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PEACE AND CONFLICT STUDIES

ASSIGNMENT ON A

COMPREHENSIVE ESSAY ON

THE TERM ‘NUCLEAR WEAPONS’

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**THE WEAPON OF MASS DESTRUCTION (WMD)**

They are said to be weapons with the capacity to inflict death and destruction on such a massive scale and so indiscriminately that its very presence in the hands of a hostile power can be considered a grievous threat. Modern weapons of mass destruction are either nuclear, biological, or chemical weapons

The weapon of mass destruction constitute a class of weaponry with the potential to, in a single moment, kill millions of civilians, jeopardize the natural environment, and fundamentally alter the world and the lives of future generations through their catastrophic effects.

The United Nations has sought to eliminate all categories of WMDs since its establishment, and the First committee of the General Assembly has from the beginning been mandated to deal with disarmament, global challenges and threats to peace that affect the international community. Other UN bodies tasked with negotiating the elimination of WMDs include the Conference on Disarmament along with its predecessors, and the Disarmament Commission

There are various types of weapons of mass destruction but the main one to be focused on is the Nuclear Weapon.

**NUCLEAR WEAPONS**

A nuclear weapon is a weapon that uses nuclear fission reactions to create an explosion. In a nuclear fission reaction, the nucleus of a large atom is broken down into smaller ones, releasing large amounts of energy. This kind of reaction also produces neutrons, and those neutrons can cause more fission reactions. Putting enough radioactive material together creates a chain reaction, as each fission reaction causes multiple other reactions until all of the material is used up.

Inside a nuclear weapon is a barrier between multiple small sections of nuclear material. That barrier is suddenly removed to make a single mass large enough for a chain reaction, and that single mass is exposed to a source of neutrons to start the reaction. Nuclear weapons can destroy entire cities at once, and are so reviled that only two were ever used in warfare: the two bombs the USA dropped on the Japanese cities of Hiroshima and Nagasaki to end World War II.

Nuclear weapons are the most dangerous weapons on earth.  One can destroy a whole city, potentially killing millions, and jeopardizing the natural environment and lives of future generations through its long-term catastrophic effects.  The dangers from such weapons arise from their very existence.  Although nuclear weapons have only been used twice in warfare—in the bombings of Hiroshima and Nagasaki in 1945—about 14,500 reportedly remain in our world today and there have been over 2,000 nuclear tests conducted to date.  Disarmament is the best protection against such dangers, but achieving this goal has been a tremendously difficult challenge.

A number of multilateral treaties have since been established with the aim of preventing nuclear proliferation and testing, while promoting progress in nuclear disarmament. These include the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the Treaty Banning Nuclear Weapon Tests In The Atmosphere, In Outer Space And Under Water, also known as the Partial Test Ban Treaty (PTBT), the Comprehensive Nuclear-Test-Ban Treaty (CTBT), which was signed in 1996 but has yet to enter into force, and the Treaty on the Prohibition of Nuclear Weapons (TPNW), opened for signature in 2017 but has yet to enter into force. A number of bilateral and plurilateral treaties and arrangements seek to reduce or eliminate certain categories of nuclear weapons, to prevent the proliferation of such weapons and their delivery vehicles.  These range from several treaties between the United States of America and Russian Federation as well as various other initiatives, to the Nuclear Suppliers Group, the Missile Technology Control Regime, the Hague Code of Conduct against Ballistic Missile Proliferation, and the Wassenaar Arrangement.

The United Nations Secretariat supports efforts aimed at the non-proliferation and total elimination of nuclear weapons. “Securing Our Common Future: An Agenda for Disarmament” considers nuclear weapons in the framework of “disarmament to save humanity.” In the agenda, the Secretary-General calls for resuming dialogue and negotiations for nuclear arms control and disarmament. He also supports extending the norms against nuclear weapons, and in that regard appeals to States that possess nuclear weapons to affirm that a nuclear war cannot be won and must never be fought. Finally, the agenda proposes preparing for a world free of nuclear weapons through a number of risk -reduction measures, including transparency in nuclear-weapon programmes, further reductions in all types of nuclear weapons, commitments not to introduce new and destabilizing types of nuclear weapons, including cruise missiles, reciprocal commitments for the non-use of nuclear weapons and reduction of the role of nuclear weapons in security doctrines.To further the agenda, concrete actions are proposed.

**TYPES OF NUCLEAR WEAPONS**

**I. FISSION WEAPONS**

When bombarded by neutrons, certain isotopes of uranium and plutonium (and some other heavier elements) will split into atoms of lighter elements, a process known as nuclear fission. In addition to this formation of lighter atoms, on average between 2.5 and 3 free neutrons are emitted in the fission process, along with considerable energy. As a rule of thumb, the complete fission of 1 kg (2.2 pounds) of uranium or plutonium produces about 17.5 kilotons of TNT-equivalent explosive energy.

In an atomic bomb or nuclear reactor, first a small number of neutrons are given enough energy to collide with some fissionable nuclei, which in turn produce additional free neutrons. A portion of these neutrons are captured by nuclei that do not fission; others escape the material without being captured; and the remainder cause further fissions. Many heavy atomic nuclei are capable of fissioning, but only a fraction of these are fissile—that is, fissionable not only by fast (highly energetic) neutrons but also by slow neutrons. The continuing process whereby neutrons emitted by fissioning nuclei induce fissions in other fissile or fissionable nuclei is called a fission chain reaction. If the number of fissions in one generation is equal to the number of neutrons in the preceding generation, the system is said to be critical; if the number is greater than one, it is supercritical; and if it is less than one, it is subcritical. In the case of a nuclear reactor, the number of fissionable nuclei available in each generation is carefully controlled to prevent a “runaway” chain reaction. In the case of an atomic bomb, however, a very rapid growth in the number of fissions is sought. Fission weapons are normally made with materials having high concentrations of the fissile isotopes uranium-235, plutonium-239, or some combination of these; however, some explosive devices using high concentrations of uranium-233 also have been constructed and tested.

**2. THE FUSION WEAPONS**

Nuclear fusion is the joining (or fusing) of the nuclei of two atoms to form a single heavier atom. At extremely high temperatures—in the range of tens of millions of degrees—the nuclei of isotopes of hydrogen (and some other light elements) can readily combine to form heavier elements and in the process release considerable energy—hence the term hydrogen bomb. At these temperatures, the kinetic energy of the nuclei (the energy of their motion) is sufficient to overcome the long-range electrostatic repulsive force between them, such that the nuclei can get close enough together for the shorter-range strong force to attract and fuse the nuclei—hence the term thermonuclear. In thermonuclear weapons, the required temperatures and density of the fusion materials are achieved with a fission explosion.

Deuterium and tritium, which are isotopes of hydrogen, provide ideal interacting nuclei for the fusion process. Two atoms of deuterium, each with one proton and one neutron, or tritium, with one proton and two neutrons, combine during the fusion process to form a heavier helium nucleus, which has two protons and either one or two neutrons. Tritium is radioactive and has a half-life of 12.32 years. The principal thermonuclear material in most thermonuclear weapons is lithium-6 deuteride, a solid chemical compound that at normal temperatures does not undergo radioactive decay. In this case, the tritium is produced in the weapon itself by neutron bombardment of the lithium-6 isotope during the course of the fusion reaction. In thermonuclear weapons, the fusion material can be incorporated directly in (or proximate to) the fissile core—for example, in the boosted fission device—or external to the fissile core, or both.

**The Effects Of Nuclear Weapons**

Nuclear weapons are fundamentally different from conventional weapons because of the vast amounts of explosive energy they can release and the kinds of effects they produce, such as high temperatures and radiation. The prompt effects of a nuclear explosion and fallout are well known through data gathered from the attacks on Hiroshima and Nagasaki, Japan; from more than 500 atmospheric and more than 1,500 underground nuclear tests conducted worldwide; and from extensive calculations and computer modeling. Longer-term effects on human health and the environment are less certain but have been extensively studied. The impacts of a nuclear explosion depend on many factors, including the design of the weapon (fission or fusion) and its yield; whether the detonation takes place in the air (and at what altitude), on the surface, underground, or underwater; the meteorological and environmental conditions; and whether the target is urban, rural, or military.

1. **BLAST**

The expansion of intensely hot gases at extremely high pressures in a nuclear fireball generates a shock wave that expands outward at high velocity. The “overpressure,” or crushing pressure, at the front of the shock wave can be measured in pascals (or kilopascals; kPa) or in pounds per square inch (psi). The greater the overpressure, the more likely that a given structure will be damaged by the sudden impact of the wave front. A related destructive effect comes from the “dynamic pressure,” or high-velocity wind, that accompanies the shock wave. An ordinary two-story, wood-frame house will collapse at an overpressure of 34.5 kPa (5 psi). A one-megaton weapon exploded at an altitude of 3,000 metres (10,000 feet) will generate overpressure of this magnitude out to 7 km (about 4 miles) from the point of detonation. The winds that follow will hurl a standing person against a wall with several times the force of gravity. Within 8 km (5 miles) few people in the open or in ordinary buildings will likely be able to survive such a blast. Enormous amounts of masonry, glass, wood, metal, and other debris created by the initial shock wave will fly at velocities above 160 km (100 miles) per hour, causing further destruction.

**2. THERMAL RADIATION**

As a rule of thumb, approximately 35 percent of the total energy yield of an airburst is emitted as thermal radiation—light and heat capable of causing skin burns and eye injuries and starting fires of combustible material at considerable distances. The shock wave, arriving later, may spread fires further. If the individual fires are extensive enough, they can coalesce into a mass fire known as a firestorm, generating a single convective column of rising hot gases that sucks in fresh air from the periphery. The inward-rushing winds and the extremely high temperatures generated in a firestorm consume virtually everything combustible. At Hiroshima the incendiary effects were quite different from those at Nagasaki, in part because of differences in terrain. The firestorm that raged over the level terrain of Hiroshima left 11.4 square km (4.4 square miles) severely damaged—roughly four times the area burned in the hilly terrain of Nagasaki.

**3**. **FALL OUT**

Residual radiation is defined as radiation emitted more than one minute after the detonation. If the fission explosion is an airburst, the residual radiation will come mainly from the weapon debris. If the explosion is on or near the surface, the soil, water, and other materials in the vicinity will be sucked upward by the rising cloud, causing early (local) and delayed (worldwide) fallout. Early fallout settles to the ground during the first 24 hours; it may contaminate large areas and be an immediate and extreme biological hazard. Delayed fallout, which arrives after the first day, consists of microscopic particles that are dispersed by prevailing winds and settle in low concentrations over possibly extensive portions of Earth’s surface.

A nuclear explosion produces a complex mix of more than 300 different isotopes of dozens of elements, with half-lifes from fractions of a second to millions of years. The total radioactivity of the fission products is extremely large at first, but it falls off at a fairly rapid rate as a result of radioactive decay. Seven hours after a nuclear explosion, residual radioactivity will have decreased to about 10 percent of its amount at 1 hour, and after another 48 hours it will have decreased to 1 percent. (The rule of thumb is that for every sevenfold increase in time after the explosion, the radiation dose rate decreases by a factor of 10.)

**4**. **ELECTROMAGNETIC PULSE**

A nuclear electromagnetic pulse (EMP) is the time-varying electromagnetic radiation resulting from a nuclear explosion. The development of the EMP is shaped by the initial nuclear radiation from the explosion—specifically, the gamma radiation. High-energy electrons are produced in the environment of the explosion when gamma rays collide with air molecules (a process called the Compton effect). Positive and negative charges in the atmosphere are separated as the lighter, negatively charged electrons are swept away from the explosion point and the heavier, positively charged ionized air molecules are left behind. This charge separation produces a large electric field. Asymmetries in the electric field are caused by factors such as the variation in air density with altitude and the proximity of the explosion to Earth’s surface. These asymmetries result in time-varying electrical currents that produce the EMP. The characteristics of the EMP depend strongly on the height of the explosion above the surface.

EMP was first noticed in the United States in the 1950s when electronic equipment failed because of induced currents and voltages during some nuclear tests. In 1960 the potential vulnerability of American military equipment and weapons systems to EMP was officially recognized. EMP can damage unprotected electronic equipment, such as radios, radars, televisions, telephones, computers, and other communication equipment and systems. EMP damage can occur at distances of tens, hundreds, or thousands of kilometres from a nuclear explosion, depending on the weapon yield and the altitude of the detonation. For example, in 1962 a failure of electronic components in street lights in Hawaii and activation of numerous automobile burglar alarms in Honolulu were attributed to a high-altitude U.S. nuclear test at Johnston Atoll, some 1,300 km (800 miles) to the southwest. For a high-yield explosion of approximately 10 megatons detonated 320 km (200 miles) above the centre of the continental United States, almost the entire country, as well as parts of Mexico and Canada, would be affected by EMP. Procedures to improve the ability of networks, especially military command and control systems, to withstand EMP are known as “hardening.”