

Bat bombs:

A Compromise between Project Downfall and The Manhattan Project.

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Bat bombs (also known as project X-ray), was a 2 million dollar¹ could-have-been compromise of an unheard of proposal. A bat bomb is a pill-shaped casing with multiple compartments in which hundreds of bats rest in a hibernative state with tiny explosives tied around the bat's neck.² This proposal (Project X-ray) was a viable alternative to the Manhattan Project. Project X-ray would have had devastating effects on Japan without the radioactive damage of the two atomic bombs. The power of the atomic bombs ended up causing many more civilian deaths than necessary. These bombs killed / injured over 200,000 innocent civilians³, and caused many health problems from the unnecessary radiation. Bat bombs, though less powerful than the atomic bombs, would have likely inflicted quite a bit of damage (setting fire to buildings), which could have possibly scared Japan enough to surrender without killing and harming as many innocent people as the atomic bombs did.

Bat bombs were first thought up by a dentist who lived in Irwin Pennsylvania.⁴ Lytle S. Adams first thought up the idea when he heard about the Japanese attack on Pearl Harbor.⁵ Adams at the time was in Mexico,

¹ Alexis C. Madrigal "Old, Weird Tech: The Bat Bombs of World War II." The Atlantic. April 14, 2011. Accessed January 30, 2018. <https://www.theatlantic.com/technology/archive/2011/04/old-weird-tech-the-bat-bombs-of-world-war-ii/237267/>.

² Giaimo, Cara. "The Almost Perfect World War II Plot To Bomb Japan With Bats." Atlas Obscura. February 27, 2016. Accessed January 31, 2018. <https://www.atlasobscura.com/articles/the-almost-perfect-world-war-ii-plot-to-bomb-japan-with-bats>.

³ "The Manhattan Project and the atomic bomb." Khan Academy. Accessed February 01, 2018. <https://www.khanacademy.org/humanities/ap-us-history/period-7/apush-us-wwii/a/the-manhattan-project-and-the-atomic-bomb>.

⁴ Alexis C. Madrigal "Old, Weird Tech: The Bat Bombs of World War II." The Atlantic.

⁵ Giaimo, Cara. "The Almost Perfect World War II Plot To Bomb Japan With Bats."

fascinated by the Mexican Free-Tailed Bat migration. These bats can withstand high pressures, and are stronger than normal bats, ⁶which explains his interest in them.⁷ Around a month later, (January 12, 1942), he sent his idea to the White House. Bat bombs; an attack and bombing strategy that involves attaching tiny incendiary bombs to bats to destroy Japan.⁸ *"Think of thousands of fires breaking out simultaneously over a circle of forty miles in diameter for every bomb dropped, Japan could have been devastated, yet with small loss of life,"* Adams later recalled. ⁹

Adams also just happened to know the first lady of that time, which was Eleanor Roosevelt. Therefore, despite his idea being rather strange, he got a large audience rather quickly. His idea was looked at by the National Research Defense Committee, which was in charge of investigating and researching war-worthy weapon ideas. His idea was then forwarded to Donald Griffin, who had experience with doing work with bats in the past.¹⁰ He conducted work on bat's echolocation strategies.¹¹ Griffin was very excited and on board for this project idea.¹²

"This proposal seems bizarre and visionary at first glance," wrote Giffin in April 1942, *"but extensive experience with experimental biology convinces the*

⁶ Giaimo, Cara. "The Almost Perfect World War II Plot To Bomb Japan With Bats."

⁷ Alexis C. Madrigal "Old, Weird Tech: The Bat Bombs of World War II." The Atlantic.

⁸ Giaimo, Cara. "The Almost Perfect World War II Plot To Bomb Japan With Bats."

⁹ Giaimo, Cara. "The Almost Perfect World War II Plot To Bomb Japan With Bats."

¹⁰ Alexis C. Madrigal "Old, Weird Tech: The Bat Bombs of World War II." The Atlantic.

¹¹ Drumm, Dr. Patrick, and Christopher Ovre. "A Batman to the Rescue ." Monitor on Psychology. April 2011. Accessed January 31, 2018. <http://www.apa.org/monitor/2011/04/batman.aspx>.

¹² Alexis C. Madrigal "Old, Weird Tech: The Bat Bombs of World War II." The Atlantic.

writer that if executed competently it would have every chance of success." A Presidential memorandum followed Griffin's lead and concluded, "This man is not a nut. It sounds like a perfectly wild idea but is worth looking into."¹³ And because of these statements, Lytle S. Adams idea became a reality, and turned into a U.S government research project. Adams was given funds to start and explore this idea of his, and had a team (including Giffin) to investigate what bats would be best for the bomb. The team decided on Mexican Free-Tailed Bats, the exact species that inspired this idea. These bats are much stronger than the average bats, they can withstand much higher temperatures and can go farther up in the air, (withstanding lower pressures), which is why they chose them.

Adams and his team caught hundreds of them at some caves in New Mexico that stretch into Texas, then sent the bats back to Washington in refrigerated trucks. After they got back to Washington, a few more problems remained. Now that they had these bats, they needed the small explosives to go around the bats necks and the casing to transport all the bats in. Adams and his team gave this challenge to Dr. Louis Fieser, who was best known as the inventor of military napalm.¹⁴ Military napalm is a flammable liquid that is a mix of a gelling agent and gasoline, which is still used in warfare to this day.¹⁵ This was a bit of a challenge for Fieser, because the bombs had to be light

¹³ Drumm , Dr. Patrick , and Christopher Ovre. "A Batman to the Rescue ."

¹⁴ Giaimo, Cara. "The Almost Perfect World War II Plot To Bomb Japan With Bats."

¹⁵ "Napalm | Definition of napalm in English by Oxford Dictionaries." Oxford Dictionaries | English. Accessed January 31, 2018. <https://en.oxforddictionaries.com/definition/napalm>.

enough for the bats to carry, but couldn't contain reagents that reacted with oxygen, as the bats still had to breath without setting on fire. Fieser ended up with a pill shaped case made of nitrocellulose¹⁶ (also known as gun cotton) and filled with kerosene. A different capsule on the side of the bomb held a firing pin, which was then separated from the cartridge by a very thin steel wire. The actual bomb casing, based off of a design by Adams, looked like any regular bomb. But on the inside, the bomb was outfitted with a parachute along with heating and cooling controls, and filled with racks and racks of cardboard trays to hold exactly one thousand and forty bats. You would load the bombs into their compartments, and these compartments were outfitted with explosives. The cooling system would then kick in, getting it incredibly cold and tricking the bats into thinking it's hibernation time. With the bats sleeping, a plane would then fly the bats over to Japan, then the bomb would drop from out of the plane. The parachute would open and the bats would be jarred awake. The bats would then fly out, go roost in big buildings, chew off the string connecting them to their explosives, and the explosives would explode as the bats fly away.¹⁷ Japan would be destroyed, burned to the ground with the help of these little creatures once seen as harmless. By this time, the military had renamed the project, "Project X-Ray."¹⁸

After Adams and his team got the mechanics of the bomb out of the way, they then started some tests on the project. For these tests, Adams team set up

¹⁶ Giaino, Cara. "The Almost Perfect World War II Plot To Bomb Japan With Bats."

¹⁷ Giaino, Cara. "The Almost Perfect World War II Plot To Bomb Japan With Bats."

¹⁸ Alexis C. Madrigal "Old, Weird Tech: The Bat Bombs of World War II." The Atlantic.

fake Japanese villages and used bat bombs to see how much they could destroy. Some went very well, while others did not. For example, they ran a trial run at Utah's Dugway Proving Grounds that resulted in partial destruction, while the bats participating in a test at the Carlsbad Army Airfield ended up escaping with their bombs and dropping them on an Army Air Base, causing them to set fire.¹⁹ There were many more tests scheduled, but they were pushed off. After 30 demonstrations and 2 million dollars spent, Project X-Ray was canceled around December 1943.²⁰ They weren't canceled because of the bombs lack of function, but because all materials going towards Project X-Ray and all materials for bombs in general got redirected towards the Manhattan Project, which was producing the atomic bomb.²¹

On August 1945, The United States sent out two atomic bombs over the Japanese cities of Hiroshima and Nagasaki, killing around 200,000 people. The president of the time, Harry S. Truman, authorized the use of these bombs in an effort to help Japan's surrender. In the next few days after the bombings, Japan surrendered.²² The atomic bomb did its job, but with many innocent deaths that should not have taken place on those two days. Because of how many useless deaths and the long term health effects on the few people who survived, it didn't seem like the best alternative to getting Japan to surrender when there could have been a less harmful compromise between Project X-Ray

¹⁹ Giaimo, Cara. "The Almost Perfect World War II Plot To Bomb Japan With Bats."

²⁰ Alexis C. Madrigal "Old, Weird Tech: The Bat Bombs of World War II." The Atlantic.

²¹ Giaimo, Cara. "The Almost Perfect World War II Plot To Bomb Japan With Bats."

²² "The Manhattan Project and the atomic bomb." Khan Academy.

and The Manhattan Project that could have worked just as well. Let's look at the long term effects of the atomic bombs.

Around 200,000 people died from three major reasons: either from the explosive blast, the massive fire it started, or from acute radiation poisoning. Acute radiation poisoning is caused by exposure to a large amount of radiation. These two bombs were the only atomic bombs ever used in war so far. Around half of the of people who survived the bombings took part in some studies tracking their overall health through their entire lifespan and the effects that are caused from the radiation. The project has kept track and studied around 100,000 survivors, 77,000 of their children, and 20,000 people who were not exposed to radiation. Though most survivors didn't develop cancer, they had a much higher chance to.²³ Female survivors and younger people had a higher risk of developing cancer than males and older people. Those who were exposed to a higher radiation (1 grey-1,000 times the safe levels) had a 44% percent higher risk to developing cancer than those who did not. The incredibly high dose reduced the average lifespan by around 1.3 years.²⁴ Many other health problems from the atomic bombs include blood disorders, cataracts, malignant tumors, and keloids.²⁵ Bat bombs could have been a way to avoid this.

²³ Genetics Society of America. "Long-term health effects of Hiroshima and Nagasaki atomic bombs not as dire as perceived." ScienceDaily. August 11, 2016. Accessed February 01, 2018. <https://www.sciencedaily.com/releases/2016/08/160811120353.htm>.

²⁴ Genetics Society of America. "Long-term health effects of Hiroshima and Nagasaki atomic bombs not as dire as perceived." ScienceDaily.

²⁵"Long Term Effects on Humans." Long Term Effects on Humans | Effects of Nuclear Weapons. 2015 . Accessed February 01, 2018. <http://www.atomicarchive.com/Effects/effects16.shtml>.

At the time, there were two options available to get the Japanese to surrender. Option one was a full invasion. Operation Downfall was its name. Operation Downfall was an all-American operation, and would have required the entire Marine Corps, all of the Pacific Navy, and many others.²⁶ William Daniel Leahy (who was the Chief of Naval Operations and was partly in charge and just all together helped with major military decisions)²⁷ estimated that over 250,000 American soldiers would have been killed or wounded in Operation Downfall.²⁸ The second option would be sending the atomic bombs, and we all know how that turned out. Thousands of innocent people were killed and the ones who lived were left with many medical issues.²⁹ Bat bombs was a compromise between those two options. Bat bombs could have left hundreds of people unharmed and still could have had devastating effects on Japan which could have possibly left the same effect of the atomic bombs, Japan's surrender.

²⁶ Clements USAF ret., Brig. Gen R. "An Invasion not found in History books." Invasion of Japan. September 16, 2006. Accessed February 01, 2018. <http://www.kilroywashere.org/006-Pages/Invasion.html>.

²⁷ "Fleet Admiral William D. Leahy." Naval History and Heritage Command. July 15, 2015. Accessed February 01, 2018.

<https://www.history.navy.mil/browse-by-topic/people/chiefs-of-naval-operations/leahy.html>.

²⁸ Clements USAF ret., Brig. Gen R. "An Invasion not found in History books." Invasion of Japan.

²⁹ "Long Term Effects on Humans." Long Term Effects on Humans | Effects of Nuclear Weapons.

Annotated Bibliography

Primary Sources:

Bat Bomb: World War II's Other Secret Weapon, by Jack Couffer, University of Texas Press, 1992

This is a book I read in a university library. Though I did not use any info I read from this book on my paper, this was a very good book to learn some background knowledge about Bat bombs. It was a bit hard to understand, there lots of big words I didn't know. It mostly talked about, in quite a bit of detail, the origins of Bat bombs.

Secondary Sources:

Madrigal, Alexis C. "Old, Weird Tech: The Bat Bombs of World War II." The Atlantic. April 14, 2011. Accessed January 30, 2018.

<https://www.theatlantic.com/technology/archive/2011/04/old-weird-tech-the-bat-bombs-of-world-war-ii/237267/>.

This is one of the sources I used the most to learn about Bat bombs. There are lots of quotes spoken from Adams, and everything is rather easy to understand. Plus, I know that this is a reliable source as it's from a news paper. There are also lots of dates and numbers that are extremely useful, for example , "*After 30 demonstrations and \$2 million spent, the project was canceled.*" I used this quote twice in my paper.

Drumm , Dr. Patrick , and Christopher Ovre. "A Batman to the Rescue ." Monitor on Psychology. April 2011. Accessed January 31, 2018.

<http://www.apa.org/monitor/2011/04/batman.aspx>.

This website spoke a lot about Donald R. Griffin and his role in Project X Ray, along with other studies he has done on bats before and after Project X Ray.

"Griffin went on to recommend some intermediate steps, including locating bats that might serve in the mission, determining their load-bearing capacity and how best to attach the incendiary devices, and ascertaining the best means of transporting and releasing the bats. Griffin even followed up personally on one of his recommendations. He collected a sample of Mexican free-tailed bats at Carlsbad Caverns to test their load-bearing abilities back at Harvard. The curious young Griffin even checked one bat's weight-carrying capacity in his motel room three hours after capturing it."

Giaimo, Cara. "The Almost Perfect World War II Plot To Bomb Japan With Bats." Atlas Obscura. February 27, 2016. Accessed January 31, 2018.

<https://www.atlasobscura.com/articles/the-almost-perfect-world-war-ii-plot-to-bomb-japan-with-bats>.

This is a website that talks a lot about how the explosive part of the Bat Bombs works. It's a bit more difficult to understand, as the words are a bit bigger, but it explains how

the explosives work. *“The whole thing was meant to work like this: To start the clock ticking, technicians would inject a corrosive solution, copper chloride, into the side cartridge, and then clip the bomb to the bat’s chest. They would then load the bats into the trays and the trays into the bomb, cool it down enough that the bats would think it was hibernation time, fly the whole thing to Japan in the belly of a plane, and release the bomb over the target city. In midair, the bomb would set free the trays, which would stay attached to the parachute. The bats would thaw out, wake up, and disperse, settling into nooks and crannies all over the city.”*

"Napalm | Definition of napalm in English by Oxford Dictionaries." Oxford Dictionaries | English. Accessed January 31, 2018.

<https://en.oxforddictionaries.com/definition/napalm>.

This website explains what napalm means, as I didn’t know beforehand. *“A highly flammable sticky jelly used in incendiary bombs and flame-throwers, consisting of petrol thickened with special soaps.”*

"The Manhattan Project and the atomic bomb." Khan Academy. Accessed February 01, 2018.

<https://www.khanacademy.org/humanities/ap-us-history/period-7/apush-us-wwii/a/the-manhattan-project-and-the-atomic-bomb>.

Though an easy website to look through, it provided some great numbers and facts.

“The United States detonated two atomic bombs over the Japanese cities of Hiroshima and Nagasaki in August 1945, killing 210,000 people—children, women, and men.”

Genetics Society of America. "Long-term health effects of Hiroshima and Nagasaki atomic bombs not as dire as perceived." ScienceDaily. August 11, 2016. Accessed February 01, 2018.

<https://www.sciencedaily.com/releases/2016/08/160811120353.htm>.

This website contains quite a bit of medical information about the long term healths effects of the two atomic bombs that hit.

“Approximately 200,000 people died in the bombings and their immediate aftermath, mainly from the explosive blast, the firestorm it sparked, and from acute radiation poisoning.”

"Long Term Effects on Humans." Long Term Effects on Humans | Effects of Nuclear Weapons. 2015 . Accessed February 01, 2018.

<http://www.atomicarchive.com/Effects/effects16.shtml>.

This website shows even more information about the long term effects from radiation on humans. *“Long after the acute effects of radiation have subsided, radiation damage continues to produce a wide range of physical problems. These effects- including leukemia, cancer, and many others- appear two, three, even ten years later.”*

Clements USAF ret., Brig. Gen R. "An Invasion not found in History books." Invasion of Japan. September 16, 2006. Accessed February 01, 2018.

<http://www.kilroywashere.org/006-Pages/Invasion.html>.

This website talks about Operation Downfall and what it was, the people that were involved, how it worked and why it got canceled.

"Fleet Admiral William D. Leahy." Naval History and Heritage Command. July 15, 2015. Accessed February 01, 2018.

<https://www.history.navy.mil/browse-by-topic/people/chiefs-of-naval-operations/leahy.html>.

This website talks about William Daniel Leahy and who he was, and why he was important in operation downfall.