30.03.2022
adjusted: 18.04.2022

Mankind's final appeal:
What would happen in a nuclear war?
And what after that?

If a nuclear reactor of a nuclear power plant explodes anywhere in the world, it is an international catastrophe. Whole ethnic groups have to be evacuated and, if they survived, have to leave the region for a long time or permanently. However, such a nuclear reactor has a TNT equivalent*) of a few kilotons (*kT*), maybe less. Let's compare such an event to a nuclear weapon used in a war with several megatons (*MT*) of TNT, i.e. with more than a thousand times, maybe even a million times of the TNT equivalent. We must also note that in such a nuclear war several thousand of these are used on each side at war. At this point I avoid extensive calculations, in the appendix I submit some numerical examples. It is certainly not necessary to have completed a university degree to be able to realistically assess the consequences of this scenario. Just remember the bombs dropped on Hiroshima and Nagasaki on August 6th and 9th, 1945. They had an explosive force equivalent of *12.5 kT TNT* and *22 kT TNT*. Altogether *90,000* to *100,000* people died immediately after the impacts, another *50,000* to *60,000* people died immediately afterwards from the radiation. There is no precise information available on the number of fatalities in the following 3 to 5 months or as a result of radiation illnesses in the following years.

I have been a military member for more than 30 years in my life. I took part in exercises and maneuvers, both in troop service and in headquarters. The use of several hundred nuclear weapons in sizes from *20 to 200 kT* TNT was always simulated and the military reactions to them were trained. The number of survivors was “calculated” using empirically prepared tabular material, their condition was assessed, and then it was assessed how these forces were to be used in subsequent battles and military campaigns. After that, so-called “detoxification measures” and “deactivations” were practiced, and life continued in protective suits.

Although the number and the size of nuclear weapons were still “moderately” handled during these exercises compared to the arsenals actually available today, the consequences would no longer be manageable. Moreover, one circumstance was completely ignored: it is unlikely that a person who knows that he is going to die soon can be persuaded to go into battle repeatedly.

In each of these exercises, I have always wondered anew how people in military command circles seriously believed that after such blows it was possible to continue the war, with an elite of commanders living on in bunkers, and from there would plan and organize the following military operations and to rebuild civilian life after the end of the war.

I have always viewed all these starry-eyed ideas through the eyes of a scientist I was able to prepare for during my military service, and who I then became when I left active service.

In nuclear-proof bunkers, survival would be secured for perhaps about four weeks, possibly a little longer, but then everyone would have to leave the shelters – but outside there would be deadly radioactive radiation for several thousand years and there would be total, all-encompassing devastation. Everything would be destroyed. There would be no nature or civil structure that could support any life.

The radioactive contamination did not remain in the war zones either, it spread across the entire globe. Life on Earth's land massifs would almost certainly be wiped out. There would no longer be anyone who could ask the question of who should be held accountable for all this.

If all goes well, a new intelligent life form could emerge on Earth in several million years, should the cosmic conditions on the planet allow it.

We can make only extremely uncertain assumptions about life in the oceans after a nuclear war.

The sequence of events on the land massifs would be analogous to the vertical crash of a large passenger aircraft, in which partial survival of those on board is impossible too.

Whether all those involved in politics, the military and social administration **are correctly fully aware of this? – Probably not. –** Otherwise they would long ago have come to the **only possible** rational conclusion **that one can abolish all nuclear weapons worldwide without hesitation because they cannot be used to achieve political goals by military means. They are definitely useless**.

It would also be a misconception to speculate on their regional use. Once the operation has been set in motion, the global escalation can no longer be stopped by anyone. **At this vertex point of human development**, at which mankind has already stood several times in the last century, **the decision-making question arises logically,**

- **whether the intelligence of today's humanity is sufficient to enable the survival of the species or**
- **whether their self-destruction will be inevitable due to their insurmountable striving for power and the greed for more and more power.**

If we drop out of this vertex point on the wrong side, we no longer need to ask the decision-making question. Nobody would answer it anymore.

It's about everything - for everyone!

Dr. Manfred Pohl

***) TNT – Trinitrotoluene, common name *Trotyl*, is a commonly used explosive. The TNT equivalent is a measure of the explosive power of nuclear weapons. The measure is the mass of the explosive TNT, usually measured in *T* (tons), *kT* or *MT*.**

Adjustment 18.04.2022:

<u>Appendix</u>

Comparative figures and evaluation statements

Trinitrotoluol

Some additional information and comparisons

Density: *1.65 G/cm^3 = 1.65 kG/dm^3 = 1.65 T/m^3*. In the smeltery: *1.47 G/cm^3*

Dimensions: *1 T = 1,000 kG, 1 kT = 1,000 T, 1 MT = 1,000 kT = 1,000,000 T*
The capitalization of the TNT equivalent units (*g, t*) indicates TNT.
Simplified spelling e.g. for "Explosive power 2 kilotons TNT": "Explosive power 2 kT".

Size visualizations of TNT amounts:

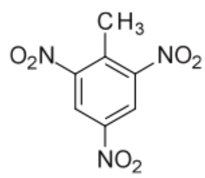
amounts	Size visualizations .
1 T → 1 T /1.65 T/m^3 = 0.606 m^3	cube with edge length 0.846 m or sphere with the radius 0.62 m
1 kT → 606 m^3	cube with edge length 8.46 m or 11 m · 11 m · 5 m or 24.61 m · 24.61 m · 1 m or sphere with the radius 5.25 m
1 MT → 606,060 m^3	cube with edge length 84.63 m or 246.18 m · 246.18 m · 10 m or 348.16 m · 348.16 m · 5 m or sphere with the radius 52,50 m
50 MT→ 30,303,030 m^3	cube with edge length 311.77 m or 1.740,78 m · 1.740,78 m · 10 m or 2.461,83 m · 2.461,83 m · 5 m or sphere with the radius 193.40 m

Energy conversions:

1 kG	*= 10^6 cal*	*= 4.184·10^6 J (4.184 MJ)*	*= 1.162 kWh*
1 T	*= 10^9 cal*	*= 4.184·10^9 J (4.184 GJ)*	*= 1.162 MWh*
1 kT	*= 10^{12} cal*	*= 4.184·10^{12} J (4.184 TJ)*	*= 1.162 GWh*
1 MT	*= 10^{15} cal*	*= 4.184·10^{15} J (4.194 PJ)*	*= 1.162 TWh*

1 kWh	*= 0.86 kG*			
1 MWh	*= 0.86 T*	*= 860 kG*		
1 GWh	*= 0.86 kT*	*= 860 T*	*= 860,000 kG*	
1 TWh	*= 0.86 MT*	*= 860 kT*	*= 860,000 T*	*= 860,000,000 kG*

molecular formula: *$C_7H_5N_3O_6$* IUPAC-number: 2,4,6-Trinitrotoluene
Molar mass: *227.13 G/mol*,
hardly soluble in water (140 mg/l at 20ºC), easily soluble in Ether, Aceton, Benzen (Benzol), Pyridin (Azabenzol)
melting point: *80.35ºC*, **boiling point:** (disintegration) on *160ºC*
structural formula:



Source: https://de.wikipedia.org/wiki/TNT-%C3%84quivalent (reviced):

TNT equivalent

The TNT equivalent is a non-SI compliant unit of measurement for the energy released in an explosion. The value relates to the total energy released, not just to the kinetic energy, which can be significantly lower than the total energy, for example, in the case of nuclear weapons. Therefore, the explosive power is only partially comparable with that of a corresponding amount of the explosive TNT.

The TNT equivalent is used to indicate the explosive power of weapons, explosives and explosive devices or generally for the release of energy, e.g. used by meteorite impacts.

The explosive TNT has a molar mass of *227.1 g/mol* and releases an energy of almost *250 kcal/mol* (at the time of definition, calculations were not made with joules (*J*) but with thermochemical calories (*cal*)). This results in an explosive force of about *1100 kcal/kG* or ***4.6 MJ/kG***. To get a "handy" unit, a calorie was taken as a base and the energy equivalent of a kiloton of TNT was defined as 10^{12} *cal* or $4.184 \cdot 10^{12}$ *J*. This results in

examples:

- The TNT equivalent of fireworks is *1* to *3 G*.
- By underwater igniting a New Year's Eve firecracker (TNT equivalent approx. *2 G*) in a bucket with *7* to *8 l* of water, the bucket is raised about *1 m* (own experiment - not for copy).
- By placing of *100 G* in a steel pot with a wall thickness of *1 mm*, the pot is rupted into pieces when it is ignited (demonstration from the blasting training).
- A tree can be felled by applying *200 G* to a tree trunk with a diameter of *15* to *20 cm*. The trunk is rupted through at the blasting site (demonstration from the blasting training).
- Explosive devices used in terrorist attacks have an explosive force of *0.5* to *500 kG*.
- The TNT equivalent of *1 kT* corresponds roughly to an earthquake measuring *4* on the Richter scale.
- The two atomic bombs dropped by the USA in Japan in 1945 had an explosive force of around *15 kT*. Other sources: Hiroshima: *12.5 kT*, Nagasaki: *22 kT*.
- In 1961, the largest hydrogen bomb ever tested with *57 MT*, was detonated in the USSR.
- Around *12.800 GWh* of electrical energy was consumed in Berlin in 2020. That is *1.067 GWh/month*. A *1 MT* nuclear weapon releases *1.162 GWh* of energy. With this energy can be supplied Berlin with electricity for a good month.
- The Hiroshima bomb released *14.5 GWh* of energy in a fraction of a second. With the energy of two such bombs you can cover the daily demand for electricity in Berlin.

Other statements of fundamental importance:

- During the Cold War, there was an arms race between the USA and the Soviet Union, at the peak of which the two states together possessed around *70,000* nuclear warheads. At the end of the Cold War, their nuclear arsenal had a total explosive capacity of more than *800,000* Hiroshima bombs (approx. *12,000 MT*)
- Nuclear powers are currently:

country	number of warheads	.
USA	5550,	ru.*) 1750
Russia	6255,	ru.*) 1570
Great Britain	225	
France	290	
China	350	
Israel	90	
India	160	
Pakistan	160	
North Korea	50	

(Countries in chronological order of acquisition).
*) ru. = ready to use

- Around 150 US nuclear weapons are located in Europe on the territories of Belgium, Germany, the Netherlands, Italy and Turkey as part of the NATO concept of "nuclear sharing".
- At the **end of 2021**, the nuclear-armed states had a total of approx. ***13,865*** nuclear warheads. That's enough to destroy mankind multiple times (overkill). In the mid-1980s there were about *70,000*.
- Worldwide, including in the USA, the use of these weapons of mass destruction, which without exception also affects the civilian population, is condemned as immoral and ethically irresponsible.
- It is impossible to achieve political goals in armed conflicts with nuclear weapons, because such wars inevitably end with the complete annihilation of both warring sides.
- The development of the atomic bomb is considered by many people today as the darkest chapter in the history of technology and science, and the atomic bomb has become a byword for the "curse of technology".

Web link:
Nuclear Weapons FAQ chapter 1.3 (*http://nuclearweaponarchive.org/Nwfaq/Nfaq1.html#nfaq1.3*)

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