

# Nuclear Weapons

Fifth Estate Collective

1980

## PART ONE:

What they do...

"It was in Hiroshima, that morning of August 6. I had joined a team of women who, like me, worked as volunteers in cutting firepaths against incendiary raids by demolishing whole rows of houses. My husband, because of a raid alert the previous night, had stayed at the Chunichi (*Central Japan Journal*), where he worked.

"Our group had passed the Tsurumi bridge, Indian-file, when there was an alert; an enemy plane appeared all alone, very high over our heads. Its silver wings shone brightly in the sun. A woman exclaimed, 'Oh, look—a parachute!' I turned toward where she was pointing, and just at that moment a shattering flash filled the whole sky.

"Was it the flash that came first, or the sound of the explosion, tearing up my insides? I don't remember. I was thrown to the ground, pinned to the earth, and immediately the world began to collapse around me, on my head, my shoulders. I couldn't see anything. It was completely dark. I thought my last hour had come. I thought of my three children, who had been evacuated to the country to be safe from the raids. I couldn't move; debris kept falling, beams and tiles piled up on top of me.

"Finally I did manage to crawl free. There was a terrible smell in the air. Thinking the bomb that hit us might have been a yellow phosphorus incendiary like those that had fallen on so many other cities, I rubbed my nose and mouth hard with a tenugui (a kind of towel) I had at my waist. To my horror, I found that the skin of my face had come off in the towel. Oh! The skin on my hands, on my arms, came off too. From elbow to fingertips, all the skin on my right arm had come loose and was hanging grotesquely. The skin of my left hand fell off too, the five fingers, like a glove.

"I found myself sitting on the ground, prostrate. Gradually I registered that all my companions had disappeared. What had happened to them? A frantic panic gripped me, I wanted to run, but where? Around me was just debris, wooden framing, beams and roofing tiles; there wasn't a single landmark left.

"And what had happened to the sky, so blue a moment ago? Now it was black as night. Everything seemed vague and fuzzy. It was as though a cloud covered my eyes and I wondered if I had lost my senses, I finally saw the Tsurumi bridge and I ran headlong toward it; jumping over piles of rubble. What I saw under the bridge then horrified me.

"People by the hundreds were flailing in the river. I couldn't tell if they were men or women; they were all in the same state: their faces were puffy and ashen, their hair tangled, they held their hands raised and, groaning with pain, threw themselves into the river. I had a violent impulse to do so myself, because of the pain burning through my whole body. But I can't swim and I held back.

"Past the bridge, I looked back to see that the whole Hachobori district had suddenly caught fire, to my surprise, because I thought only the district I was in had been bombed. As I ran, I shouted my children's names. Where was I going? I have no idea, but I can still see the scenes of horror I glimpsed here and there on my way.

“A mother, her face and shoulders covered with blood, tried frantically to run into a burning house. A man held her back and she screamed, ‘Let me go! Let me go! My son is burning in there!’ She was like a mad demon: Under the Kojin bridge, which had half collapsed and had lost its heavy, reinforced concrete parapets, I saw a lot of bodies floating in the water like dead dogs, almost naked, with their clothes in shreds. At the river’s edge, near the bank, a woman lay on her back with her breasts ripped off, bathed in blood. How could such a frightful thing have happened? I thought of the scenes of the Buddhist hell my grandmother had described to me when I was little.

“I must have wandered for at least two hours before finding myself on the Eastern military parade ground. My burns were hurting me, but the pain was different from an ordinary burn. It was a dull pain that seemed somehow w, come from outside my body. A kind of yellow pus oozed from my hands, and I thought that my face must also be horrible to see.

“After lying almost unconscious for a long time on the parade ground, I started walking again. As far as I could see with my failing sight, everything was in flames, as far as the Hiroshima station and the Atago district. It seemed to me that my face was hardening little by little. I cautiously touched my hands to my cheeks. My face felt as though it had doubled in size. I could see less and less clearly. Was I going blind, then? After so much hardship, was I going to die? I kept on walking anyway and I reached a suburban area.

“In that district, farther removed from the center, I found my elder sister still alive, with only slight injuries to the head and feet. She didn’t recognize me at first, then she burst into tears. In a handcart, she wheeled me nearly three miles to the first-aid center at Yaga. It was night when we arrived, I latter learned there was a pile of corpses and countless injured there. I spent two nights there, unconscious; my sister told me that in my delirium I kept repeating, ‘My children! Take me to my children!’

“On August 8 I was carried on a stretcher to a train and transported to the home of relatives in the village of Kasumi. The village doctor said my case was hopeless. My children, recalled from their evacuation refuge, rushed to my side. I could no longer see them; I recognized them only by smelling their good odor. On August 11, my husband joined us. The children wept with joy as they embraced him.

“Our happiness soon ended. My husband, who bore no trace of injury, died suddenly three days later, vomiting blood. We had been married sixteen years, and now, because I was at the brink of death myself, I couldn’t even rest his head as I should have on the pillow of the dead.

“I said to myself, ‘My poor children, because of you I don’t have the right to die!’ And finally by a miracle, I survived after I had again and again been given up for lost.”

## **PART TWO**

### **... & How They Work**

A fissile core of uranium-235, plutonium-239, or a combination of the two is squeezed into supercritical density by a special-purpose chemical high explosive which surrounds the core and implodes it, or explodes it inward. Before detonation the core is a ball of metal the size of a grapefruit. The implosion squeezes it down to the size of an apple. A burst of neutrons starts a chain reaction in the supercritical core, resulting in a fission, or an A-bomb type explosion. Before the bomb has a chance to fly apart, temperatures in excess of a hundred million degrees Celsius cause the fusion of tritium and deuterium into helium. For convenient storage in the bomb, the tritium and deuterium are chemically bonded to other elements, such as lithium, but the high temperatures of uncontrolled fission sever all chemical bonds and leave individual atoms standing naked. Like billiard balls on a table waiting to be struck by the cue ball, they are held in position by their own inertia. Many collisions take place during each billionth of a second. Although fusion releases energy comparable to that from fission, most of the fusion energy is carried off by high speed neutrons which can travel as much as half a mile through air or several inches through solid material before giving up their energy. If the neutrons are not somehow captured and used the result is a very mushy explosion and a great waste of neutrons. In the early days such an explosion would have been called a fizzle; today it would be called a neutron bomb. Unless the designer intends to make a neutron bomb, the neutrons must be put to work in the bomb. There are two ways this goal is accomplished. The first application of fusion neutrons is to bombard the, by now rapidly expanding fissile core and cause additional fission. This application is called

the “booster principle” and it can multiply the explosive yield of the fissile core from an unboosted yield of tens of kilotons to a boosted yield of hundreds of kilotons. (The Hiroshima bomb was twelve kilotons.) Not only is the energy of the fusion neutrons thereby captured, it is multiplied. The fission yield of a weapon can be boosted by more than ten kilotons by little more than placing deuterium and tritium in the core. The second application of fusion neutrons is used in megaton-class weapons. It is more complicated. Weapons of more than approximately half a megaton yield, or five hundred kilotons, use the boosted fission weapon described above as a “trigger” to ignite a complex geometrical arrangement of “superbomb” fuels. Neutrons from the trigger ignite the superbomb. The trigger by itself could kill most of the people in the District of Columbia, but to destroy a city the size of Chicago and all its suburbs with a single bomb, one needs a superbomb of twenty megatons. In a superbomb, the designers’ name for what journalists in the 1950’s called the hydrogen bomb, a fusion-boosted trigger, or core, is surrounded by alternating layers of lithium-6 deuteride and uranium-238.

Lithium-6 deuteride is a grey powder which can be pressed into pieces of ceramic material resembling porcelain salad bowls. The bowls fit one inside the other. Between each pair of ceramic salad bowls is a piece of uranium-238 sheet metal which has been cut and pressed into the shape of a stainless steel mixing bowl. The concentric salad bowls and mixing bowls complement each other. The uranium mixing bowls absorb high energy fusion neutrons from the trigger and undergo fission, which does two things. It showers the lithium-6 deuteride salad bowls with low energy fission neutrons that convert the lithium-6 into tritium, and it generates the temperatures necessary to insure that fusion will take place between the tritium thus produced on the spot and the deuterium, which is the other half of lithium-6 deuteride. In turn, the fusion of tritium and deuterium creates the high energy neutrons that are necessary for the fission of uranium-238. Uranium-238, although fissionable, is not fissile because its own fission neutrons just barely miss having enough energy to sustain a chain reaction. But uranium-238 fissions nicely when struck by fusion neutrons. In the few billionths of a second that elapse between the time the trigger generates fusion temperatures and the time all the bomb components are scattered to the four winds, fusion neutrons from the exploding trigger, traveling outward at thirty thousand miles per second, ignite the superbomb which surrounds the trigger. To give this discussion a human dimension, it may be useful to point out that if all nuclear components of a bomb or warhead, the lithium, uranium, etc., are assembled into a sphere, the sphere would not be larger than three feet in diameter for the largest of weapons. Typical weapons are one to two feet in diameter and weigh one and one half pounds per kiloton of explosive yield. With today’s technology the Hiroshima bomb, originally weighing nine thousand pounds, can fit inside a six inch artillery shell. In thermonuclear weapons of medium yield, such as the forty kiloton to two hundred kiloton weapons on multiple-warhead ballistic missiles and on cruise missiles, tritium is used to enhance the efficiency of the A-bomb trigger which constitutes, essentially, the whole weapon.



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