



# NUCLEAR ARSENALS

**ICAN CAMPAIGNERS MEETING/GENEVA**

# 1. Nuclear weapons 101

## How do they work?

Most nuclear weapons today are two-stage thermonuclear weapons that derive their explosive energy from the combined power of nuclear fission and fusion. An initial fission reaction generates the high temperatures needed to trigger a secondary—and much more powerful—fusion reaction (hence the term “thermonuclear”).

Israel, India, and Pakistan are generally believed to possess nuclear weapons that utilize only nuclear fission, although some of these nations may also have some thermonuclear weapons.

Certain isotopes of radioactive elements (i.e., variations of the same element with different numbers of neutrons in the nucleus) such as plutonium-239 or uranium-235 can emit two neutrons when they fission.

These secondary neutrons then collide with other nearby nuclei, causing them to fission and release two more neutrons. Each fission reaction doubles the amount of neutrons and energy released, causing a chain reaction. After only a few microseconds, this chain reaction can produce an explosion equivalent to the detonation of many thousands of tons (or kilotons) of TNT. The bombs dropped on Hiroshima and Nagasaki, were fission-based, and had explosive yields

equivalent to about 15 and 20 kilotons of TNT, respectively.

Thermonuclear weapons (H-bombs) can produce much larger explosions than fission weapons (A-bombs). Essentially, the destructive energy produced by such weapons is the result of three separate but nearly simultaneous explosions. The first is the detonation of chemical explosives that surround a hollow sphere (or “pit”) of plutonium-239 metal.

The force from this blast is directed inward, compressing the pit and bringing its atoms closer together. Together, these chemical and fission explosions are known as the nuclear “primary.” The primary produces the high temperatures and pressures required to ignite fusion reactions in the “secondary” and that produces the third explosion. In fusion, two or more atomic nuclei fuse into one heavier nucleus and release a great deal of energy. In a thermonuclear weapon, isotopes of hydrogen undergo fusion, which is why these weapons are commonly called hydrogen or H-bombs. ■

# 2. Who has nuclear weapons?

## How many do they really have?

China, France, India, Israel, North Korea, Pakistan, Russian Federation, United Kingdom and the United States all have developed nuclear weapons for their own arsenals. There are also other countries that use nuclear weapons in their security strategies or doctrines. The US keeps about 180 nuclear bombs in Europe, spread across six air force bases in five countries (Belgium, Germany, Italy, the Netherlands and Turkey). NATO (28 countries) calls itself a ‘nuclear alliance’ and as a group relies on the strategic nuclear weapons of the US and UK (but not France). Australia, Japan, and the Republic of Korea (South Korea) also have (US) nuclear weapons in their security strategies.

These countries are sometimes called nuclear umbrella states or those who rely on extended nuclear deterrence. Modernisation programmes are taking place in all of these countries- both the nuclear armed and the ones that host nuclear weapons (they have to buy new airplanes to drop the new types of nuclear bombs).

This chart is produced by Hans Kristensen and Robert S. Norris for the Federation of American Scientists. It is the best publicly available information about the size of nuclear arsenals worldwide. There are approximately 15,350 warheads as of early-2016. Of these, more than 10,000 are in military stockpiles (the rest



are awaiting dismantlement/retired). Nearly 4,200 warheads are deployed with operational forces, of which nearly 1,800 US, Russian, British and French warheads are on high alert, ready for use on short notice. Weapons that are retired can still return to active duty- a weapon is still usable until it is fully dismantled. Until a weapon is fully decommissioned and destroyed, it still poses a risk (including the risk of theft!).

A deployed weapon is understood to be a weapon that is either on a ballistic missile or located at an active bomber base. For example, the US has sub-strategic nuclear weapons (or tactical nuclear weapons) deployed in Europe. Bilateral agreements between the US government and five NATO countries mean that their air force pilots (except from Turkey) actually train to drop these bombs. ■

**“ Some of the US deployed sub-strategic nuclear weapons are stationed in Europe. ”**

**3. What do these numbers actually mean?**

Generally, weapons are classified into either strategic or sub-strategic (sometimes called tactical) weapons, and are based on their delivery systems. These classifications come from the only nuclear weapon reduction treaties that have ever been negotiated- the bilateral agreements between the US and Russian Federation. There is no universally agreed definition of what is a strategic vs a tactical weapon.

Here’s a quick guide to the major types of nuclear delivery vehicles.

ICBM	Intercontinental Ballistic Missile
SLBM	Submarine Launched Ballistic Missile
ALCM	Air Launched Cruise Missile
TNW / SSNW	Tactical Nuclear Weapons or SubStrategic Nuclear Weapons, these are generally understood to be gravity bombs (dropped from airplanes, usually called Dual Capable Aircraft/ DCA).

**4. What do the arsenal numbers really mean?**

Often, the further classification of nuclear weapons is directly related to their delivery systems. The nuclear ‘triad’ is attack capability from the air, ground and sea. Here you can see what type is where:

COUNTRY	AIR*	GROUND	SUBMARINE
Belgium**	Yes		
China	Yes	Yes	Yes
France	Yes		Yes
Germany**	Yes		
India	Yes	Yes	Yes
Israel	Yes	Yes	Yes
Italy**	Yes		
The Netherlands**	Yes		
North Korea	Yes	Not there yet	
Pakistan	Yes	Yes	
Russia	Yes	Yes	Yes
Turkey**	Yes		
United Kingdom			Yes
United States	Yes	Yes	Yes

\* Missiles launched from airplanes or bombs dropped by them

\*\* These countries host US nuclear weapons, but engage in exercises training to use them.

## 5. What is modernisation?

Who is doing it? What does this mean?

All nuclear armed countries are planning on modernising their arsenals. This is going to be expensive, an estimated US\$ 1,000,000,000,000 (one trillion) over the next 30 years. To put it in perspective, this is more per minute on nuclear weapons than the normal American family earns per year (approximately US\$66,000/ minute).

Nuclear modernisation plans significantly increase the risk of use. Currently many launch systems use old technology- they are analogue and far, far from the digital age. While you'd think that the most modern system would be the safest, the opposite is actually true. Keeping the systems command, control, communications and computers (C4) technology away from the digital age, and away from global networks reduces cyber-security concerns. The chances of hacking into a computer and starting a nuclear war are becoming more likely with planned technical upgrades.

Other arsenal upgrades include plans to increase targeting

**“ Nuclear modernisation plans significantly increase the risk of use. ”**

capabilities and reduce the possible yield of the weapons. For some, that means nuclear weapons will become more usable in the field. Gen. James E. Cartwright, a retired vice chairman of the Joint Chiefs of Staff (US) explained “what going smaller does,” he said, “is to make the weapon more thinkable.” Instead of high yield, city destroying weapons, modernisation plans like the targeted tail-kit and dial-a-yield preparations for the new B61-12 modification mean that we could see the weapons used in a conflict in the near-future. These are the bombs the US deploys in Europe, and those countries will have to pay for new airplanes to be able to keep the ability to drop the bombs. It is unclear how other nuclear

armed countries would react to the use of a “small” nuclear weapon, would they respond with their own nuclear use?

There are also plans to build new missiles that could be used either with conventional or nuclear warheads. Radar systems will not be able to see the difference. A conventionally armed missile could be mistaken for a nuclear armed missile and invite a nuclear response. With over 1800 nuclear weapons that are ready to be launched within minutes of a suspected nuclear attack, this increases the risk of use and the risk of nuclear war. ■

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### LEARN MORE:

This is a tiny starter guide to nuclear arsenals. There are great resources out there. For details on nuclear arsenals, look up Hans Kristensen and Robert Norris from the Federation of American Scientists. For information on modernisation programmes, see the Reaching Critical Will publication “Assuring Destruction Forever”. ■

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