The Hydrogen Bomb

A report by Stephen

Introduction

On August 6, 1945, the United States dropped the first atomic bomb on Hiroshima. Hundreds of thousands of people were killed or wounded. And the world knew that it had entered the Atomic Age.

After a second bomb hit Nagasaki on August 9th, Japan surrendered, of course, but this was only the beginning. After the war, the United States and the Soviet Union eyed each other uneasily, two superpowers co-existing in a state of uneasy pseudo-truce. The United States had the trump card—the atom-bombs—and the Soviet Union wanted to level the playing field. They had a spy already in place at Los Alamos, the primary American lab for the making of the atomic bombs, and he sent them the plans they needed to build their own nuclear weapons.

When news of the first detonation of a Soviet nuclear device became public, the United States set out to build the hydrogen bomb, a weapon with more than a thousand times the destructive force of the bomb dropped on Hiroshima. All this set the stage for the thousands and thousands of nuclear weapons there are now in the U.S. and Russia. The United States should never have researched the hydrogen bomb.

Making the Bomb

After World War II ended, nuclear research and development in the U.S. basically ended. A lot of the scientists that had worked at the Los Alamos lab left to go home and get on with their lives. And at the same time that the said nuclear programs in the United States were all but standing still, the Soviet Union was pumping resources into a crash program to develop its own nuclear weapons.

Many in the United States were opposed to any further research on atomic weapons—even the scientists themselves. An important exception to that statement was Edward Teller, a

scientist who had had only minor involvement with the atom-bombs during the war. A famous scientist had once discussed the idea of a hydrogen bomb with him. Teller quickly picked up the idea and ran with it—he championed the idea of a program to design and construct a hydrogen "superbomb" to the people above him.

No one listened to him because no one seriously expected the Soviets to produce an atom-bomb in the next few years. Leslie Groves, the former head of the atomic bomb project, said that "if the U.S. had shipped the complete blueprints of the Manhattan Project to Russia on V-J (victory over Japan) Day, they would waste a couple of years searching suspiciously for a gimmick in the plans, which, they would be confident, some American had fiendishly inserted to assure Russia the privilege of blowing herself off the map (Rhodes 211)." Teller left Los Alamos for the University of Chicago to do some work on the idea on his own. Nevertheless, the remaining scientists at Los Alamos *did* do work on the idea of the "superbomb", mostly as something to do to prevent any more researchers from jumping ship.

Two programs were actually being worked on at Los Alamos—the "booster" and the "super". The idea of a "booster" was to use a large atomic bomb to initiate the reaction of a small amount of hydrogen; the idea of a "super" was to use a *small* atom-bomb to trigger the explosion of a *large* amount of hydrogen. Nobody really objected to the idea of making boosters, so research proceeded in that direction, but, as mentioned before, very few people were in favor of a super. The majority of people opposed the super because of the exponentially larger number of innocent people it would kill (i.e., mass genocide), and the fact that it would, simply, be overkill—comparable to killing a spider with a 250-pound bomb.

After a few years of work, in 1948, the first boosters were ready for testing. The super research was still inching along sluggishly. And then, on August 29, 1949, the Soviet Union detonated their first atomic bomb. All the variables changed.

Now, nuclear research across the board was sped up, and a huge debate broke out concerning the super—lots of people said "no, we shouldn't make it" and some people said "yes, we *have* to make it." The argument dragged on for quite a while, with both sides arguing vehemently that they were right. Finally, President Truman told the National Security Council to talk it over and tell him what to do. After some discussion, the NSC said "fine, go ahead," and Truman gave the OK for more-enthusiastic research.

The United States tested its first successful thermonuclear device in May 1951. Watching the explosion from a distance, Teller liked what he saw. Afterwards, he telephoned some of his associates to offer a comment on the bomb: "It's a boy (Bankston 47)."

Before the explosion, the Soviet spy at Los Alamos was finally caught. Unfortunately, he had already managed to leak enough information to his superiors for the Soviets to construct their own H-bomb. The Soviets detonated *their* first hydrogen bomb in August 1953, only a scant two years behind the U.S.

Workings of the Hydrogen Bomb

The mechanics of the detonation of a hydrogen-based thermonuclear weapon are anything but simple. But, simply put, here is a list of the steps in a thermonuclear explosion:

1. The fission-bomb part of the weapon is detonated (i.e., an atomic bomb).
2. The detonation of the atomic bomb heats the space in the immediate vicinity of the blast to hundreds of millions of degrees (Fahrenheit).
3. Because of the resulting heat, the fusion fuel (i.e., hydrogen; see below) is now "ignited." As it "burns", it fuses together with other atoms of fuel to form helium, releasing large amounts of energy in the process.

The fuel can be a few different elements—in the original design, deuterium (hydrogen with one proton and one neutron) was used. Later, tritium (hydrogen with one proton and two neutrons) was used for a better reaction. The problem, though, was that tritium isn't found in nature, as opposed to deuterium, which can be easily produced from water. Another problem was that tritium only has a half-life of 12.5 days, severely limiting the shelf-life of the bombs.

Another idea for fuel is to use a certain isotope of lithium, which would yield a large advantage over deuterium or tritium—lithium didn't need to be refrigerated at extremely low temperatures before detonation as deuterium or tritium had to be. During the reaction, lithium would break down and produce tritium, which would be instantly available for the reaction, which also got rid of the half-life problem. One disadvantage, though, was that, like the uranium and plutonium fuel used in the atomic bombs and tritium, the certain isotope of lithium was expensive to manufacture.

Conclusion

After all the arguing, after the decision to commence research on the H-bomb to stay ahead of the Soviet Union in the nuclear arms race, after years of labor to get the bombs to work, the Soviets had stolen the plans out from under the U.S. scientists' noses, and now they had the H-bomb, too. The whole purpose of the program was defeated—the U.S. still wasn't ahead in the possession of nuclear weapons. Now both the U.S. and the U.S.S.R. just had *more powerful* weapons of mass destruction to drop on each other in the case of a war. And because the Soviet Union effectively received their H-bombs from the U.S., *they would never have had the H-bomb if the United States hadn't made it.*

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