

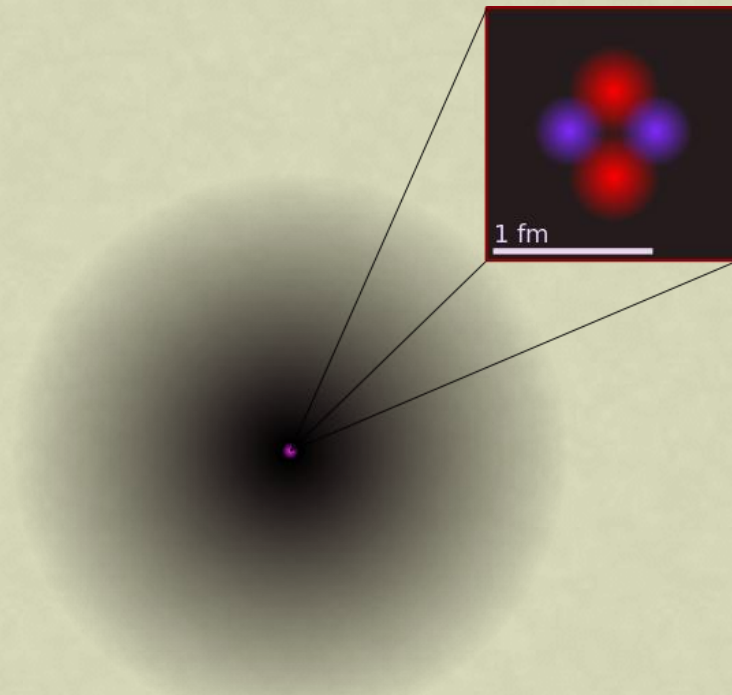
NUCLEAR WEAPONS

HOW THEY WORK
AND WHAT THEY DO (TO YOU)

DR PATRICIA LEWIS

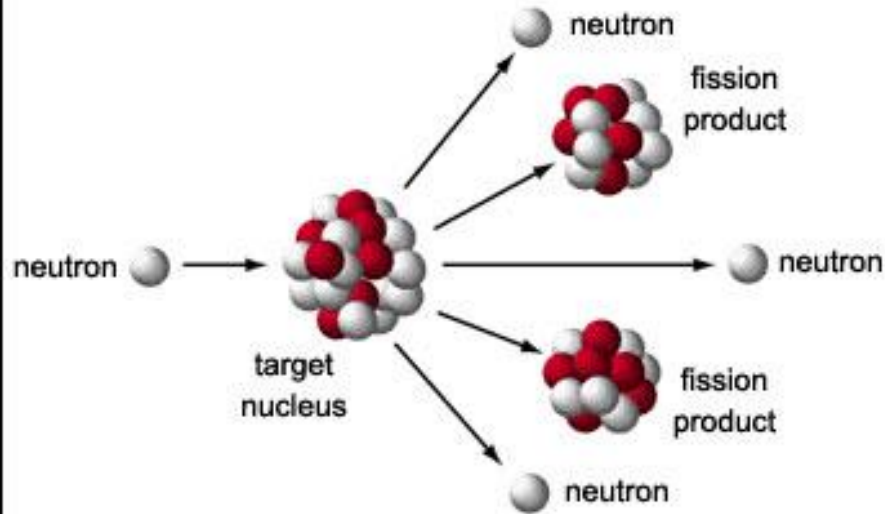


AT THE HEART: THE ATOMIC NUCLEUS



$1 \text{ \AA} = 100,000 \text{ fm} = 1.0 \times 10^{-10} \text{ metres}$. 1 fm is $1.0 \times 10^{-15} \text{ metres}$
(very small)

FISSION & FUSION

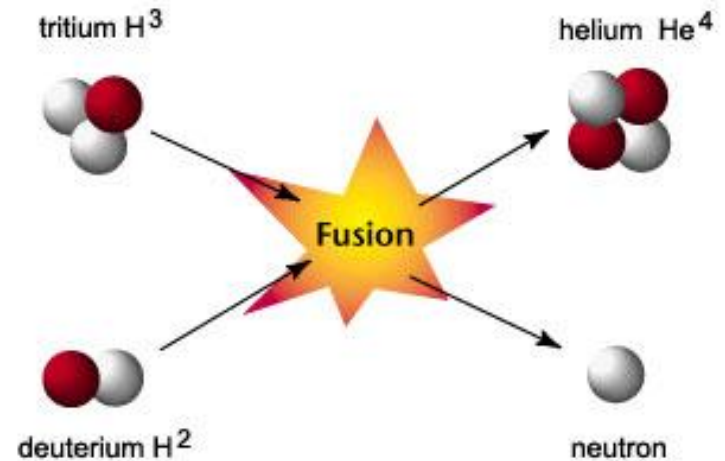


Splitting large nuclei releases energy

$$E=Mc^2$$

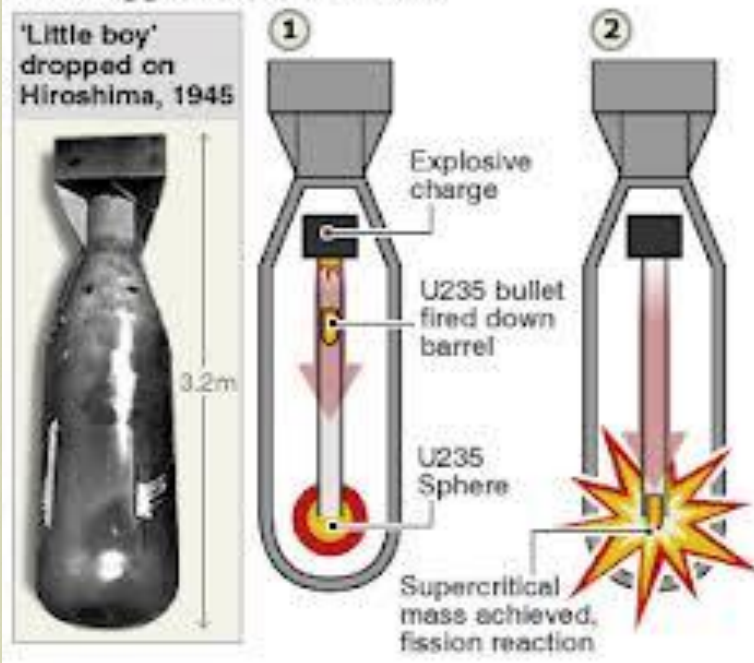
$$E=Mc^2$$

Fusing light nuclear releases energy



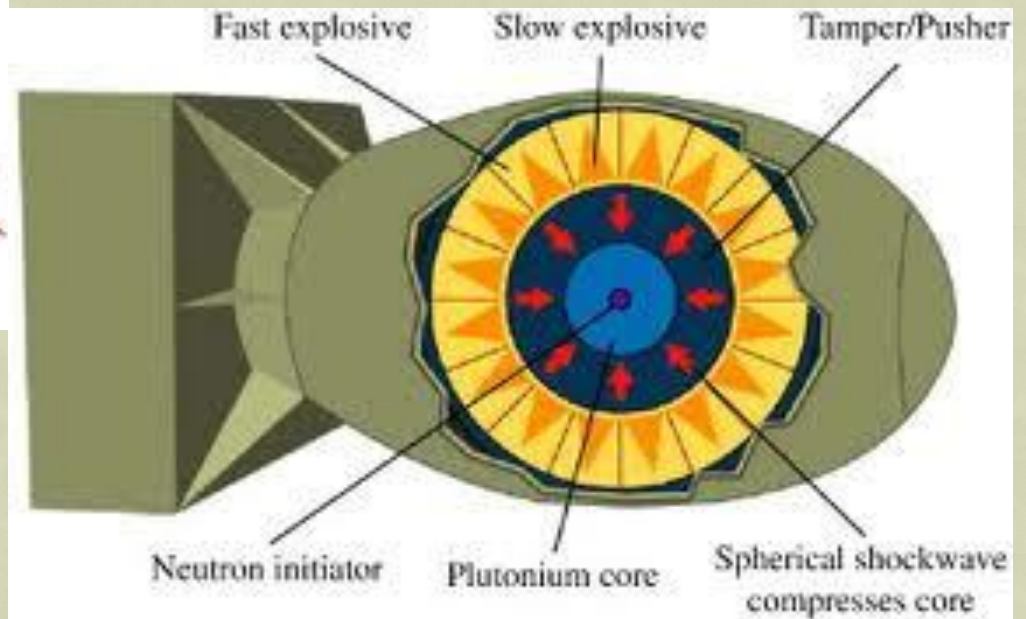
FISSION BOMBS

Gun-triggered fission bomb

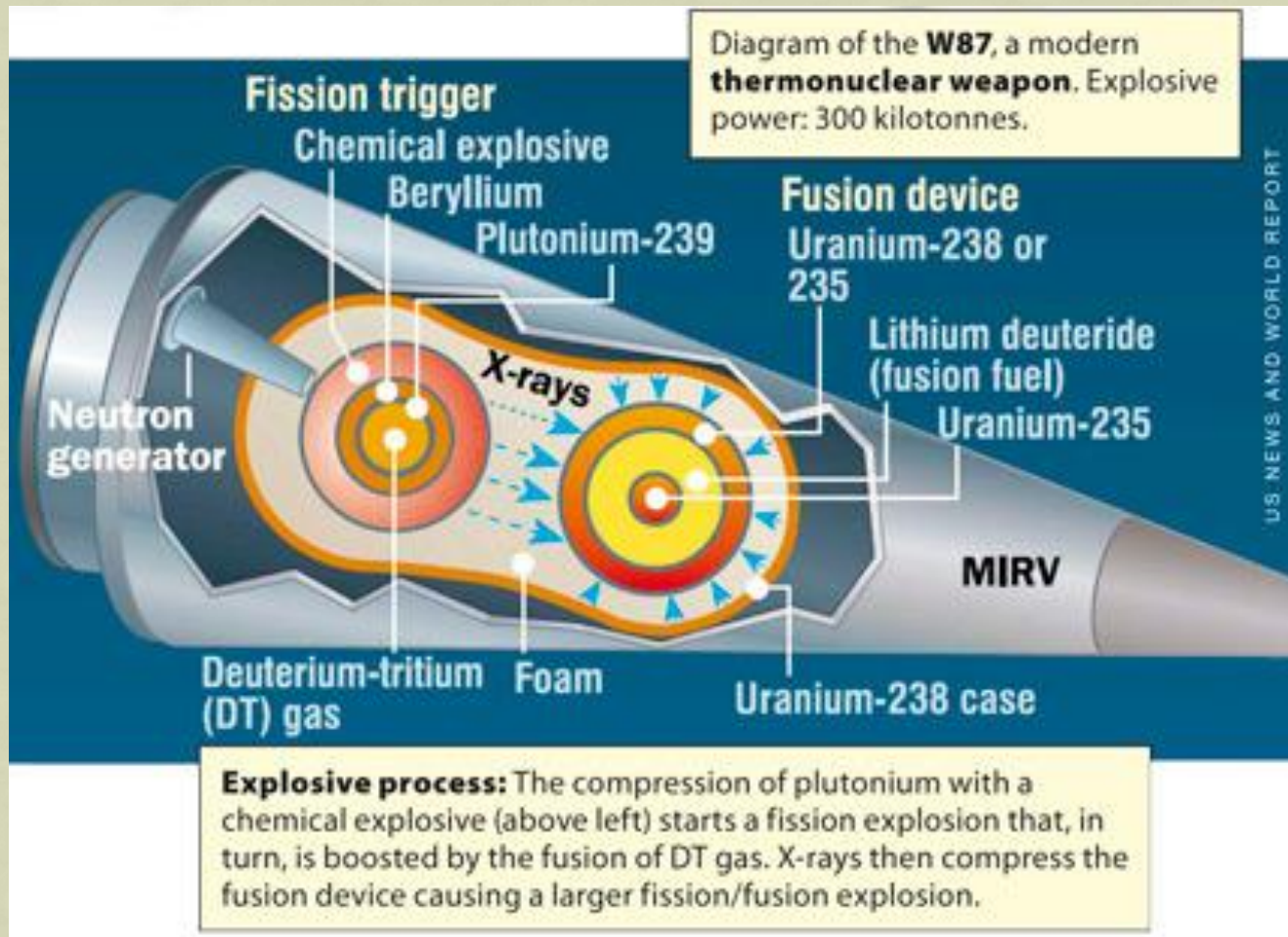


Gun-triggered fission bomb
"Little Boy" dropped on
Hiroshima 1945

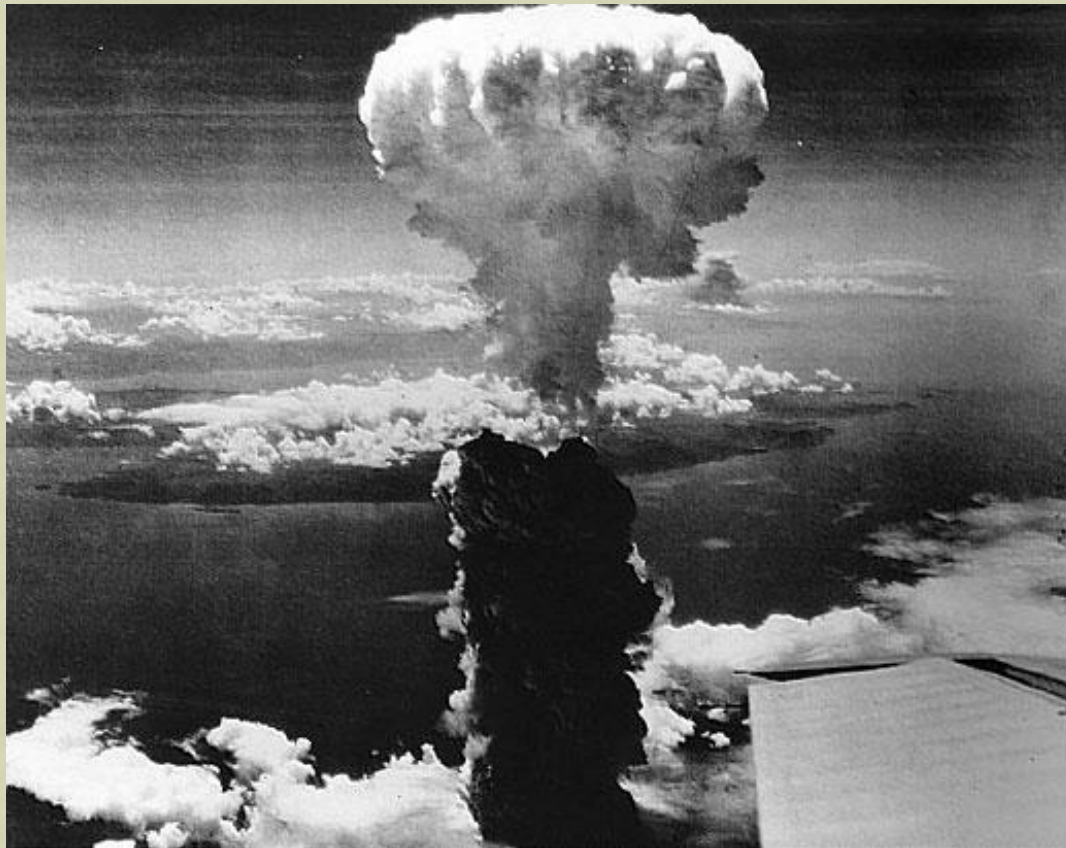
Implosion fission bomb "Fat Man" dropped on Nagasaki 1945



THERMONUCLEAR BOMBS



WHAT DO THEY DO?



Nagasaki 1945

EFFECTS OF NUCLEAR EXPLOSIONS



**Blast energy –
approximately 50% of
the energy**



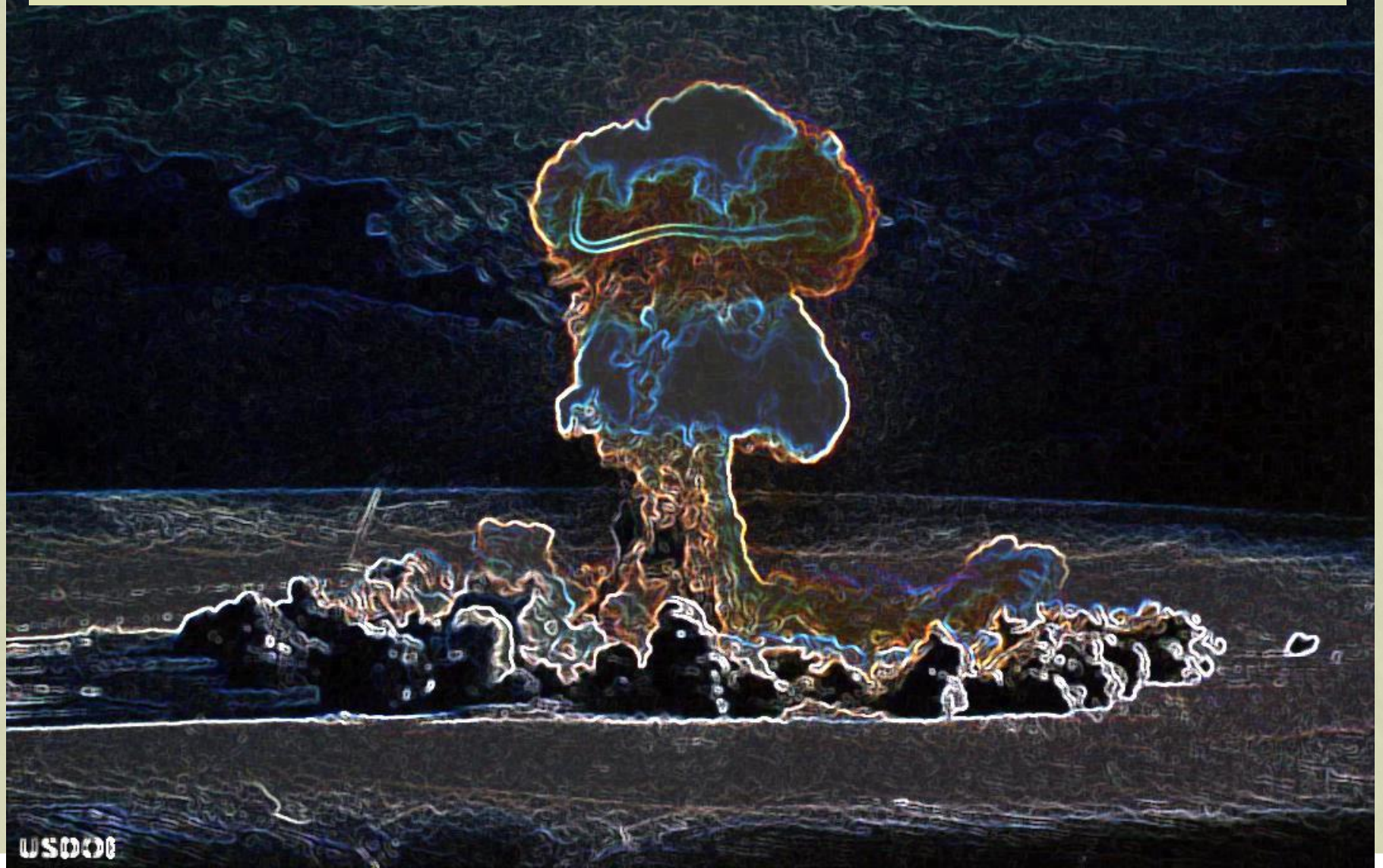
**Thermal radiation –
approximately 35% of
the energy**



**Nuclear radiation –
approximately 15% of
the energy**

- 5% as initial ionizing radiation -
- 10% as residual nuclear radiation in fallout.

FLASH OF LIGHT



PROMPT RADIATION



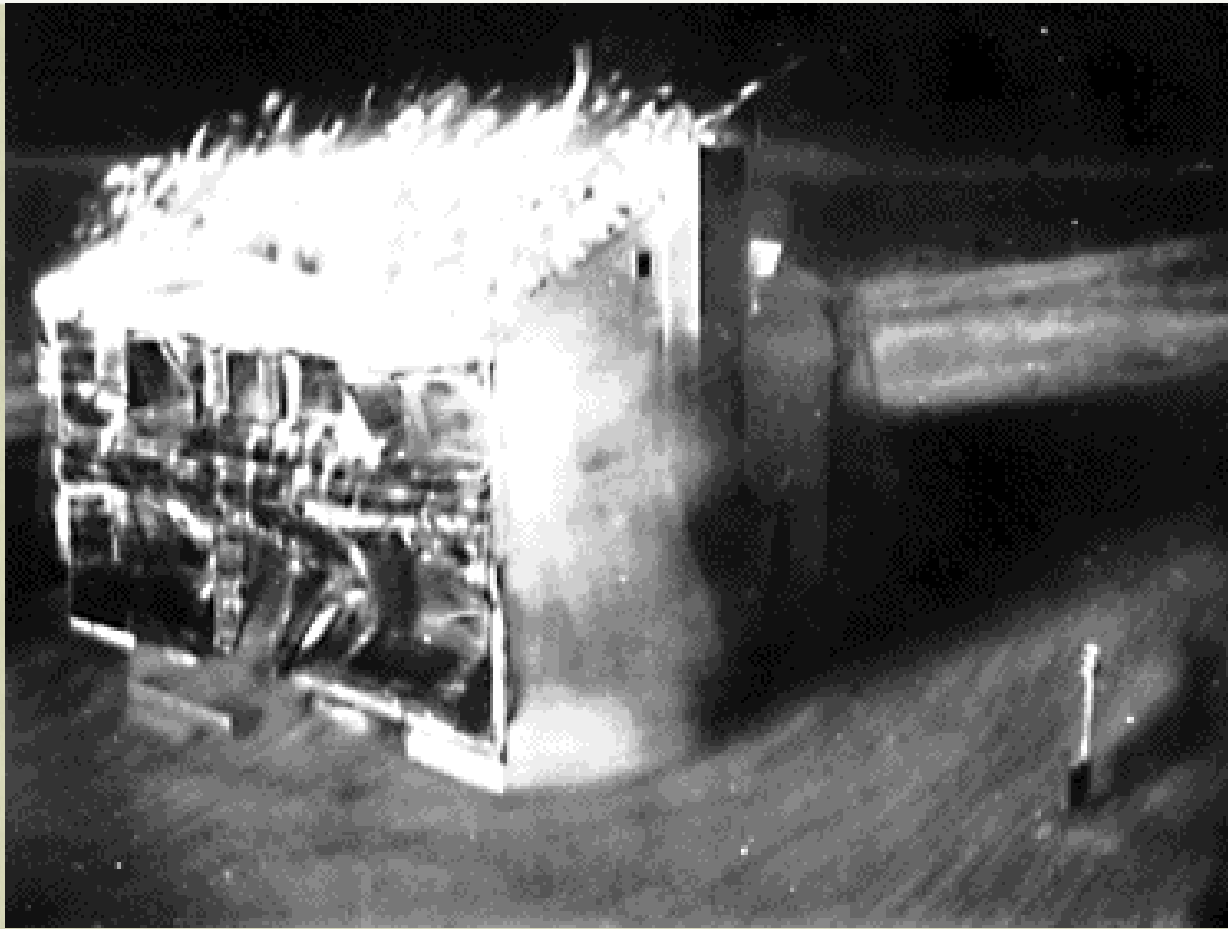
FIREBALL



THERMAL PULSE



BLAST WAVE



FALL OUT



WHO HAS THEM, WHO HASN'T



WHY WORRY?

- Alert status and decision-making time
- Accidents
- Embedded in military doctrines of NWS and allies
- Nuclear spread: India, Israel, Pakistan, North Korea... who next?
- Risks are enormous
- There are no small mistakes with nuclear weapons

SOURCES & REFERENCES

- The Atomic Archive <http://www.atomicarchive.com/index.shtml>
- Wikipedia
http://upload.wikimedia.org/wikipedia/commons/d/d5/Greenhouse_George_Early_Fireball.ogg
- http://en.wikipedia.org/wiki/Atomic_nucleus
- S. N. Kile, et al., “World Nuclear Forces,” SIPRI Yearbook 2012: Armaments, Disarmament and International Security (Oxford: Oxford University Press, 2012), pp. 307–44.
- New Internationalist Magazine
<http://newint.org/features/2008/06/01/nuclear-weapons-facts/>
- <http://www.reuters.com>
- H. Kristensen & M. McKinzie, Reducing Alert Rates of Nuclear Weapons, UNIDIR, October 2012 http://www.unidir.ch/bdd/fiche-ouvrage.php?ref_ouvrage=92-9045-012-M-en