



The Story of Fat Man - Plutonium a Metallurgist's Dream (A is for Atom B is for Bomb Book 2)

Patrick Bruskiwich

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This is the second book in the A is for Atom B is for Bomb series. This book is about Fat Man the implosion atom bomb that had a solid core of Plutonium 239.

In this book the chemistry of Plutonium will be introduced as well as the basic physics of a spherical core and the basic manner in which Fat Man worked.

Fat Man was the second type of atom bomb developed by the Allies in 1943 to 1945. The first type was Little Boy. Little Boy was dropped on the Japanese wartime target of Hiroshima on August 6th, 1945. Three days later Fat Man was dropped on the Japanese wartime target of Nagasaki on August 9th, 1945. The two atom bombs, dropped in quick succession, was enough to convince that the Empire of Japan should accept the Allie's terms of unconditional surrender and cease hostilities with the 50 nations then at war with Japan.

The first type of atom bomb was Little Boy, which was a gun-type atom bomb which used a core of highly enriched Uranium-235 (H.E.U.). The second type, Fat Man, used a core of Plutonium – 239 (Pu239), which required a different technique to form a critical mass.

The man made element Pu239 cannot be used in a gun-type atom bomb because of its high spontaneous fission and alpha particle emission rate which would cause pre-detonation (and a fizzle) in a Little Boy type atom bomb (this is explained in the first volume of the A is for Atom B is for Bomb series).

The gun-type quickly assembled a critical mass of H.E.U. but did not compress or change the density of the H.E.U. A different technique needed to be developed if Pu239 were to be used in an atom bomb. The technique was to compress, or implode a spherical or sub-critical mass of Pu239, so that it became supercritical. It took over twelve months of concerted effort in 1944 and 1945 before implosion became a viable technique.

Before a full yield test was done of the Fat Man design on the Trinity test of July 16th, 1945, sub-critical assembly tests were done studied using high speed x-ray cameras. A full yield test of Fat Man was needed to ensure that the design functioned as expected (in comparison, the Little Boy design only needed sub-critical assembly tests – 'Tickling the Dragon' – before being deployed for use against the wartime target of Hiroshima).

Compared to Little Boy, which was a simple design, Fat Man was a feat of great scientific and engineering ability. The greatest secret of Fat Man was not the spherical core, or even to a great extent the initiator at the core of the design, the greatest secret was how implosion was undertaken, using shaped charges and a layered design to the assembly.

By the time that Japan surrendered much of the secrets to Fat Man had already been stolen by Soviet spies. In a subsequent volume of the A is for Atom B is for Bomb series we shall look at the Atomic Bomb spies and the secrets that they gave to the Soviet Union.

The development of the implosion mechanism was a challenging scientific and technical task. A little of the history of the development of the moderated neutron initiator (the “Urchin”) is also described.

The development and physics of the shaped charges is described in passing in this volume but will be touched upon in greater detail in a future volume of the Atom B is for Bomb series.

The final chapter of this book is about the “Demon Core.” I will leave you to read that story.

The first volume in the series was The Story of Little Boy. A third volume of the series is in the works.

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