

PHYSICS

A-Bomb: Mass Murder Design

A 400-page report, "The Effects of Atomic Weapons," by Atomic Energy Commission and Department of Defense, tells everything possible about atomic attack.

By SAM MATTHEWS

The volume's flyleaf carries these words: "The Civil Defense Office, National Security Resources Board, commends this publication as a source of scientific information for technical personnel engaged in civil defense planning activities. Its detailed description of the physical phenomena associated with atomic explosions provides certain basic data helpful in the preparation of practical plans for atomic warfare defense."

► IT is mid-afternoon. An atomic bomb explodes over your city. In the first great flash of light, equal to 100 suns, the buildings stand etched against a sky of fire. Then the buildings fall.

You are two miles from "ground zero," the point directly beneath the bomb's burst. You will be burned, but you will live—if the bomb is no stronger than the one this country dropped on Japan.

Your wife is downtown shopping. You never see her again. Less than half a mile from ground zero, she is hit almost simultaneously by three waves of force, each powerful enough to kill.

The first and the second arrive as one: flash heat, thousands of degrees hot; and invisible, penetrating nuclear radiation, deadly gamma rays and neutrons. Then, a second later, the blast wave strikes. The city is crushed under a giant hand.

Atomic energy is energy on a scale never before released by man. What happens if it is released as a bomb? Suppose, as do the scientists at Los Alamos, that a "nominal atomic bomb" is dropped over your town.

The bomb is the equivalent of 20,000 tons of T.N.T. Expressed in electrical energy, it is roughly equal to the daily output of Hoover Dam, or enough to burn a 100-watt bulb for 263,000 years. Yet this tremendous force can be released in the complete fission of only 2.2 pounds of uranium 235. It happens in less than a millionth of a second.

A blinding ball of fire leaps from the point of burst. The initial temperature of the exploding bomb is more than 1,000,000 degrees Centigrade. The pressure is of the order of hundreds of thousands of atmospheres.

Complete destruction will occur within a mile-wide circle. Small masonry buildings will be engulfed by pressure and collapse completely. Light buildings and homes

will be totally demolished by blast and fire. Factories of steel will be stripped of roofing and siding and only the twisted frames will remain. Buildings will lean away from ground zero as though struck by a hurricane of stupendous proportions.

Chances of anyone surviving within 2600 feet—half a mile—of an atomic explosion are very poor, the scientists say bluntly. Victims within that circle will either be killed by blast, crushed by falling buildings, burned to death or given a greater-than-lethal dose of radiation.

The heat wave which precedes the blast front will last about three seconds. It will set flash fires and char combustible materials. Human beings exposed to it will receive more or less serious skin burns if within two miles of ground zero.

Heat Travels Straight Line

This heat travels only in a straight line. Hence protection from it is afforded by almost any object. Clothing shields the body, or even a tree trunk. When an A-bomb bursts, AEC's handbook says, drop to the

ground and curl up in a ball to escape the flash.

Burns from flash heat and ordinary flame caused more than half the deaths and three-quarters the injuries at Hiroshima and Nagasaki. There were no fire departments after the explosion. Water pressure in the city mains was practically zero. Twenty minutes after the blast came the "fire storm," wind blowing into the holocaust from all directions, 30 to 40 miles an hour at its height.

Unmatchable Third Explosion

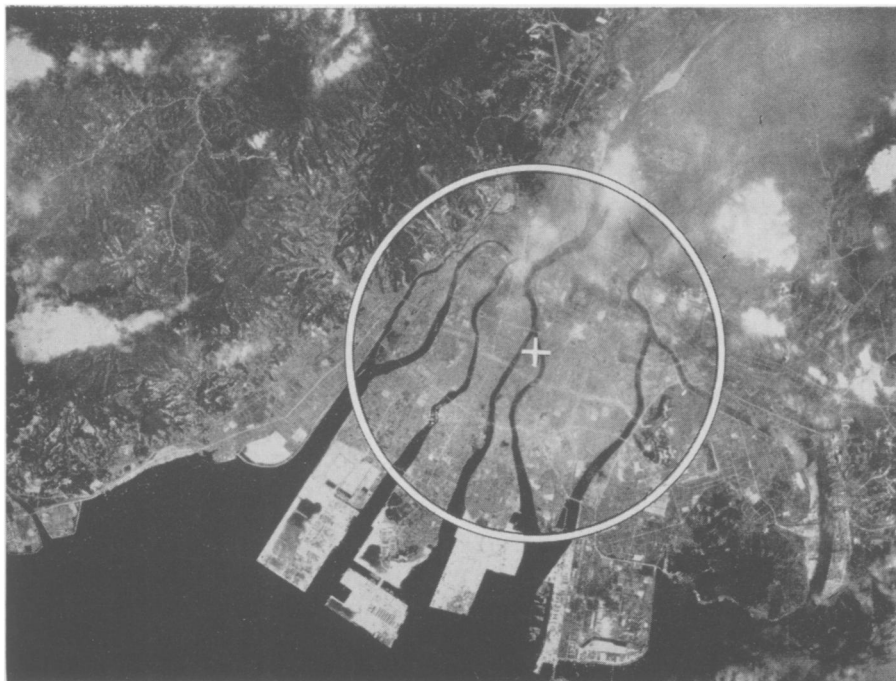
Atomic weapons have a third explosion of energy, the only one which a conventional explosion cannot match on its smaller scale. This is the wave of invisible energy which produces radiation sickness, striking the single human cell in the bone marrow, the blood and the living tissues.

Gamma rays and neutrons are the dangerous particles of energy in this wave to victims of atomic warfare. Shielding from these rays is a matter of reinforced concrete by the foot or solid lead inches thick.

Gamma radiation (X-rays) from a nominal atomic bomb will kill at 4200 feet from the burst. Neutrons are lethal up to half a mile. At 3000 feet from the burst, there is a better than 50% chance you would be killed by this nuclear radiation alone, even



CHERBOURG SHAMBLES—Allied forces during World War II reduced the French port of Cherbourg to these ruins. Weeks of bombardment by ordinary high explosives were required to cause such damage as this. Yet one atomic bomb, of the earliest type used on Hiroshima, can turn an entire city into similar shambles in 10 seconds.



HAVOC OF HIROSHIMA—The heart of Hiroshima was ripped out by the atomic bomb. The picture was taken by the AAF the day after the bomb fell. A mile-wide area, shown within the white circle, was completely flattened.

if you are shielded by 12 inches of concrete.

A lethal dose of radiation will have these immediate effects: Varying degrees of shock, possibly within a few hours; nausea, vomiting and diarrhea in the following day or two; then fever. Often there will be no pain in the first few days, but merely a feeling of discomfort, marked depression and fatigue.

The early stages of severe radiation sickness may be followed by two or three days when the patient is free from all symptoms, although profound changes are taking place in the body. Then the earlier symptoms reappear. Active illness is soon followed by delirium, coma and finally death. The patient dies usually within two weeks. Infection, internal bleeding, swelling of the throat, loss of hair and degeneration of the sex organs are apt to occur.

Effect on Posterity

AEC scientists and genetics experts are extremely cautious in discussing one vital question: will the children or grandchildren of atomic victims be human monsters? Chromosomes and genes, biological factors which control heredity, are changed by radiation. Risk of passing on changes in chromosomes can be reduced if atomic victims "refrain from begetting offspring for a period of two or three months following exposure," the report states.

It adds that this precaution probably would not lessen the risk of passing on changes in the genes. Until large gaps in man's knowledge of radiation in genetics are closed, say the scientists, estimates of

what can or may happen will be little better than guesses.

Will your city be left an echoing ghost town, too "hot" with radioactivity to be entered? If the bomb explodes high in the air, the report says, this hazard will be extremely small. The radioactive residue of the bomb itself will eventually fall to earth, but the small amount of these fission products and the wide area over which they will be dispersed lead military men to discount almost completely any real danger from them.

However, the "base surge" of water from an underwater atomic explosion, or dirt thrown by a bomb exploded either at street level or underground, will be intensely radioactive. Lethal levels of radiation in the wake of such bombs are possible.

If an atomic bomb were a fizzle, unexploded radioactive material might settle over a limited area in high enough concentration to be dangerous. The AEC-Defense Department report says such fizzles are entirely possible. Atomic bombs can explode only partially, breaking apart and scattering their substance into the atmosphere.

Radiological Warfare

Radioactivity might be deliberately sown without bombing, as a new weapon of war. In the report, the wraps are officially pulled off the terrifying possibility of radiological warfare.

Radioactive materials can be made in an atomic pile. Small amounts of certain elements can be made to give off tremendous

amounts of radiation when so treated. If these could be spread uniformly over a given area, such as a city, that city might perhaps be denied for habitation or industrial use.

But who will do the spreading, and how? So great would be the difficulties in using radioactive materials that such weapons may be impractical. Nevertheless, warn the atomic scientists, the panic-inspiring potential as a "mystery weapon" makes radiological warfare a grim possibility to be taken into account in civilian defense planning.

How to Decontaminate

Ships at Bikini were "hot" after the underwater burst. Much of what was learned at Bikini about decontamination, hitherto kept classified, is revealed in the report.

Gas masks and protective clothing will be necessary for rescue workers. Radiation detectors, such as Geiger counters, will be vital.

Once made radioactive, an object can be: 1) buried deep in the earth or jettisoned at sea; 2) kept isolated until the radiation lessens; or 3) decontaminated below the dangerous level.

In most instances, this means cleaning or removing the surface of the radioactive object, whether it be a tank or an office building. Certain chemicals have been found effective. Blasting with wet sand or high-pressure steam containing a detergent were Bikini-tested measures. Ordinary household cleaners might be used. So too might powerful acids or other corrosives.

Danger of Panic

Panic is the final danger in the minds of the atom scientists. "Mass hysteria could convert a minor incident into a major disaster," they say.

The first atomic bomb at Hiroshima killed 78,150 people, which seems far from a "minor incident." But if an American community—anywhere—were to be atom-bombed, panic would strike 80 out of 100 of the physically unharmed survivors. Tens or hundreds of thousands of Americans in other parts of the country might desert their homes and jobs from sheer terror. The great industrial centers of the nation might suddenly become empty shells.

Not a World Hazard

Could the entire world be contaminated by deadly radiation from atomic bombs? "It has been calculated," says the report, "that in order to constitute a world-wide hazard, something like a million atomic bombs, of the nominal size, would have to be detonated, roughly one to each 200 square miles of the earth's surface. This clearly represents a highly improbable situation."