
<td>NZ(a,b6); announced by ACD(A) 72.900</td>
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<td>underground</td>
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<tr>
<td>10/25/64</td>
<td>75958.8</td>
<td>NZ(a,b6); announced by ACD(a) 73.500</td>
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<td>underground</td>
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<td>Semi (a,b1) 50.000 78.000</td>
<td>50.000</td>
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<td>b1 low to low intermed. (a)</td>
<td>underground</td>
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<tr>
<td>01/15/65</td>
<td>55958.4</td>
<td>Outside main test areas (f4) 49.880</td>
<td>79.960</td>
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<td>Announced as PNE by USSR (f4) 49.880</td>
<td>79.960</td>
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<td>underground</td>
</tr>
<tr>
<td>03/03/65</td>
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<td>Semi (a,b1) 50.000 78.000</td>
<td>50.000</td>
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<td>b1 low to low intermed. (a)</td>
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<td>05/11/65</td>
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<td>06/17/65</td>
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<td>30500.0</td>
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<td>Semi (a,b3) 49.860 78.040</td>
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<td>underground</td>
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<td>TIME</td>
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<td>Semi (a,b5) Announced by AEC (a)</td>
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<tr>
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<td>Semi (a,b1) Announced by AEC (a)</td>
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<td>35757.9</td>
<td>Semi (a,b6) Announced by AEC (a)</td>
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<td>N. Caspian Sea (b8,h)</td>
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<td>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)</td>
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<td>Semi (b3,h)</td>
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<td>Turkmen (a); Uzbekistan (h)</td>
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<td>78.000</td>
<td>b1</td>
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<tr>
<td>09/30/66</td>
<td>55352.8</td>
<td>PNE to plug fire in Urtabulak gas field near Bukhara (h); PNE (ii)</td>
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<tr>
<td>10/19/66</td>
<td>35757.8</td>
<td>Semi (a,b3) Announced by AEC (a)</td>
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<td>78.030</td>
<td>b3</td>
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<tr>
<td>10/27/66</td>
<td>55757.9</td>
<td>NZ(a,b3); announced by AEC(a)</td>
<td>73.400</td>
<td>54.570</td>
<td>b3</td>
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<td>Vented (h)</td>
<td>73.400</td>
<td>54.570</td>
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<td>Northern site</td>
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<td>54.570</td>
<td>b3</td>
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<td>78.000</td>
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<td>12/18/66</td>
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<td>01/30/67</td>
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<td>h</td>
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<td>02/26/67</td>
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(Source F4 gives 12/29/72; sources b1,h,i2 give 12/28)
DATE | TIME | LOCATION/COMMENTS | LATITUDE | LONGITUDE | MN | MS | 2 | RANGE | TYPE
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
12/14/73 | 74700.0 | Semi (a,b1); E. Kazakhstan (i2) | 50.000 | 78.000 | b1 | 200 kt to 1 Mt (a) | underground
Announced by AEC (a) | 50.036 | 79.011 | 6.6 | i2
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
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 | 55500.0 | Semi | 50.000 | 78.000 | b1 | underground
E Kazakhstan | 49.994 | 78.824 | 5.2 | i2
05/16/74 | 30257.3 | Semi (a,b6); E. Kazakhstan (i2) | 49.743 | 78.150 | b6 | 20 to 200 kt (a) | underground
Announced by AEC (a) | 5.3 | i2
05/31/74 | 32657.4 | Semi (a,b6); E. Kazakhstan (i2) | 49.952 | 78.844 | b6 | 20 to 200 kt (a) | underground
Announced by AEC (a) | 5.9 | i2
06/25/74 | 35657.6 | Semi | 49.889 | 78.115 | b6 | underground
E Kazakhstan | 5.0 | i2
07/08/74 | 60001.7 | Semi | 55.800 | 55.200 | b6 | underground
07/10/74 | 25657.5 | Semi | 49.789 | 78.139 | b6 | underground
E Kazakhstan | 5.3 | i2
07/22/74 | 13221.5 | NZ | 70.682 | 53.545 | b3,i2 | underground
08/14/74 | 145958.3 | Tazovskyi Penin. (a); W. Siberia | 68.913 | 75.899 | b6 | 20 to 200 kt (a) | underground
(i2); announced by AEC (a); PNE | 5.5 | i2
08/29/74 | 95955.5 | NZ (a,b6,i2); northern site (f2) | 73.366 | 55.094 | b6 | 1 to 3 megatons (a) | underground
Announced by AEC (a) | 5.4 | i2
08/29/74 | 145959.2 | Semi | 67.223 | 62.119 | b6 | underground
Ural Mountains, PNE | 5.2 | i2
09/13/74 | 30257.8 | Semi | 49.820 | 78.091 | b6 | underground
E Kazakhstan | 5.2 | i2
10/16/74 | 63257.5 | Semi (a,b6); E. Kazakhstan (i2) | 49.972 | 78.360 | b6 | 20 to 200 kt (a) | underground
Announced by AEC (a) | 5.5 | i2
11/02/74 | 45956.7 | Semi (a,b6); NZ (a,i2), southern site (f2); announced by AEC (a) | 70.817 | 54.063 | b6 | 3 to 4 megatons (a) | underground
6.7 | i2
5.3 | i2
6.78 | 5.29 | i2
1890+210 kt | 1900+210 kt | underground
12/07/74 | 55956.9 | Semi | 49.908 | 77.648 | b6,i2 | underground
12/16/74 | 62302.4 | Semi | 49.735 | 78.064 | b6 | underground
E Kazakhstan | 5.0 | i2
12/16/74 | 64102.4 | Semi | 49.824 | 78.177 | b6 | underground
E Kazakhstan | 4.8 | b6
12/27/74 | 54656.8 | Semi (a,b6); E. Kazakhstan (i2) | 49.960 | 79.046 | b6 | 20 to 200 kt (a) | underground
Announced by AEC (a) | 5.6 | i2
6.7 | b6,i2
4.7 | b6
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which is probably same as 06/09/76 test due to time difference (a)

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12/07/76 test date to time difference (a)

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which is probably same as
03/29/81 test due to time difference (a)

04/22/81 test due to time difference (a)

05/25/81 test due to time difference (a)

06/05/81 test due to time difference (a)

07/18/81 test due to time difference (a)

08/14/81 test due to time difference (a)

09/13/81 test due to time difference (a)

09/30/81 test due to time difference (a)

10/01/81 test due to time difference (a)

10/18/81 test due to time difference (a)

10/22/81 test due to time difference (a)

11/20/81 test due to time difference (a)

11/29/81 test due to time difference (a)

12/22/81 test due to time difference (a)

[Series of two tests in the Astrakhan natural gas field, probably to build storage cavities.]

[Serious soft on test in the Astrakhan natural gas field, probably to build storage cavities.]
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<td>[Nine tests, two of which were PNEs, reported to have taken place in 1985 by Col. Gen. Chervov of the Soviet General Staff e8]</td>
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Sources:

   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.

   b1. DoE.
   b2. Hagfors Observatory.
   b3. International Seismological Centre.
   b4. Seismological bulletins.
   b7. Swedish National Defence Research Institute, Nuclear Explosions 1945-1972 Basic Data.

   c1. AEC, announcement on 31 August 1953, dated 1 September 1953.
   e. Miscellaneous reports.
p. 8, quoting sources at Hagfors Observatory.

i. SIPRI Yearbooks (London: Taylor & Francis).
i10. SIPRI Yearbook 1985, p. 81.
j. Declassified documents.
ji. DDEL, Staff Secretary, Subject Series, Alphabetical Subseries, Box 7, Folder CIA Vol I (5), 26 September 1957,
1. JAEIC.
11. Central Intelligence Agency, Memorandum for the Acting Director of Central Intelligence from H. Marshall Chadwell, Assistant Director of Scientific Intelligence, on Atomic Explosion in the USSR, 1 October 1957.
12. Chairman, Joint Chiefs of Staff, Memorandum for the Secretary of Defense, CJCS 381 (Continental Defense), 23 June 1954.
14. Joint Chiefs of Staff, Statement from the Joint Atomic Energy Intelligence Committee, reported by by Edwin T. Layton, Deputy Director for Intelligence, The Joint Staff, 7 November 1955.
15. 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.
17. CIA, National Intelligence Survey 26, USSR, Section 73, Atomic Energy, Army -- October 1949, p. 73-1.
## Table 2

**Summary of Known Soviet Nuclear Explosions, 1949-1985**

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**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 Défense, Direction de Centre d'Esperiments Nucleaire, *Organization et Functionnement de Centre d'Experimentation Nucleaire, Dossier No. 1, "Essais Nuclaires, Tableau Recapitulatif Des Explosions Annoncees 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.
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Table 5

Summary of Explosions at Semipalatinsk and Novaya Zemlya

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 Totals 289 118 407 71.0 29.0 100.0 263 32 295 89.2 10.8 100.0
Table 6


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1964-1985

~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).

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.
Recent Nuclear Weapons Databook Publications


Nuclear Notebook, Bulletin of the Atomic Scientists (monthly).

Copies of the above publications are available for purchase from NRDC for the prices listed. Orders must be prepaid (make checks payable to NRDC). Send to: Judy Funderburk, Nuclear Weapons Databook Project, Natural Resources Defense Council, 1350 New York Avenue, NW - Suite 300, Washington, DC 20005.