



NUCLEAR DYNAMITE

Chronology

Key dates in the Peaceful Nuclear Explosions (PNE) race

- 1945 First atomic bombs
- 1949 First Soviet bomb
- 1954-55 Hydrogen (fusion) bombs developed by US and USSR
- 1957 First US contained underground nuclear tests
Teller and three other scientists meet in San Francisco to create Project Plowshare
- 1958 US-USSR Testing moratorium, High explosives tests for Plowshares begin
Nuclear-pulse-powered rocket conceived for space exploration
- 1961 End of moratorium. Soviets explode 30 bombs in atmosphere in the Arctic, up to 54MT
First Plowshare explosion in New Mexico salt deposit
Canadian PM Diefenbaker intervenes to prevent 9 KT nuclear test in Athabasca tar sands in Alberta
- 1962 Project Sedan, first US nuclear cratering experiment uses 104 KT modified warhead, digs crater.
- 1963 Partial test ban treaty signed by US, USSR, UK ends explosions underwater, in atmosphere, or in space
Peaceful nuclear explosions including cratering explosions still allowed but "debris" or "fallout" should not cross international boundaries. US nuclear rocket program abandoned. Plowshare focuses on Panama Canal project
- 1965 USSR launches PNE program with 140KT explosion
- 1966 USSR puts out first of five gas-well fires using nuclear explosives
- 1968 US Buggy row charge successful, USSR develops row craters for canal construction
- 1970+ International PNE projects promoted at Geneva
German-Egyptian-US project in Egypt to dig nuclear canal, flood the Qattara depression
US-Soviet scientists exchange visits, information
- 1974 Threshold test ban treaty signed, limits underground explosions to 150 kt.
Final underground explosion in Plowshares series
First atomic explosion in India, claimed as a PNE
US abandons Plowshare
- 1976 US / USSR negotiate draft treaty on Peaceful Nuclear Explosions to allow larger row charge explosions
- 1980-88 USSR: 49 more nuclear explosions for oil, gas, seismic sounding, waste disposal, program ends 1988
- 1986 Chernobyl nuclear reactor fire
- 1990 USSR dissolves, Soviet engineers in Ottawa offer nuclear explosives for waste disposal
- 1996 Comprehensive test ban treaty (CTBT). China gives up demands for PNE program and signs, along with 150 other nations.
- 2000 Russia ratifies CTBT
- 2006 Ten year review date for CTBT makes allowance for possible resumption of PNEs.

Global Nuclear Explosions 1945-1998

source: Brookings Institution: <http://www.brook.edu/FP/PROJECTS/NUCW/COST/TESTS.HTM>

United States	1032	(815 underground	217 atmospheric)	(Includes PNEs)
Soviet Union	715	(496 underground	219 atmospheric)	(Includes PNEs)
Britain	45	(24 underground	21 atmospheric)	
France	210	(160 underground	50 atmospheric)	
China	24	(22 underground	23 atmospheric)	
India	3	(3 underground)		
Pakistan	2	(2 underground)		



NUCLEAR DYNAMITE Peaceful Nuclear Explosions

How large is it?

The bomb dropped on Hiroshima released the energy equivalent of 40,000,000 pounds = 20 kilotons of conventional TNT explosives. Peaceful nuclear explosion (PNE) experiments varied from a fraction of a ton to 140 kilotons used by the Soviet union to excavate the Chagan crater in Kazakhstan. Much larger individual explosions or groups of explosions were planned but were not carried out. The smallest practical size for cratering explosions is in the 100 kiloton (KT) range, similar to the 104 kiloton explosion used by the US to excavate the Sedan crater in Nevada. Below that it may be equally efficient to excavate by conventional means. Rows of explosions totalling up to 18 million tons (megatons abbreviated MT) were considered for the excavation of the Panama Canal. The largest single military explosion was a 54 megaton bomb exploded over Novaya Semlya by the Soviet Union.

In the USSR

Dates	Number	Size (KT)	Purpose
1965-1970	5	1.1 to 140	Water reservoir development
1968-1971	3	.24 to 15	Canal construction (incl two row shots x 3 explosives)
1974	2	75 and 98	Dam construction
1965-1987	21	2.3 to 15	Oil stimulation, underground
1966-1971	3	1.1 to 64	Salt cavity development (experimental industrial application)
1966-1981	5	3.8 to 47	Putting out runaway gas well fires
1967-1984	25	0.3 to 15	Underground cavity construction
1971-1988	39	2.3 to 22	Deep seismic sounding
1972,1984	2	1.8 to 2.1	Breaking up ore bodies
1973,1974	2	10	Underground cavities for burying toxic wastes
1975-1979	13	.35 to 58	Creation of transplutonic elements
1976	1	10	Decoupling experiment
1979	3	1	Coal mining application to control coal dust, methane blow outs
1964-1984	40	.001 to 150	Development of explosive devices

In the US

Dates	Number	Size (KT)	Purpose
1961	1	3	Salt cavity and neutron experiments
1964- 1967	2	2.2 and 12	Neutron flow in one metre pipe
1962- 1968	5	up to 104	Cratering experiments
1968	1x 5	1.1x 5	Row charge of five explosives for canal experiment
1967-1969	2	29 and 40	Nuclear gas stimulation
1973	1x3	3 x 33	Vertical set of three simultaneous explosions for gas stimulation
not given	9	not given	Development of ultra low fission thermonuclear explosives
not given	1	not given	Low tritium thermonuclear device
not given	1	not given	Special emplacement device
not given	5	not given	Transplutonic elements experiments

Notes on tallying PNE explosions

The final tally of PNE explosions depends on which explosions are counted. Some counts include testing new devices and triggers, some only include applied explosions. In some cases PNE explosions were "add ons" during military tests. Interview subjects commonly referred to 15 for the US and 135 for the USSR. The total, in any case, is in the 150-180 range, compared to more than 2000 nuclear explosions of all kinds by all nuclear powers to date. Source: Nordyke, Milo *The Soviet Program For Peaceful Uses of Nuclear Explosions*, Center for Global Security Research, Lawrence Livermore National Laboratories 1996.