

Week 3 Part 1 - Building The Bomb

Week 3 Part 2 - Using The Bomb

1. Factories
 - Hanford: PU-239
 - Oak Ridge: U-235
 - Both send to Los Alamos to make the bomb
2. Critical Mass
 - Really just boils down to probability
 - At a small enough size, the neutrons from the reaction can just disappear and the probability that it will continue hitting other fissile material will be low so the neutrons will fizzle out
 - Ex: Uranium critical mass is 50 kg
 - When something goes critical, the mass will heat up and expand. If it expands too much, then the probability of neutrons will hit will be even lower
3. Bomb Types
 - Gun-Type Bomb
 - Have 1/2 critical mass in one area with a gun barrel leading to it, then shoot the other 1/2 of critical mass via explosion this way it forms 1 whole critical mass
 - * *ADDING MASS*
 - “Little Boy” used in Hiroshima, Japan w/ ~15,000 tons of TNT
 - Problem: (Summer 1944) Reactor-bred plutonium is *contaminated* with PU-240
 - * PU-240 has high spontaneous fission rate = too many neutrons = **predetonation (fizzle)**
 - Easier to test
 - New Approach: Implosion
 - Have subcritical mass surrounded by explosive material, then explode the outer material to compress the subcritical mass making it critical
 - * *INCREASES DENSITY*
 - Not easy, had to develop method of explosion lenses to redirect explosions down to a sphere applying even pressure on mass
 - Hard to test
4. Trinity Test (July 1945)
 - Tested Implosion Bomb Type
 - Estimated TNT Equivalent: 0 - 45,000 tons of TNT
 - AVG: 4,000 tons of TNT
 - ACTUAL: 20,000 tons of TNT
 - ***Did it impact the ecosystem?***
 - Upon making it into a bomb that can be dropped, it was named **Fat Man**
 - Used on Nagasaki
5. Pros and Cons of Bombs
 - Gun Type (Little Boy):
 - PROS:
 - * Simple design
 - CONS:
 - * Only works with U-235
 - * Need so much U-235, limits how many you can have and how fast you can make them
 - 64 kg of High Enriched Uranium = 15 kt
 - Each kg of HEU releases 17 kt of TNT
 - Only 1% of HEU fissioned
 - Implosion Type (Fat Man):
 - PROS:
 - * Works with PU-239 and/or U-238
 - * Very efficient use of fuel

- CONS:
 - * Design very complicated, reasonable chance of failure
 - 6.2 kg of Pu = 20 kt
 - Each kg of Pu that fissions entirely release 19 kt of TNT
 - So 17% of Pu fissioned! (Efficient!)
6. Potsdam and the bomb
- Last major conference of allied powers in WW2
 - Truman had to talk to Soviets/Stalin about post-war, bomb, and the issue with Poland and it being a Soviet puppet state
 - Soviets don't want to work with US
7. Japan-Soviet Relations
- Soviets were occupied with Nazis so they were neutral with Japan
 - Neutral till 1945
 - Japan:
 - Emperor is a political power, but not in day-to-day operations
 - * Equivalent to constitution, up for interpretation but just paper
 - Knew Japan was not going to win this war, but couldn't go to US and give up
 - * Had to surrender and let US do whatever it wanted, so they thought the US was going to get rid of the emperor
 - * **Wanted to maintain the emperor house**
 - Wanted to use Soviet as a middleman to help negotiate and keep some of these things
 - Soviets:
 - Don't want to be friends with Japan (Japan doesn't know this)
 - Want to declare war with Japan and see what they can get (ie. islands) (Japan doesn't know this)
8. Potsdam Conference, July 1945
- Truman knows all of this info going into the conference
 - Truman began planning for invasion of Japan (not Honshu)
 - Trinity Test happens while the conference is going on
 - Truman is thrilled at the success
 - Truman thinks that using the bomb might scare the Soviets since they don't have one
 - Truman tells Stalin that they have a powerful bomb, Stalin did not show any emotion toward it
- Stalin already knows about the progress, and is weary that the US isn't telling them everything
9. Order to use the bomb, July 25, 1945
- General Spaatz wanted to use the bomb, pushed for it
 - Groves wrote it, Truman saw it
 - Part 1:
 - They want visual bombing because they don't want to miss
 - “After 3 August 1945” so that it's after Potsdam
 - Part 2:
 - They want to keep bombing, if they get more bombs, they'll use them
 - If they need more targets, they'll get them
 - Done for the psychological effect on Japan and to impress upon the world/Soviet
10. Japanese and Soviet Responses
- Soviet:
 - Stalin is initially sad because he thinks the war is going to end so he can't invade Japan/anything
 - Realizes that Japan doesn't surrender immediately, Stalin pushes for invasion
 - Soviet declares war with them and invades Manchuria 1 hour later pressing into Korea
11. Dropping more bombs
- Could produce 3.5 bombs per month
 - Groves to Marshall
 - Was ready to be dropped on August 17 or 18
 - Wasn't an “ask for permission” memo, it was just a courteous memo

- *If Japan didn't surrender, keep bombing*
 - Marshall: “It is not to be released on Japan without express authority from the President”
 - Henry Wallace Diary, 8/10/1945
 - Truman said he had given orders to stop atomic bombing. He said the thought of wiping out another 100,000 people was too horrible. He didn't like the idea of killing, as he said, “all those kids”
 - * Truman thought the military had control and not him now
 - * Truman was severely uninformed, so he took control (didn't know the amount of people who will die, what Hiroshima actually was, and when the next bombing was)
 - $\frac{1}{4}$ of Americans wanted to drop more bombs on Japan due to racism
12. End of war
- Factual Series of Events:
 - Japanese gets invaded by USSR
 - Japanese surrenders to US, so long as they don't touch Imperial House
 - US says no, it was supposed to be unconditional so Truman issues severe fire bombing to show seriousness
 - * US gets ready for third bomb
 - ***Did Japan or forces know about bomb being shipped to Tinian? If so, couldn't someone intercept delivery and build it themselves?***
 - Japanese eventually agrees to unconditional surrender
 - Attempted coup by junior officers in Japan to not end war
 - Fighting between US/Japan end, but war not officially over until Sept. 2 (Soviets take Kurils)
 - * Soviets still fight because technically papers weren't signed
 - If you remove X, Y, and/or Z, will you get the same output?
 - Nagasaki was likely unnecessary
 - Japan surrenders by saying it was because “force of nature” or “human extinction”
13. Orthodox Narrative:
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|------------------------|----------------------------------|
| nature of the decision | careful moral deliberation |
| motivation | end the war as soon as possible |
| outcome | atomic bombs ended the war |
| narrative creators | people involved with the bombing |
14. Revisionist Narrative:
- | | |
|------------------------|------------------------------------------------------------|
| nature of the decision | diplomatic intrigue |
| motivation | scaring the Soviets into submission |
| outcome | atomic bombs weren't necessary to end war, Cold War begins |
| narrative creators | critics of the bombing; often Marxists |
15. **Consensus Narrative:**
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|------------------------|----------------------------------------------------------------------------------------------------------|
| nature of the decision | accumulation of assumptions (no single "decision") |
| motivation | multiple: ending war, scaring Soviets, scaring world, finishing job |
| outcome | atomic bombs probably contributed to end of war, but unclear of contribution compared to Soviet invasion |
| narrative creators | academic diplomatic historians |