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Thermonuclear Micro-Projectile and Methods for its Use in Defensive Protection from Space Rockets, Peaceful Energy and Transport.

C&R, **Alexander A. Bolonkin**
(PhD, former senior scientist at NASA)
abolonkin@gmail.com.

Abstract

A new type of thermonuclear micro - projectile (reactor) is proposed. The idea is to disperse the micro-capsule (10^{-4} g.) contained thermonuclear fuel to an energy in excess of 10^4 eV by collision with a solid material obstacle, thereby causing a micro-thermonuclear explosion. Ways of its use in protection against space rockets, in military science, peace power and transport are offered.

Introduction

In 1984, the United States launched the Strategic Defense Initiative (SDI) program to seek means of protection against Intercontinental ballistic missiles in outer space or in the Earth's upper-atmosphere [5]. The USA investigated ways of damaging nuclear warheads by kinetic collision with material bodies, damaging the incoming warhead by burning a hole into it with a laser beam or damaging it with a beam of neutral beamed particles.

Unfortunately, none of these methods proved to be practical at that time in terms of monetary costs (affordability) or and technical reliability.

Launching into outer space a very large number of material bodies is expensive. A powerful laser system has not yet been created and laser beam diverge (up to a diameter of 1 m, at a distance of tens of kilometers) without providing the desired range through the impeding air. Destructive energy does not yet concentrate at the point in the needed urgency time. Its creation requires enormous power and energy. In addition, the targeted incoming nuclear warhead has a protective shield (nosecone) to counteract its frictional heating upon re-entry. Beams of comminuted neutral atomic particles has similar disadvantages. However, when braking sharply, it produces a hard radiation that can damage the electronics of guided missiles. But the trajectory of the enemy warhead is set at the upper stage, and the warhead can do without complex electronics.

Therefore, the Program was curtailed, but not canceled, in 1993 after accumulated spending on the Program of about $10 billion. Currently, an anti-missile system of consisting solely anti-missiles is being created by the USA. But the deployed system remains very expensive and, as well, almost powerless against a massive short distance ballistic missile strike and cruise low-altitude missiles.

The author in 2007 [3] proposed the protection of cities by a two-layer transparent inflatable plastic cap with a height of 3 -5 kilometers with the inclusion of small stones in the shell, the collision with which will destroy warheads and aircraft by disruption. The method is simple, cheap, protects against all types of aircraft and is used in peacetime to protect the internal volume from heat, cold, poisonous gases and radioactive fallout. It turns deserts and cold areas into subtropics with evergreen vegetation and a closed water cycle [4]. Even when the destroyed nuclear warhead will work, the method removes the epicenter of the nuclear explosion at a height of 3-5 km in the rarefied atmosphere. This, by hundreds and thousands of times, reduces the force of the explosion and radiation on the ground-based target, reduces by hundreds and thousands of times the amount of radioactive fallout (no

contact with the ground epicenter and overpressure under the hood removes radioactive dust from the urban atmosphere). All this allows to save the most part of the human population not protected within bunkers or fallout shelters and to protect a considerable part of city property from destruction and fires [3].

Proposed innovations.

Of all the methods studied as potential SDI space protection as well as tested currently existing technologies, the most acceptable was the method of neutral particle beam. But the divergence and small destructive capacity of the beam are the principal obstacles to its practical application. This leads to a short beam range and low efficiency.

To eliminate these drawbacks, the author proposes an idea acceptable for modern known and investigated technologies: the author's mission is to form a beam (of successively launched micro-projectiles) composed of atomic nuclei that are capable of thermonuclear reaction (solid material) and to project it at a speed sufficient to initiate a thermonuclear reaction on contact with the enemy target.

The first requirement means that the beam should not be sent in the form of a gaseous jet (as has been done so far, but in the form of a small solid body (needle, or micro-shell, balls, etc., i.e. a thermonuclear micro-projectile, TMP). This will eliminate the divergence of the beam, preserve the effectiveness of the projectile and make the range of weapons in space - unlimited, and in the atmosphere. The weapon's range in the atmosphere should be hundreds of kilometers. Accuracy will suffer if the aiming will be carried out by air-distorted laser beam. The micro-projectile must have kinetic energy to initiate a thermonuclear reaction.

But all currently known sources of high-speed particles (for example, ion (electric) rocket engines, IRD, ERD) work on the principle: matter is converted into plasma (gas), positively charged nuclei are accelerated to huge speeds by an electric field, mixed with electrons and thrown into the void in the form of a neutral rarefied gas.

If, after acceleration, we focus the particles using electric and magnetic fields in a sufficiently dense jet with a sufficiently high temperature of solidification, they trickle and turn into the required solid "needle". Note that the high speed of the needle is not a hindrance for solidification of the jet, because for solidification, melting, evaporation of any substance, its temperature is important, i.e. the speed of molecules relative to each other. This speed is low and the jet can be cooled.

The **second** method of overclocking is much easier. Taken readily as example the needle formed of thermonuclear fuel. For example, lithium hydrate *LiD* (here *Li*-lithium, *D* – deuterium). It has a melting point of about 100^{o}C.

A TMP projectile (Thermonuclear Micro-Projectile, mass only 10^{-4} g) or plasma is reported to have an electric charge of 0. 01 - 0.1 part of the electric charge of all electrons in it and the needle accelerates in an electric field (in an electric gun [7]). However, in this method, the electric field strength (or distance of dispersal) should be 10 – 100 times more than a normal Ion Rocket Propulsion (IRP), but there are no all problems with focusing and cooling of the gas jet.

We now turn to the main features (the author's idea) of the proposed method to fire thermonuclear micro-projectiles. Its main advantage is the small amount and volume of fuel used. In fact, it is a very simple microscopic fusion reactor with a mass of one ten thousandth of a gram (10^{-4} g). Compare this with existing and projected fusion reactors weighing hundreds and thousands of tons. True, the energy released by it is only 8-20 MJ (equivalent to ~ 2-5 kg of explosives), but it is enough to destroy any

aircraft, ballistic missile or nuclear warhead, especially since the distance of destruction increases to hundreds and thousands of kilometers, and the time to achieve the goal is reduced to fractions of a second (the speed of the micro-projectile reaches 400 – 600 km/s).

Why does a micro-projectile turn into a micro-reactor? It is known that to start a thermonuclear reaction, it is necessary to heat the thermonuclear fuel to several hundred million degrees. This corresponds to the speed of collision of nuclei 400-600 km/s. But with this speed moves our postulated micro – projectile (needle). When the needle (projectile) hits a solid obstacle, part of the needle goes deep into the obstacle and is slowed down to zero forward motion, and the remaining part compresses the fuel and hits the inhibited fuel with the speed of the beginning of a thermonuclear reaction. This causes a small thermonuclear explosion (Fig.1.).

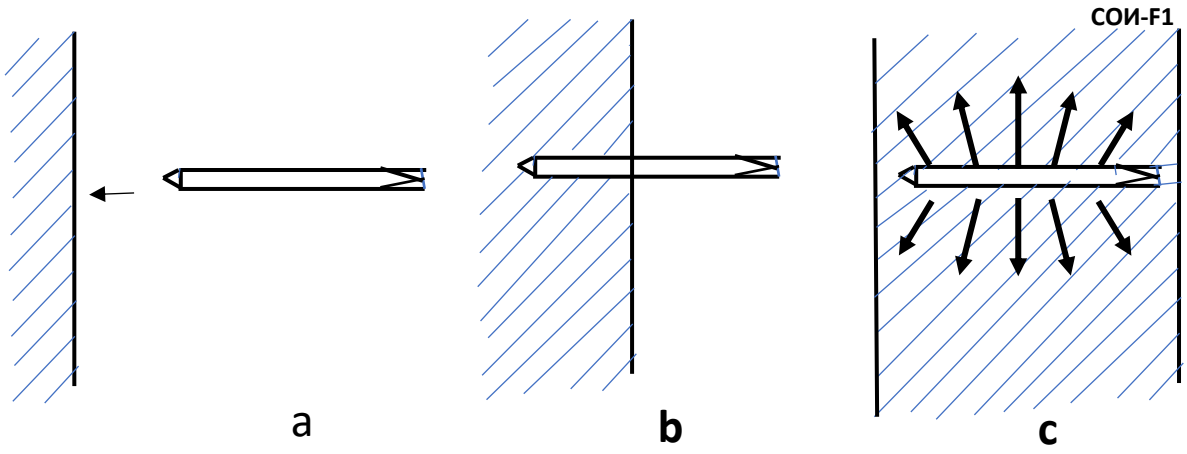

Fig. 1. Thermonuclear Micro-Shell. *Notation*: a –approach to the target; b-introduction into the target barrier; c – explosion.

Some estimates.

The proposed method requires complex supercomputer calculations and estimates of the required accelerators and thermonuclear micro-reactors [1]-[2]. However, many of the proposed methods are confirmed in existing technologies and calculations of thermonuclear reactors. For example, in some existing Ion Rocket Propulsion (IRP), the exhaust jet accelerates to a speed of 300 km/s [5]. It is indicated that it can theoretically be brought almost to the speed-of-light, but this is unprofitable for IRP, because it requires a lot of energy to do so. For our case this is irrelevant if not actually insignificant, for the mass of the projectile is scanty. The approximate size of the needle (projectile) 0.2x2 mm. The mass of 10^{-4} g. Material is *LiD*. The required needle speed is 400-600 km/s. the acceleration Energy is 15 – 20 kJ. Field voltage equal to 10 – 30 MV/m.

In [1] the method of calculation of a thermonuclear reactor and a low-inductive starting capacitor is given (example). In [2] calculation of initial (starting) heating of thermonuclear fuel (up to 10^4 eV) and its subsequent heating from thermonuclear reaction. In [6-7] theoretical calculations and estimates of thermo-nuclear micro-projectile and electric gun are given.

Application.

1. The main application of the proposed method is cheap protection against inter-continental nuclear warhead-tipped ballistic missiles and missiles and aircraft of other ranges and modes of operational. The earth's atmosphere and clouds are almost no obstacle to the delivery of TMP. Only the accuracy of TMP aiming can suffer.

2. Targeted destruction of military facilities, equipment and even individuals on the ground. The TMP-carrying Earth-orbiting satellite, flying at an LEO altitude of 100-200 km, can distinguish individual vehicles. It is able to view the earth's strip with a diameter of 300-600 km and makes one revolution around the Earth in 100 minutes. During the day, the targeter can view the most important areas of the Earth.

3. The supply of cheap TMP on the satellite is practically unlimited. Let me remind you that the mass of one TMP 10^{-4} g., and the acceleration energy is only 20 kJ. This means that 100 thousand rounds of TMP will weigh 10 grams, in the energy of 1 kg of conventional explosives (4 MJ / kg) will be enough for 100-200 shots.

4. The proposed TMP will be a powerful weapon in the ground forces and Navy. One gunner or sailor in the motorboat can destroy armored vehicles, buildings, fortifications, warships, planes, etc. Ground electric gun can protect [7] a large area and fire at targets thousands of kilometers away. Like drone strikes on shore facilities, missions may become surreptitious and anonymous.

5. The entire (100 km) earth's atmosphere below the von Karman Line reduces the speed of TMP by 50-70 km/s (out of 500 km/s) and is not a serious obstacle for TMP.

Advantages

1. The proposed type of weapon is capable of providing total protection against all types of nuclear and conventional weapons.

2. It is cheap and does not require ultra-sophisticated technology.

3. It's a point defense or attack weapon. It does not burn huge areas (like conventional nuclear bombs), almost does not contaminate them with radioactive fallout (pure thermonuclear reaction gives almost no radioactive particles and the reacting mass is negligible). It destroys only military targets and, if necessary, dictators wherever they hide. It preserves the country, the landscape, the industry, the human population.

TMP *IS THE MOST POWERFUL AND MOST HUMANE TYKPE OF NUCLEAR WEAPONS YET DEVISED IN THE HISORY OF HUMANKIND.* The force of the explosion does not exceed the force of a grenade explosion or a conventional projectile. Therefore, the use of point weapons does not fall under the ban of nuclear bombs.

4. The proposed method can be used to create a thermonuclear engine for ground vehicles and transport, which will solve all the energy problems of the Earth’s populace and make the range of all types of transport practically unlimited.

5. The proposed method can be used for space flights and wide space exploration.

Discussion.

Well, the reader may say, but the dictator may be the first to develop this method and enslave the whole world. Indeed, there is such a danger. But, fortunately, dictatorships tend to be economically weaker than the democratic USA or the European Union (NATO). Unfortunately, democratic States are corroded by liberalism and careless attitude to defense issues (NATO does not want to spend even 2% of the budget on defense). At the same time, dictatorships are throwing all their wealth at military development. For example, the tank is an offensive weapon - was invented in the West. Yet, during the 1930s, the Communists of the USSR brought the population to a terrible famine, but made more tanks than the rest of the world (planned to 100 thousand). They did not understand the simple truth

that by extending their regime to strong countries, they are leading the case to their own destruction (remember the friendship, and then the fight with Hitler's socialism, as well as the fight with Communist China for the island of Damascus on the Amur in 1969). If the Communists had seized power in the USA, they would have spoken to the Communists of the USSR in a completely different language.

Therefore, democratic States should be the first to explore the possibilities of new weapons and not allow dictatorships to take possession of such weapons first (as was done with conventional nuclear bombs, 1945-49).

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