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If It Happened Here: The Impact of a Nuclear Bomb on Adelaide

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Introduction:

On August 6th, 1945, the world changed forever. The United States dropped an atomic bomb on the city of Hiroshima. The bomb was known as "Little Boy", a 'uranium gun-type bomb that exploded with about thirteen kilotons of force'(Atomic Heritage Foundation, 2014). Thousands of people have been killed in an instant and the city was reduced to ashes. Just three days later, a second bomb, 'a 21-kiloton plutonium device known as Fat Man' (Atomic Heritage Foundation, 2014), have exploded in Nagasaki, causing similar damage. Together, these bombings marked the first- and only-time nuclear weapons have being used in war, and their impact is still felt today .

Eighty years ago, we remembered the horrors from this event, not just history but as a warning. What if such devastation happ20ened here? What if a nuclear bomb exploded in Adelaide?

Through this article, the science behind the impact from nuclear bombs will be investigated, using Hiroshima and Nagasaki as case studies. Through studying the radiation fallout, environmental effects and health impacts from those who experienced the explosion, the physical damage will be understood. But beyond the science, the ethical responsibilities and the urgent need for peace in our world will be reflected in this text.

The science behind the bomb

Before a nuclear bomb could be released, they first have to be tested and checked on what was contained in them. Here are more detailed descriptions of the Hiroshima and Nagasaki bombs as case studies to give an insight on what a nuclear bomb may contain:

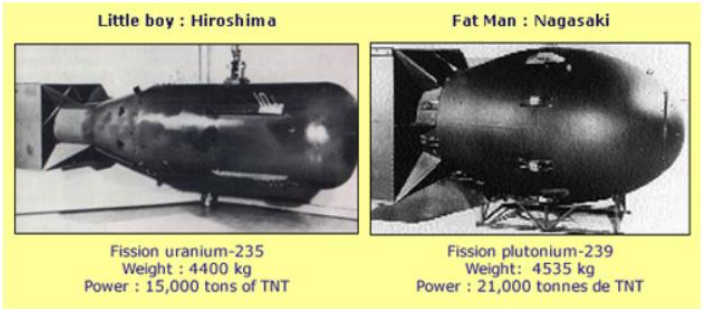

***Figure 1**: Visual representation of nuclear bombs 'Little Boy' (left) and 'fat man' (right), (RadioActivity.eu.com, n.d.)*

The Hiroshima bomb (Little Boy) was made from highly enriched uranium 235. This was prepared by 'diffusion enrichment techniques using the very small differences in mass of the two main isotopes: U-235 (originally 0.7% in the uranium) and U-238, the majority' (World Nuclear Association, n.d.). As for UF_6,(Uranium hexafluoride), there is only one percent difference in mass between the molecules, enabling concentration of the less common isotope. About 64 kilograms of enriched uranium was used in the bomb which had a 16-kiloton yield (equivalent to 16,000

tonnes of TNT) and it destroyed 90% of the city. The Nagasaki bomb (Fat Man) was provided with about 6.2 kilograms of plutonium -239 (less than 90% of Pu-239). The preparation for the bomb depend ed on the operation of special nuclear reactors. During 1942, the first human designed reactor had being constructed at the University of Chicago. It used highly purified graphite to slow the neutrons released in fission for further fission. The creation of the first reactor led to more substantial production reactors at Handford. These reactors generated plutonium -239 that could be separated by chemical methods without isotope separation.

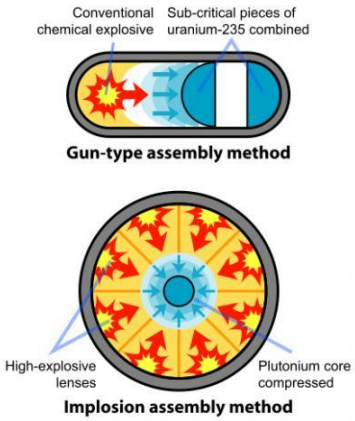

***Figure 2**: A diagram of different methods to assemble an atomic bomb (Atomic Heritage Foundation, 2014).*

This suggest that the nuclear bomb that detonates on Adelaide would have high concentration of Uranium-235 or Plutonium-239, or some combination of these elements because they undergo fission. Fission occurs when a neutron strikes nucleus of either isotope, splitting the nucleus into parts and releasing tremendous amount of energy. This process is continuous as neutrons produce by splitting of atom strike nearby nuclear, producing more fission, creating a chain reaction. This is the cause of an atomic explosion.

The radiation effects from the nuclear bomb

The most immediate effect of a nuclear bomb is an intense burst of direct radiation, mainly from gamma rays and neutrons. The radiation lasts just under a second and is produced directly by the weapons nuclear reactions. The lethal direction radiation extends nearly a mile from a 10-kiloton explosion. Like most nuclear weapons, other effects are more significant because of their broader range, except for a neutron, an

***Figure 3**:A photo of a 'rapidly expanding' fireball from a Nuclear Bomb explosion, (The Mit Press Reader, 2021)*

enhanced radiation weapon that maximises radiation and minimizes blast and heat.

An exploding nuclear bomb instantly vaporise itself, turning into gas hotter than the Sun's 15-million-degree core. This gas 'radiates its energy in the form of X-rays, heating the surrounding air, creating a 'rapidly expanding fireball that can be 1 mile in diameter after 10 seconds from a megaton blast' (The Mit Press Reader, 2021). The fireball glows brightly from its own heat, so much that the early stage of a 1 megaton fireball are many times brighter than the Sun, even from 50 miles away. The glowing fireball also radiate heat, so intense that it can cause severe burns on exposed flesh far as 20 miles from a large explosion. Two thirds of Hiroshima survivors showed evidence of those burns.

***Figure 4**: A representation of severe burns on one of the Hiroshima survivors (The Mit Press Reader, 2021).*

If such an event happens in Adelaide, the people who live here would also experience these radiation disasters. They too, will be killed immediately from the thermal radiation, and those who survived, would face intense burns and radiation, just like the citizens in Nagasaki and Hiroshima. Even people in underground shelters face death due to lack of oxygen and carbon monoxide poisoning (ICAN, n.d.).

The Ethical responsibilities of scientists

The scientists that contribute to nuclear bomb testing and creation, would have ethical responsibilities from the impact and death their bomb caused when launched in Adelaide, because even though they didn't launch the bomb, they are still responsible unless they actively oppose or attempt to limit its harm (Green Left, 2023). One of the ethical responsibilities is that the scientists from the country or region that wanted to bomb Adelaide, would be responsible because of their decision making. If an organisation was planning to bomb Adelaide, the scientists in that organisation won't just have the knowledge to build the nuclear bomb; but understand the consequences and damage afterwards This meant that if the bomb was launched, then the scientist would be responsible because it was their decision and moral choice to contribute to the project, rather than advocating to cancel the launch. This also raise an ethical dilemma: Should scientist continue with the knowledge and invention regardless of potential harm, or do they have a moral duty to stop if their work was used for violence?

Another ethical responsibility that if a country was to drop a nuclear bomb on Adelaide, the scientist behind that weapon have is to consider moral consequences. This is because that the people in Adelaide, aren't just targets for a nuclear war; they have values, fears and beliefs. The fact that Nagasaki was home to many Japanese Christians, are religion shared by Americans, was overlooked when choosing the city as a target. This give a valid reminder to scientists to never allow their work to be used without questioning its moral impact (Green Left, 2023).

The Call for Peace

The immense damage of Hiroshima and Nagasaki servs as a powerful warning. If a nuclear bomb hits Adelaide, then its people, land and future generations would suffer from lasting consequences. Therefore, it is important to prevent nuclear attacks on Adelaide, and to entirely reject the use of nuclear weapons.

Recognising this, the international community have significant efforts to prevent a nuclear disaster from happening again. Campaigns like the International Campaign to Abolish nuclear weapons (ICAN) is a 'coalition of non-governmental organizations promoting adherence to and implementing of the United Nations nuclear weapon ban treaty' (ICAN, n.d.). Their call for action is to invite people to their campaign and they have an ICAN's Cities Appeal to protect cities. They believe that these cities can be activated to commemorations for protection and to highlight the catastrophic dangers nuclear weapons due to their citizens. In February 1970, Australia signed the Treaty on the Non-Proliferation of nuclear weapons (NPT), committing to not acquire nuclear weapons, and stick to strong non-proliferation obligations. By signing up to these international treaties and committees aimed to prevent nuclear weapon use, countries demonstrate a strong commitment to global peace and security. These agreements help build trust between nations, prevent dangerous wars and show the world that peace is a priority worth valuing.

Scientists, governments and citizens all share an ethical responsibility to advocate for peace and prevent use of these weapons. True safety comes from peaceful cooperation between nations. Every voice raised against nuclear threats matters, whether through protests, social media posts or an email to the government. We must remember that people are not targets. Behind every city are family, children, and individuals with dreams, feelings and futures. Humanity must unite to resolve conflicts without violence, protecting innocent lives and securing a future free from nuclear disasters. By choosing peace over war, we ensure that no city – Adelaide or anywhere else- ever face such destruction again.

Conclusion

The devastating power of nuclear weapons is a stark reminder of the fragility of human life and the importance of responsible science and political decision making. Studying the impacts of Hiroshima and Nagasaki teaches us not only the destructive capabilities of these weapons but also about the immediate need for ethical reflection and global peace efforts. As we imagine the consequences of such a disaster in Adelaide, we are encouraged to commit ourselves to a future where nuclear weapons are never used again, and peace, kindness and humanity lead our actions above anything else.

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