

Nuclear Blast Mapper at PBS: The American Experience

(www.pbs.org/wgbh/amex/bomb/sfeature/mapablast.html)

Would you survive a nuclear blast near your home? Learn how destructive thermonuclear weapons are.

The increasing distances explosives can travel means more and more places are vulnerable to attack. In World War I the Germans dropped nearly 9,000 bombs on England, killing and wounding nearly 6,000 people. In World War II the B-29 dropped one bomb on Hiroshima, killing and wounding some 200,000 people. Today's MX missile carries ten independently-targeted warheads and has a destructive force 300 times as great as the bomb that destroyed Hiroshima and the power to kill many millions of people. Greater speeds of delivery combined with greater distances traveled combined with greater explosive power mean that what has been called war in past ages is in the nuclear age perhaps better called holocaust.

| Era | Speed | Distance |
|--------------------------|------------|-------------|
| World War I bomber | 90 mph | 300 miles |
| World War II B-29 bomber | 360 mph | 4,000 miles |
| Contemporary MX missile | 15,000 mph | 15,000 mph |

National Security Issues

Since World War II U.S. leaders have defined national security primarily in military terms. Their view has been that if the U.S. has military power that is equal or superior to that of any potential enemy, the nation will be able to defend its interests in various parts of the world and be safe from attack at home. This point of view is represented most clearly in the military doctrine that has guided the U.S. for nearly half a century and still does - deterrence. Robert McNamara, Secretary of Defense for Presidents Kennedy and Johnson, defined this policy 30 years ago. In his book *The Essence of Security* he writes: "Assured destruction is the very essence of the whole deterrence concept. We must possess an actual assured-destruction capability, and that capability also must be credible. The point is that a potential aggressor must believe that our assured-destruction capability is in fact actual, and that our will to use it in retaliation to an attack is in fact unwavering." Deterrence therefore "means the certainty of suicide to the aggressor, not merely to his military forces, but to his society as a whole."

In a speech 18 years ago Secretary of State Alexander M. Haig Jr., who served for President Reagan, declared: "The simple possession of nuclear weapons does not guarantee deterrence... War, and in particular nuclear war, can be deterred, but only if we are able to deny an aggressor military advantage from his action and thus insure his awareness that he cannot prevail in any conflict with us. Deterrence, in short, requires the maintenance of a secure military balance, one which cannot be overturned through surprise attack or sudden technological breakthrough." To support its deterrence policy the United States has spent \$5.48 trillion on nuclear weapons since 1940, and plans to spend through 2008 another \$4.5 trillion.

The "potential aggressor" was the Soviet Union. The result was an arms race in which both nations built, stockpiled, and aimed at each other thousands of nuclear weapons, only a very small number of which, if fired and exploded, would have destroyed the other nation as a functioning society. Nevertheless, the feeling among U.S. and Soviet military strategists was that they could not have too many nuclear weapons.

There have always been critics of the deterrence policy. Some argue that military defense traditionally has meant being able to protect one's land and society. But deterrence does not defend or protect. It only threatens to destroy an opponent's society if one's own is attacked and devastated and relies on this threat to prevent an attack. Critics have also protested a definition of national security that focuses almost entirely on military security. Does not the national security of the U.S. also depend upon how well its citizens are educated? The character of their healthcare? The quality of the environment? Such critics focus on the costs of nuclear weapons, and argue that the huge sums spent on them deprive Americans of valuable social programs.

Problems and Dangers

In 1945 only the U.S. possessed nuclear weapons. This monopoly lasted until the Soviet Union became a nuclear power in 1949. Soon afterward so did England, France, and China. The growing number of nuclear nations and the dangers associated with nuclear weapons led in 1968 to the Non-Proliferation Treaty or NPT in which non-nuclear nations agreed not to receive nuclear weapons or manufacture their own and nations with nuclear weapons agreed to make serious efforts at nuclear disarmament. This agreement has now been signed by 187 nations. Four countries remain outside the treaty - India and Pakistan, both of which recently tested nuclear weapons; Israel, which has never declared that it has nuclear weapons but is widely believed to have them; and Cuba, which does not.

There are no secrets anymore about how to make atomic and hydrogen bombs. Virtually any nation with a desire to develop them and the necessary money is capable of beginning a nuclear arsenal. Critics say that the nuclear powers have not lived up to their agreement to Article VI of the NPT which requires them to move toward the abolition of nuclear weapons. But U.S. officials point to declines in spending on and reductions in nuclear stockpiles as evidence that they take Article VI of the NPT seriously. The NPT has had some success in preventing or slowing nuclear proliferation, but the continued existence of tens of thousands of nuclear weapons and the absence of efforts to eliminate them contribute to the continuing appearance of new nuclear weapons nations.

Accidental nuclear attack

The U.S. and Russia have the most nuclear weapons and missiles with which to deliver them. Both nations follow launch-on-warning policies that mean if command and control centers report that an attack is on its way, leaders have no more than a few minutes to decide what to do. In the past 20 years there have been a number of major false alarms. One of the most recent was in 1995 when Russians believed a rocket was headed toward their country and for the first time in their history activated a nuclear suitcase accompanying President Boris Yeltsin. They were about two minutes from a decision on whether to launch a nuclear missile response when they decided that the rocket was not headed toward Russia. In fact what had alarmed them was an American research rocket sent up off the coast of Norway to study the aurora borealis. The serious problems of the Russian economy have resulted in the deterioration of the nation's defense system. Money has not been available to maintain it adequately. Storage depots have been vulnerable to theft, and there have even been reports of missing portable weapons. Four American experts on the situation in Russia declared in a study recently that "the leakage of weapons-usable nuclear materials from the former Soviet Union is already occurring and could easily get worse."

Environmental and health problems

Decades of nuclear arms production in the U.S., Russia, and other countries have produced serious environmental and health problems. The U.S. Environmental Protection Agency lists nine nuclear weapons facilities as the worst contaminated sites in the country. One of them at Rocky Flats, Colorado exposed people in the area to soil contamination and radiation from exhaust plumes of the plant's smokestacks. The health officer of the area reports that before the plant was built in 1952 leukemia deaths among Jefferson County children were less than the national rate but increased to about twice the national rate between 1957 and 1962. Infant mortality and fetal death rates also rose.

During the decades of nuclear weapons production some 600,000 workers have been exposed to radiation, which is linked to higher rates of cancer, brain tumors, and birth defects. After many years of denials, the U.S. government conceded in January 2000 that this exposure has in fact produced cancer and early death in workers. Some 250,000 U.S. military personnel have been exposed to radioactive fallout in nuclear weapons test. Millions of Americans living near weapons plants and test sites have been exposed to dangerous radiation levels. At Savannah River, South Carolina; Fernald, Ohio; Rocky Flats, Colorado; and Hanford, Washington State workers have been exposed to radiation, radioactive waste has leaked into groundwater, and radioactive particles have been spewed into the air.

No one knows how many people have suffered from cancers and other illness as a result. Such events, typically, have been kept secret for many years, becoming publicly known only in the past decade.

At Hanford managers secretly permitted radioactive elements to be released for more than 20 years. They recognized the risks to people who lived in the area but went ahead “because they believed that Hanford’s mission to defend the nation’s security outweighed potential danger to the American public.” Government officials were warned before 1950 that workers at nuclear weapons plants were being exposed to dangerous levels of radiation. But the workers were not told, according to a Senate committee, because “in the climate of the early cold war, decisions were made to subordinate concerns about the health of workers to the need for more bombs.” At the Savannah River Plant repeated nuclear reactor failures and extensive radioactive contamination were kept secret “because of national security concerns about publicizing America’s problems producing atomic weapons.”

Fallout from atmospheric tests of all nuclear powers in past years will continue to settle to the earth for thousands of years to cause cancer deaths in the yet unborn. Most of the places where the government guilt nuclear bombs will never be safe enough for public use of the land. A National Academy of Sciences report issued in August 2000 states: “At many sites, radiological and nonradiological hazardous wastes will remain, posing risks to humans and the environment for tens or even hundreds of thousands of years. Complete elimination of unacceptable risks to humans and the environment will not be achieved, now or in the foreseeable future.” The Academy also declares that plans for guarding these unsafe sites are inadequate.

Preventing the Use of Nuclear Weapons

Since the opening of the nuclear age with the destruction of Hiroshima and Nagasaki in 1945, there have been many disagreements about nuclear weapons. But just about everyone agrees that the holocaust they create means they should never be used again. During the half-century since Hiroshima and Nagasaki, the major efforts at avoiding a nuclear catastrophe have been:

- *The theory of deterrence.* It boils down to the idea that if the U.S. keeps a powerful enough arsenal of nuclear weapons and the means to deliver them, any enemy nation knows it will be destroyed if it attacks and therefore will be deterred or prevented from attacking.
- *Nuclear test bans.* A series of agreements gradually eliminated nuclear testing by most, but not all, nuclear powers and reduced continued contamination of air, sea, and soil by nuclear weapons production.
- *Arms control.* A series of agreements, mainly between the U.S. and the Soviet Union, slowly cut back the numbers of missiles and nuclear warheads each nation was allowed to have. Efforts at agreement continue between the U.S. and Russia.
- *Non-proliferation agreements.* These have been successful in keeping most of the nations of the world from developing nuclear weapons, but some nations have not signed the agreements. Seven nations on three continents are known nuclear powers. Several others may be attempting to develop nuclear weapons and one, Israel, almost certainly has them. The danger of an intentional or an accidental nuclear attack still exists. The danger of terrorists obtaining nuclear weapons and using them still exists. Environmental and health hazards caused by nuclear weapons development still exists. But since the collapse of the Soviet Union in 1991, the danger of a war between it and the U.S. has vanished. The danger of a deliberate nuclear bombardment of each nation has vanished. Russia, which inherited most of the Soviet Union’s nuclear weapons is afraid of the United States. So obstacles to inspections of nuclear facilities in each nation, which during the cold war were major reasons why nuclear disarmament was said to be impossible, have vanished. But the U.S. deterrence policy remains the same even though the country it was designed to deter no longer exists.
- *The abolition and prohibition of nuclear weapons.* In 1996 the United Nations General Assembly adopted a resolution to work for an agreement to prohibit “the development, production, testing, deployment, stockpiling, transfer, threat or use of nuclear weapons and providing for their elimination.” In the vote on this resolution, 115 nations approved, 32 abstained, and 22, including the U.S. disapproved.

A Nuclear Weapons Chronology

- 1939 - Albert Einstein writes President Franklin D. Roosevelt to warn him about the possibility of a German atomic bomb and to urge the U.S. to develop such a weapon. World War II begins in Europe.
- 1941 - Japan attacks Pearl Harbor, and the U.S. enters World War II.
- 1942 - The U.S. establishes the Manhattan Project to develop an atomic bomb.
- 1945 - A U.S. plane drops an atomic bomb on Hiroshima on August 6. Three days later a second bomb is dropped on Nagasaki. Japan surrenders and World War II ends.
- 1946 - The cold war begins between the United States and the Soviet Union.
- 1949 - The Soviet Union tests an atomic bomb.
- 1952 - The United States tests the first hydrogen or thermonuclear bomb.
- 1953 - The Soviet Union tests a hydrogen bomb.
- 1957 - The Soviet Union develops the first intercontinental ballistic missile.
- 1958 - The United States develops an ICBM.
- 1963 - The United States and the Soviet Union agree to a Limited Test Ban Treaty that halts testing by them of nuclear weapons in the atmosphere, in space, or underwater. Underground testing continues.
- 1972 - The United States and the Soviet Union agree to the Strategic Arms Limitation Treaty which, for the first time, establishes limits on the number of missiles each side can have.
- 1991 - The Soviet Union collapses. Russia emerges as the largest of the newly independent republics and possesses most of the nuclear weapons of the Soviet Union.
- 1994 - The Comprehensive Test Ban Treaty forbidding any nuclear weapons testing is agreed to by 149 nations. Neither the Russian Duma nor the Senate of the U.S. has ratified the treaty.
- 1996 - The UN General Assembly approves a resolution to work for an agreement to forbid the further development of nuclear weapons and to eliminate those that exist.

High School Activity - Nuclear Deterrence Debate

Support For Deterrence

William J. Perry, U.S. Secretary of Defense, March 1996 annual report to the President: “ Strategic nuclear deterrence remains a key U.S. military priority. The mission of U.S. strategic nuclear forces is to deter attacks on the United States or its allies and to convince potential adversaries that seeking nuclear advantage would be futile. To do this, the United States must maintain nuclear forces of sufficient size and capability to hold at risk a broad range of assets valued by potentially hostile foreign nations.”

Walter B. Slocombe, Under Secretary of Defense for Policy, February 12, 1997: “Nuclear deterrent -- survivable against the most aggressive attack, under highly confident constitutional command and control, and assured in its safety against both accident and unauthorized use. . . . Even if we could ignore the Russian nuclear arsenal entirely, there are unfortunately a range of other potential threats to which nuclear weapons are a deterrent. One cannot survey the list of rogue states with potential WMD (weapons of mass destruction) programs and conclude otherwise . . . the knowledge that the U.S. has a powerful and ready nuclear capability is, I believe, a significant deterrent to proliferators to even contemplate the use of WMD.”

Executive Report, U.S. Nuclear Policy in the 21st Century, Institute for National Strategic Studies, July 1988: “Whether we like it or not, nuclear weapons will be part of the global security setting. The knowledge to build them will continue to exist; they cannot be disinvented. Moreover, in some regions - notably South Asia and the Middle East - the value ascribed to demonstrated nuclear prowess has been increasing. The Indian nuclear tests in May 1998 and the rapid Pakistani response demonstrated the resolve of these governments, backed by domestic political opinion, to risk international censure for stated security reasons. The Indian and Pakistani tests may anticipate a long-term trend that would significantly increase the number of the de facto nuclear weapons states. The emergence of more “declared” or “demonstrated” nuclear states may be inevitable.”

Criticism of Deterrence

Center for Defense Information, 1993: “Nuclear weapons serve no military purpose, especially given U.S. superiority in conventional weapons. The United States is the world’s number one military power, with or without its nuclear weapons. The United States’ substantial and powerful nonnuclear forces, as demonstrated in the war against Iraq, can destroy the same targets as nuclear weapons. General Colin Powell expressed the military’s doubts about the value of nuclear weapons: “I think there is far less utility to these (nuclear) weapons than some Third World countries think there is, and they are wasting a lot of money, because what they hope to do militarily with weapons of mass destruction. . . . I can increasingly do with conventional weapons, and far more effectively.”

General Lee Butler, Commander of U.S. Strategic Command until 1994. “Deterrence had this further peculiar quality: it worked best when you needed it least. In periods of relative calm, you could point with pride at deterrence and say, “Look, how splendidly it’s working!” It was in moments of deep crisis that not only did it become irrelevant but all the baggage that came with it - the buildup of forces, the high states of alert - turned the picture absolutely upside down. As you entered the crisis, thoughts of deterrence vanished, and you were simply trying to deal with the classic imponderables of crises . . . Deterrence, in a word, never operated the way that we imagined or envisioned it would . . . It led to an open-ended arms race - at that level, it failed utterly.”

Jonathan Schell, The Gift of Time. The principal strategic question is whether the doctrine of deterrence, having been framed during the cold war, will now be discredited as logically absurd and morally bankrupt or, on the contrary, recommended to nations all over the world as the soundest and most sensible solution to the nuclear dilemma. The question then will not be whether a particular quarreling pair of nations (the United States and the Soviet Union during the Cold War) is better off with nuclear arsenal but whether any and all such pairs (India and

Pakistan, Greece and Turkey, Iraq and Israel, or Iran and Iraq will do as examples) are better off . . . The fundamental choice . . . is between, on the one hand, condemnation of nuclear weapons and their abolition and, on the other, their full normalization and universalization.

High School Activity - Nuclear Abolition Debate

Support for Nuclear Weapons Abolition

The Canberra Commission on the Elimination of Nuclear Weapons, Executive Summary (a commission established by the Australian government): The elimination of nuclear weapons must be a global endeavor involving all states. The process followed must ensure that no state feels, at any stage, that further nuclear disarmament is a threat to its security. To this end nuclear weapon elimination should be conducted as a series of phased verified reductions that allow states to satisfy themselves, at each stage of the process, that further movement toward elimination can be made safely and securely.

The first requirement is for the five nuclear weapon states to commit themselves unequivocally to the elimination of nuclear weapons and agree to start work immediately on the practical steps and negotiations required for its achievement. The commitment by the nuclear weapons states to a nuclear weapon free world must be accompanied by a series of practical, realistic and mutually reinforcing steps. There are a number of such steps that can be taken immediately: Taking nuclear forces off alert; Removal of warheads from delivery vehicles; Ending deployment of non-strategic nuclear weapons; Ending nuclear testing; Initiating negotiations to further reduce United States and Russian nuclear arsenals; Agreement amongst the nuclear weapon states of reciprocal no first use undertakings, and of a no first use undertaking by them in relation to the non-nuclear states.

Effective verification is critical to the achievement and maintenance of a nuclear weapon free world. Before states agree to eliminate nuclear weapons they will require a high level of confidence that verification arrangements would detect promptly any attempt to cheat the disarmament process. A key element of non-proliferation arrangements for a nuclear weapon free world will be a highly developed capacity to detect undeclared nuclear activity at both declared and undeclared sites.

General George Lee Butler, commander of U.S. Strategic Command until 1994: We need to reflect on how revolutionary ideas get implemented and become evolutionary realities. The first and foremost test is whether, at its very core, the idea makes sense. And I believe that the idea of abolishing nuclear weapons passes that test with flying colors. Today, we are left with the spectacle of democratic societies clinging to the proposition that threats to the lives of tens of millions of people can be reconciled with the underlying tenets of our political philosophy. Why should we accept a bargain whose contractual terms take as commonplace forms of retribution that hold at risk the lives of so many people and threaten the viability of life on the planet? Who can argue that this is the best to which we can aspire? Nuclear weapons are irrational devices. They were rationalized and accepted as a desperate measure in the face of circumstances that were unimaginable. Now as the world evolves rapidly, I think that the vast majority of people on the face of this earth will endorse the proposition that such weapons have no place among us. There is no security to be found in nuclear weapons. It is a fool's game.

A Middle Position On Nuclear Weapons Abolition

Fred Charles Ikle, former director of the U.S. Arms Control and Disarmament Agency: The idea of abolishing nuclear weapons is for many people the first that comes to mind in trying to get out of the nuclear predicament. However, it wouldn't take very long for nations to build nuclear weapons again. You need - in the short term, I believe, a kind of concert of the major nuclear powers to maintain the tradition of nonuse as long as possible, not only among themselves, but to keep all the so-called rogue states from ever using nuclear weapons. These major powers would punish the use of nuclear weapons by rogue states, perhaps by lettering one major party - the most effective one in each case - step forward and respond to prevent any repetition. If, for instance, North Korea were to

use nuclear weapons against South Korea or Japan, the United States might handle the needed nuclear response, but Russia and China would tolerate the United States' doing so, much as they tolerated the Gulf War. This enforced nonuse policy, however, would have to apply not just to nuclear weapons but to any large-scale use of weapons of mass destruction. Sometime in the far distant future, it (nuclear abolition) might happen. But other things would have to happen first. The world would have to come under the control of some global authority, and a rather intrusive and demanding one at that...neither governments nor people will seriously consider taking any really big steps until they are kicked in that direction by very intense emotions.

Opposition To Nuclear Weapons Abolition

Walter B. Slocombe, Under Secretary of Defense for Policy, February 12, 1997: There is no reasonable prospect that all the declared and de facto nuclear powers will agree in the near term to give up all their nuclear weapons. And as long as one such state refuses to do so, it will be necessary for us to retain a nuclear force of our own. If the nuclear powers were . . . to accept abolition, then we would require - and the Congress would rightly demand - a verification regime of extraordinary rigor and intrusiveness. This would have to go far beyond any currently in existence or even under contemplation. It would have to include not merely a system of verification, but what the "international generals statement" calls "an agreed procedure for forcible international intervention and interruption of current efforts in a certain and timely fashion.

We who are charged with responsibility for national security and national defense must recall that we are not only seeking to avert nuclear war - we are seeking to avert major conventional war as well . . . During the cold war nuclear weapons played a stabilizing role in that they made the resort to military force less likely. The world is still heavily armed with advanced conventional weapons and will increasingly be so armed with weapons of mass destruction. The existence of nuclear weapons continues to serve as a damper on the resort to the use of force.

Richard Perle, Assistant Secretary for International Security Policy of the Defense Department, 1981-1987, February 12, 1997: There are at least five important reasons why we should reject categorically and unapologetically the argument that the elimination of all nuclear weapons would be a wise goal for the United States. First, there is no way to verify compliance with a treaty banning all nuclear weapons. Not now. Not tomorrow. Not ever. The weapons are too small and the space in which they can be hidden too vast to allow for confident monitoring. Second, the elimination of our last remaining nuclear weapon, in light of the near certainty that others would cheat and hold some weapons back would be an act of supreme folly. Third, even if the impossible happened and everyone turned in his last weapon, how long would it be before the continuing technical and scientific know-how and industrial capacity in the former nuclear-weapon states was mobilized to re-establish one or more nuclear powers? Fourth, the elimination of nuclear weapons, or even a commitment to eliminate them in the future, would be a major encouragement to potential proliferators . . . These would pose a serious threat to us and to others, to be sure. But the United States possesses many thousands of such weapons and other nuclear weapons states have thousands or hundreds. Surely a state with a handful of nuclear weapons would take seriously the substantial nuclear arsenals of the major nuclear powers. Fifth, the elimination of all nuclear weapons would end our possession of a deterrent force that has contributed significantly to the peace among nuclear powers that has prevailed since World War II. And while conventional weapons have improved dramatically, and we are less dependent on nuclear weapons than at any time since their invention, they still exert a sobering influence that cannot be achieved by any other means.

Classroom Activity On Nuclear Weapons: The Beebee Demonstration

Ask students what they know or have heard about the death and destruction caused by weapons in World War II. What do they know about the bombs the U.S. dropped on Hiroshima and Nagasaki in Japan?

Tell students that the total power contained in all the weapons used in World War II - including the nuclear bombs dropped on Japan - are represented by a single beebee. Hold up the beebee and then drop it into the empty cookie tin. It makes a dull ping.

Explain that since World War II, nuclear weapons have multiplied: There are now about 35,000 nuclear weapons on the earth, mostly in the U.S. and Russia.

Tell students that the total power of the world's current nuclear arsenal is represented by these beebees.

Gradually pour half of a carton of beebees –about 2,500 beebees - into the cookie tin.

After the demonstration, ask students their reactions to this information. Ask: What caused this enormous proliferation of weapons? Some people argued that nuclear weapons were a necessary “deterrent” to aggression during the Cold War. Now the Cold War is over. Do you think there is still a role for nuclear weapons?