THE DEVELOPMENT AND DEPLOYMENT OF THE ATOMIC BOMBS

‘THAT AWFUL CLOUD’

During the Second World War the United States government funded an immense, and secret, research programme aimed at creating an atomic bomb. The programme achieved success in July 1945 through the collaboration of thousands of physicists and engineers. Together, they had built a weapon that could destroy a city.

Early in 1939, the global scientific community learned that German physicists had recently split an atom of uranium. For many scientists outside Germany, particularly those who had fled the Axis powers, the possibility that Hitler’s regime could develop atomic weaponry was horrifying and they acted to make the US government aware of this potentially grave danger.

A call to arms

In October 1939, the American president, Franklin Roosevelt, received a letter from a group of scientists led by the Hungarian-born physicist, Leo Szilard, and Albert Einstein. The letter warned the president that ‘extremely powerful bombs’ could be developed as a result of the German discovery and it encouraged him to support uranium research in the USA. Although Roosevelt was initially cautious, the letter led the American government to fund an investigation into uranium and its potential uses as a weapon. Over the following years, particularly from 1942, this research became increasingly important to the US war effort.

Since one early component of the research programme was based in the US army’s Manhattan District, the name Manhattan Project eventually stuck, though work was carried out in: Los Alamos National Laboratory, New Mexico (for security reasons, this was the principal facility): Oak Ridge, Tennessee; Hanford, Washington; Chalk River, Ontario; and several other sites. One important site was the metallurgical lab in the University of Chicago, where a team led by Enrico Fermi engineered the first controlled nuclear-fission chain reaction in late 1942.

That autumn, Brigadier General Leslie Groves, an army engineer, was made director of the Manhattan Project and he chose the physicist J. Robert Oppenheimer to lead the research at Los Alamos. By summer 1944, the project employed around 130,000 people: mostly builders, factory workers and military personnel, as well as scientists and engineers from leading universities and industrial research labs.

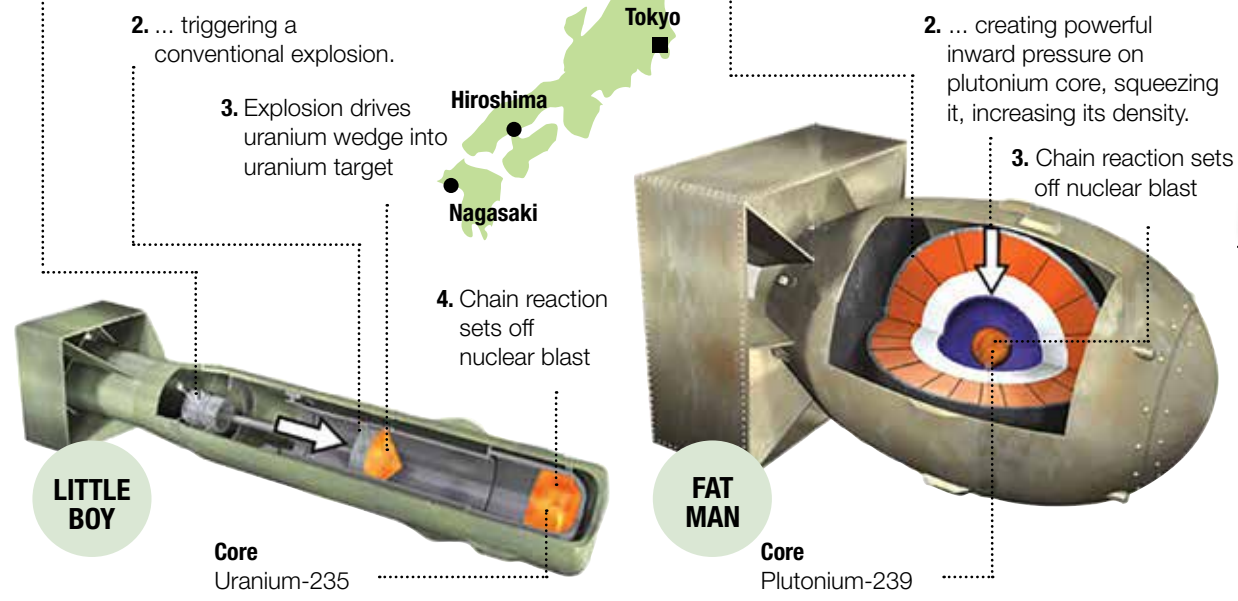
Little Boy and Fat Man

The Manhattan Project’s lead scientists settled upon two designs, each using different materials – uranium-235 and plutonium-239 – and each given cartoonish nicknames that belied their ultimate use.

The first design led to the bomb that would be used against Hiroshima. Called ‘Little Boy’, despite the fact that it weighed over 4,400 kilogrammes, it was a gun-type nuclear-fission bomb (see graphic). At one end of the bomb was a uranium-235 target shaped like a sphere with a conical wedge removed from it. At the other end was a cone-shaped bullet of uranium-235 with its point toward the target. To detonate the bomb, a charge of cordite fired the uranium bullet into its target. The force of the impact welded the two pieces of uranium together, creating a critical mass and an explosion of 15 kilotons.

This means that the bomb’s explosive power was equal to 15,000 tons of the chemical explosive TNT, far beyond the power of conventional weapons. For example, in 2017 the US air force used the GBU-43/B Massive Ordnance Air Blast (popularly known as the ‘mother of all bombs’) in Afghanistan. That bomb, widely considered to be one of the most powerful non-nuclear weapons ever deployed, had an equivalent blast power of about 11 tons of TNT.

The second design led to the bomb nicknamed ‘Fat Man’ (see graphic), which was later dropped on Nagasaki. Unlike Little Boy, Fat Man was built around plutonium, not uranium. Scientists had originally envisioned building a bomb that contained the same gun-type detonation method as Little Boy. However, testing made it clear to the designers that this method would not be suitable, as the plutonium reaction proved hard to control. Instead, the Fat Man bomb would use an outer ring of explosive charges that fired simultaneously and compressed the plutonium core with enough pressure to produce a nuclear explosion.



The relative complexity of the plutonium bomb caused so much concern among the project’s scientists that a trial run of the design was scheduled for 16 July 1945 – the so-called Trinity Test. On that day, at Alamogordo in New Mexico, the viability of Fat Man’s design was proven and the world witnessed its first atomic bomb blast. The plutonium bomb that was subsequently used against Nagasaki was larger, more efficient and of greater destructive power than the Hiroshima bomb – it weighed 4,670 kilogrammes and released the energy of about 21,000 tons of TNT.

Dropping the bombs

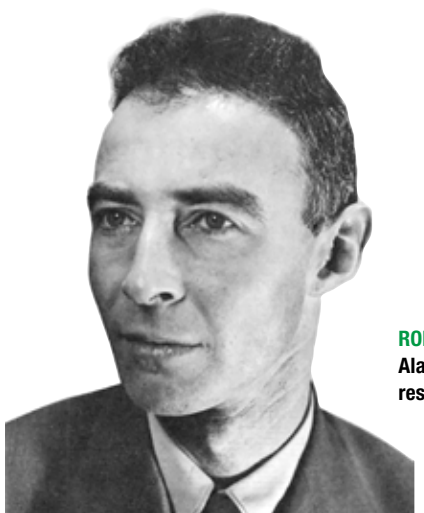
Little Boy, was dropped over Hiroshima on 6 August 1945, with Fat Man deployed over Nagasaki three days later. In both instances the bombs exploded over 500 metres above their target, so as to maximise the blast damage.

Large areas of both cities suffered almost complete destruction. In Hiroshima, an area within 2.5 kilometre radius of the hypocentre (the point directly beneath the explosion) was devastated – the only surviving structures were a small number of badly damaged reinforced-concrete buildings. The blast caused thousands of fires, which quickly merged into an immense firestorm of the type that had devastated Tokyo and Dresden earlier in 1945. Around 70,000 people were killed by the bomb blast or the subsequent fires.

In Nagasaki, the most heavily damaged area was within a radius of two kilometres of the hypocentre. Unlike the broad flat delta on which Hiroshima is located, Nagasaki stretches along a twisting valley bounded by hills that protected many parts of the city from the blast. Nevertheless, an estimated 40,000 were killed in the city that day.

In both cities, the initial radiation emitted within in a minute of the explosion was lethal as far as 1.3 kilometres from the hypocentre. In that zone, most people were immediately killed or died within a few days. Others, who initially appeared to have escaped injury, became ill and died over the following weeks and months. Indeed, many scientists estimate that the fatality rates in each city at least doubled over the next five months, bringing the combined death toll to over 200,000 people by the end of 1945. The ultimate death toll may never be known.

In 1937, the world had been appalled by the German bombing of Guernica during the Spanish Civil War. That raid killed around 300 people. Only eight years later, humanity’s technological prowess had increased to such an extent that a single aircraft could drop one bomb and incinerate tens of thousands of people in an instant.



ROBERT OPPENHEIMER was director of the Los Alamos Laboratory and oversaw the scientific research that led to the atomic bombs.

■ **IAN KENNEALLY**
Editor of *The Revolution Papers*

Next week, Part 90

Year by year: 1946
In January 1946, the United Nations holds its first General Assembly in London. Irish newspapers welcome this new organisation and their enthusiasm is matched by that of the Irish government, which makes a formal request to join the United Nations. However, the government soon discovers that Ireland has powerful enemies that will frustrate the country’s efforts to re-establish itself on the world stage.

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