Europen Organization for Nuclear Research

SSBL MUN 25

Table of Contents

1. Welcome Letters

1.1. Letter from the Secretary General

Dear Delegates,

My name is Erol Erbil, and I am the Secretary General of SSBLMUN'25. It is my utmost pleasure to welcome you all to our conference. On behalf of the entire SSBLMUN'25 team, the whole team is honoured to host such talented and committed youthful leaders like yourselves, who are ready to leave an impact on the world by arguing for peace and diplomacy.

Over the past few months, we have worked willingly and wonderfully hard putting together a conference that you'll never forget. Model United Nations conferences are platforms for young leaders such as yourselves to come to try out ideas, to argue on the world stage and to train. I have every confidence that your energy, creativity, and commitment will make SSBLMUN'25 effective and unforgettable.

As you go through this year's sessions, I would advise you to engage each and every conversation with open-mindedness, respect and curiosity. Remember that MUN is not only a simulation of global relations but also a learning zone, a growth zone, and a platform for making lifelong friends. Do not get discouraged by little setbacks, but aim at growing as an individual and making your voice heard and appreciated through this meaningful experience that only happens once.

Our team has really gone the extra mile to make sure things have been going well. Should you have any questions or need my assistance prior to, during or after the conference, please feel free to contact me at erol55erbil@gmail.com.

Once again, welcome to SSBLMUN'25. I am truly looking forward to meeting all of you and witnessing the stimulating discussions and innovative ideas that are generated throughout the conference.

Best regards,
Erol Erbil
Secretary General

1.2. Letter from the Under Secretary General

Dear delegates,

I sincerely welcome you as the Under Secretary General of the CERN committee. I look forward to the time we will have through the committee. I am incredibly excited to meet you all and engage in meaningful, productive debate. My personal goal is that each delegate will come away from this experience more knowledgeable about the topics and better prepared for a future of addressing these challenges in the real world.

Throughout the conference, I will try for total excellence and provide you with the finest possible experience. I wish to see all the delegates' contributions and participation in the committee. Remember that this conference is about more than simply resolutions and speeches; it's about connecting and growing together. I wish you an inspiring and unforgettable MUN experience. We appreciate all participants' efforts and eagerly anticipate their attendance at the conference.

For any further questions you may have can contact me via mail
ayseberrakselen@gmail.com

Sincerely,

Ayşe Berrak Selen

Under Secretary General of CERN

2. Introduction of the Committee

2.1. History of the Committee

The European Nuclear Research Centre (CERN) is an intergovernmental organization that operates the world's largest existing particle physics laboratory. Founded in 1954, the organization is located in Meyrin, a western suburb of Geneva on the French-Swiss border. The convention establishing CERN was ratified by 12 countries in Western Europe on September 29,1954.This agreement gave the Council 18 months to officially prepare the CERN Convention. During these early years, the Council worked at the University of Copenhagen under the direction of Niels Bohr before moving to its current location near Geneva. After the provisional council was dissolved, the acronym for the new laboratory was retained, but the name was changed to current *Organization européenne pour la recherche nucléaire* ('European Organization for Nuclear Research') in 1954.In July 1955, Felix Bloch, Director General of CERN, created the first foundations.Since then, CERN has more than fulfilled the initial plans of a few optimistic scientists who dreamed of building an international laboratory to make great advances in basic research and push the boundaries of our technology and imagination.At the time, many of Europe's brightest scientists were migrating to North America in search of better opportunities, creating a significant brain drain. CERN's creation was a strategic effort not only to reverse this loss but also to create unity through science by creating a common platform for peaceful research.

CERN has contributed to science a lot from the beginning. Experiments of CERN in the 1980's led to the discovery of the W and Z bosons, confirming the electroweak theory which is a critical part of the Standard Model of particle physics. Another major discovery came in 2012, when the experiments confirmed the existence of the Higgs boson. This discovery was considered one of the most significant scientific achievements of the 21st century. Beyond physics, CERN has influenced the world in other ways.

From its beginning, CERN was designed to serve as a centre for fundamental physics research and as a symbol of post-war European cooperation. Over the years, CERN has expanded significantly. From the original 12 founding states, it has grown to include 24 member states, multiple associate members, and international observer states. This global participation has transformed CERN into the largest and most important laboratory for particle physics in the world.

CERN is a unique example of an institution that combines scientific excellence with significant diplomatic significance. CERN has proved how research may bridge political divides and promote peaceful international cooperation through shared goals and free knowledge.

2.2. Functions of the Committee

CERN is the leading fundamental physics research laboratory in Europe. In order to investigate the fundamental components of matter, it runs accelerators such as the Large Hadron Collider.CERN, an intergovernmental institution managed by its member governments, brings together scientists from dozens of nations to advance fundamental knowledge.Its main goal is to use high-energy particle collision experiments to have a better understanding at the fundamental principles of existence and the building blocks of matter.

One of the important purposes of CERN is developing and maintaining large-scale scientific infrastructure and equipment. Its complex accelerator tunnels, detectors, and computing grids which are not only necessary for high-energy research, but also serve as centers for international engineering and technical innovation. Technologies that have been developed by CERN have found applications in medicine, aerospace, computing, and other fields, with the World Wide Web serving as a fine example.

CERN also plays a major role in promoting open science. Its founding convention mandates that all research be performed for peaceful purposes, and that scientific findings be made publicly available. This commitment to transparency is reflected in CERN's open-access publication policy and the development of platforms such as the CERN Open Data portal, which shares data from experiments for researchers and educators worldwide. These approaches ensure that scientific knowledge is a global public good.

CERN's operations are strongly reliant on worldwide collaboration. CERN, which employs thousands of scientists, engineers, and technicians from more than 100 countries, exemplifies how large-scale science can bridge cultural and political divides. Major experiments at CERN include worldwide teams working toward common research goals. CERN's governance reflects this collaboration, with decisions made collectively by representatives from its member states to ensure shared ownership and direction.

Importantly, CERN maintains a strict commitment to peaceful scientific progress. Its founding charter explicitly prohibits any research for military purposes. By focusing solely on civilian research and mandating openness, CERN not only advances scientific understanding but also safeguards against the misuse of scientific breakthroughs. In this way, CERN serves not only as a scientific institution but also as a model of science diplomacy.

3. Preventing Weaponization of Scientific Breakthroughs

3.1. Introduction to Preventing Weaponization of Scientific Breakthroughs

Scientific progress has the power to transform the world by curing diseases, improving energy systems, and extending human knowledge. However, this same progress can be misused. Some of the most groundbreaking discoveries in history have also become tools of war. This phenomenon, often called the "dual-use dilemma," occurs when technologies developed for peaceful or civilian purposes are repurposed for harm. In this committee, we will focus specifically on two major categories of concern: nuclear weapons and biotechnology. Each of these areas presents critical challenges to global peace and security.

During World War II, scientific research led to the development of nuclear weapons. The devastating reality that a single atomic bomb might destroy an entire city in a matter of seconds was made clear when the first bombs were unleashed on Hiroshima and Nagasaki in 1945. Since then, nuclear weapons have come to represent both strength and terror.

Approximately 12,000 nuclear weapons are in use worldwide today. Some are kept at high alert so they can be launched in a matter of minutes. The same technology can be used to create bombs, even though nuclear energy has numerous peaceful applications, such as generating electricity. Due to this risk, world leaders decided to employ international agreements to restrict the proliferation of nuclear weapons. As well as the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT) is the most significant of these accords.Which had many important goals as stopping nuclear weapons from spreading, encouraging the peaceful application of nuclear power and promoting the disarming of current nuclear weapons.

To this day the NPT is still one of the most frequently ratified weapons control agreements, with over 190 nations as participants. Verifying that nations exclusively use nuclear material for peaceful purposes is a major responsibility of the International Atomic Energy Agency (IAEA). But there are still issues: political unrest (such in Russia's recent wars) has rekindled concerns about the use of nuclear weapons, and some countries have secretly pursued weapons projects. The subject of nuclear weaponization is of utmost importance to the international community because of these realities.

Apart from nuclear weaponization both agriculture and healthcare have been transformed by biotechnology. Powerful methods to combat diseases, enhance crops, and comprehend life itself are provided by technologies like DNA sequencing, synthetic biology, and CRISPR gene editing. These same instruments, meanwhile, can also be abused to produce biological weapons, which are contagious substances intended to injure or kill humans.

The increasing accessibility of biotechnology is a significant worry. Using publicly accessible data and simple laboratory supplies, researchers replicated the poliovirus in 2002. Governments are no longer the only entities capable of creating harmful viruses; individual researchers and non-state actors may also be able to do so. This presents serious biosecurity issues.

In 1972, nations ratified the Biological Weapons Convention (BWC) in response to these threats. The creation, acquisition, and application of biological weapons are prohibited under the BWC. 189 states, or nearly every nation on earth, have ratified the convention. The BWC, in contrast to the NPT, has a formal inspection body, therefore enforcement is dependent on the integrity and accountability of national governments as well as the scientific community.

The global warning was the COVID-19 pandemic. The virus demonstrated how swiftly a pathogen can upend communities, harm economies, and take millions of lives, despite the fact that it was not man-made. Consider the repercussions if a virus were purposefully created to be harmful. International supervision and responsible scientific practice are therefore more crucial than ever.

3.2. Key Terminology

1. Bioethics: The study of ethical issues that may arise in biological research.

2. Non-Proliferation: Preventing or controlling the spread of something, especially nuclear and chemical weapons.

3. Nuclear Weapon: A device that uses nuclear energy for attack.

4. Nuclear Fission: Release of nuclear energy when a nucleus splits spontaneously or on impact

5. Nuclear Fusion: Process of two light nuclei combining and releasing large amounts of energy.

6. Research Transparency: Openly sharing and and disseminating a research and its outcomes

7. Scientific Diplomacy: Scientific teamwork across nations.

8. Scientific Regulation: Laws and rules that guide how science is used.

9. Scientific Oversight: Systems to safely monitor and manage research.

10. Weaponization: Converting non-combative research into military instruments.

3.3. Definitions

1. Biological weapons: Weapons that use disease causing microorganisms such as bacteria or viruses or toxins to hurt or kill people, animals, or plants.

2. Chemical weapons: Weapons that use dangerous chemical substances to harm or kill living creatures

3. CRISPR: A way of gene editing which comes from a bacterial system that enables precisely targeting and modifying particular DNA segments in an organism.

4. Dual-use technology: Technology or materials that, depending on their application, can be used for both military and peaceful purposes

5. Genomic data misuse: Using someone's genetic data in ways that are hurtful or unethical such as violating their privacy or discriminating against them because of their genes.

6. Misuse of science: Using scientific methods or knowledge in unethical or damaging ways including creating lethal weapons or carrying out experiments that cause harm to humans.

7. Nuclear fuel cycle: The process of using nuclear fuel to generate energy, which includes uranium mining, reactor fuel production, and spent fuel management or disposal

8. Nuclear proliferation: The spread of nuclear weapons, fissile material or technologies capable of producing such weapons to countries not recognized by the United Nations Security Council as nuclear weapon states or to outside the state.

9. Peaceful nuclear energy:Activities that involve the use of nuclear technologies for non-military purposes such as electricity production, medicine and industry, and that take into account compliance with international safety, environmental and security standards in this process.

10. Quantum computing: Computer systems that process data using the superposition and entanglement principles of quantum mechanics; have the potential to solve certain complex problems much faster compared to classical computers

11. Responsible state behavior: State attitudes and actions aimed at maintaining peace, security and stability, while adhering to international law, human rights, ethical principles, scientific responsibility and disarmament norms.

12. Science-based policymaking: The process of making decisions for the benefit of society and the environment based on objective data, scientific research results and expert opinions, in a rational and evidence-based manner.

13. Thermonuclear weapons:A type of nuclear weapon that releases high levels of energy through a fusion (combination) reaction and has a destructive capacity much stronger than classical atomic bombs.

14. Weapon proliferation: The process of increasing, spreading and diversifying all types of weapons, such as conventional, nuclear, chemical and biological, between states and non-state actors.

3.4. History of the Agenda Item

The Geneva Protocol (1925)

1. World War provided the most shocking developments in the field of nuclear weapons. Most importantly, the use of weapons consisting of chemical substances such as phosgene, mustard gas and chlorine not only caused damage to the military forces in the region but also to the civilian population. Mass deaths and permanent illnesses occurred. Millions of soldiers have been exposed to these attacks since 1915, and hundreds of thousands have died or been disabled. This tragic year led to the first serious step by states to limit the use of scientific developments as weapons. The Geneva Protocol, which came into force in 1925, banned the use of “choking, poisonous or other gases” and “bacteriological warfare methods” in war. Although the protocol does not directly prohibit the development of these weapons, it has gone down in history as the first major agreement at the international level against the transfer of scientific research to the battlefield.

Discovery of Nuclear Fission (1938)

Nuclear fission was discovered in December 1938 and was the leading point of nuclear power and weapons. Fission is a nuclear reaction of an atom splitting into two or more smaller particles. The fission process releases large amounts of energy causing it to become a potential weapon for mass destruction. Because of that fission had great importance by having a nuclear chain reaction which led to the development of nuclear power and nuclear weapons. So the discovery of nuclear fission was historically significant for being the lead of nuclear developments and weapons.

The Manhattan Project (1942)

During World War II. The United States led a research and development program to create the first nuclear weapons with the collaboration of the United Kingdom and Canada. The project took action from 1942 to 1946 and was directed by Major General Leslie Groves and Nuclear Physicist J. Robert Oppenheimer. The project and the functioning of the bomb itself were mostly theoretical before 1943. J. Robert Oppenheimer established a laboratory in an isolated area in New Mexico. The purpose of this laboratory was to create techniques for turning the fissionable products of the manufacturing facilities into the weapons. In addition to the actual construction of a deliverable weapon that would be dropped from a plane and fused to detonate at the right moment in the air above the target, methods for quickly assembling quantities of fissionable material to achieve a supercritical mass (and thus a nuclear explosion) had to be developed. By the summer of 1945 needed products were finally provided and the weapon development and design were much more advanced and an actual usage of nuclear explosive was possible.

Hiroshima and Nagasaki (1945)

II. Towards the end of World War II, the most traumatic example of how a scientific invention can create destruction that has never been encountered in human history occurred. The United States used the atomic bomb developed during the Manhattan Project in war, attacking Hiroshima on August 6, 1945, and Nagasaki on August 9, 1945.Hiroshima: The uranium bomb called “Little Boy” caused the deaths of 70,000 people within seconds of the explosion. By the end of 1945, the number of people injured and killed by the effects of this bomb and exposed to radiation exceeded 140,000.Nagasaki: The “Fat Man” plutonium bomb killed more than 40,000 people in a single second. By the end of the year, this number reached 70,000.These attacks fundamentally changed international security protocols by showing that nuclear weapons could be used brutally not only

against military targets but also against civilian populations. Hiroshima and Nagasaki brought to light the moral, legal and humanitarian dimensions of nuclear weapons.

Treaty on the Non-Proliferation of Nuclear Weapons - NPT (1968)

The nuclear arms race between the US and the Soviet Union during the Cold War increased the risk of the world being dragged into a nuclear war. From 1945 to 1968, the number of states with nuclear weapons was rapidly increasing. This situation was in danger of creating instability not only between the two states, but also at the regional level. Dec.In the face of these threats, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) was opened for signature in 1968 and entered into force in 1970. The treaty consisted of three main parts: Non-Proliferation, which prohibited any country other than the five nuclear weapon states (USA, USSR/Russia, UK, France, China) from developing or possessing these weapons. Disarmament, The obligation for countries that possess nuclear weapons to participate in negotiations to reduce and ultimately eliminate these weapons. Peaceful Nuclear Energy, Requiring countries to use nuclear energy only for civilian and peaceful purposes, encouraging technological cooperation.

3.5. Past United Nations Actions

Comprehensive Nuclear Test Ban Treaty

Comprehensive Nuclear Test Ban Treaty (CTBT) was adopted by the United Nations in 1996, to forbid the explosion of any nuclear weapon test, whether for military or civilian uses. By ensuring that no nation tests nuclear weapons explosively, it seeks to stop the development and proliferation of nuclear weapons.Almost every nation approved the agreement but CTBT still hasn't fully come into action because of nine key countries including China, India, Pakistan, North Korea, Israel, Russia, the United States, Egypt and Iran haven't approved it yet. While waiting for approval from the remaining countries, The Preparatory Commission for the CTBT, or CTBTO, has been working hard to create a global monitoring system. This group is putting up international stations to monitor for nuclear explosions and to implement the test moratorium. Even before the treaty formally comes into effect, these initiatives together contribute to strengthening the international standard against nuclear testing.

UN Security Council Resolution 1540

In the wake of the 9/11 attacks, resolution 1540 was passed with the intention of preventing terrorists and other non-governmental organizations from obtaining nuclear, chemical, or biological weapons. The resolution mandates that all nations pass and implement legislation that prevents such non-state actors from receiving any assistance or supplies such as nuclear fuel or lethal chemicals. Practically speaking, this includes tightening export regulations, guarding border crossings, and making attempts to spread WMD illegal. Resolution 1540 was important because it established a new international regulation that all countries must follow: all states must work together to prevent the transfer of WMDs to terrorists. It even established a unique UN "1540 Committee" to assist in directing and evaluating how countries implement these policies.

The "Start" agreements have drastically decreased the nuclear weapons stockpiles of both the United States and Russia since the conclusion of the Cold War. According to the most recent start accord, the nation is limited to 1,550 nuclear weapons. It is estimated that 13,400 nuclear weapons remain in existence worldwide. Since its founding, the United Nations has sought to disarm nuclear weapons. This has led to the signing of several non-proliferation treaties. As part of these efforts, the TPNW was implemented in 2021. New nuclear disarmament talks are being called for by the UN Secretary-General. The Future Pact, which was considered at the next meeting in 2024, is the most comprehensive nuclear disarmament pledge in the past ten years.

Treaty on the Non-Proliferation of Nuclear Weapons.

On July 1, 1968, the United Kingdom, the Russian Federation, and the United States of America signed an agreement to prevent the spread of nuclear weapons. The following is covered by this agreement. The International Atomic Energy Agency will support efforts to develop technical use in certain areas of security based on awareness of the destruction of a potential nuclear war and their prevention, the fact that the proliferation of nuclear weapons will lead to a global nuclear war, and the fact that every country that has or does not have nuclear weapons but has signed will be confirmed to comply with peaceful countries. On the other hand, it will also be encouraged to denuclearize.

3.6. Current Situation of the Nuclear Weaponization

In current analyses it has been stated that nuclear arsenals are still large and growing all around the world.It has been reported that as nations deepen their trust on nuclear deterrence the number and variety of nuclear weapons continue to increase. At the beginning of 2024 the world had an estimated 12,121 warheads with around 9600 of them stored in military depots. Experts warn that the decades-long trend of significant reductions and terminations of arms control treaties is coming to an end. Global risk measures reflect the increased threat: the Bulletin of Atomic Scientists set its Doomsday Clock to 90 seconds to midnight in early 2023, citing nuclear tensions as the primary cause. This warning is shared by United Nations authorities.

The foundation of the global non-proliferation system is the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). While the remaining 186 parties promised not to acquire nuclear weapons, the five acknowledged nuclear-weapon nations (the only governments that tested before 1967) committed not to transfer them under the NPT. IAEA safeguards are used to implement this framework; practically all non-nuclear states have extensive safeguards agreements in place that require routine inspections of their nuclear sites. The NPT is the most extensively ratified weapons control agreement, with 191 states having joined.Despite these agreements, important limitations remain. The NPT's disarmament pillar has seen little concrete progress: nuclear-armed States continue extensive modernization of their arsenals , and no new global disarmament treaty has replaced the ones that lapsed (such as the INF Treaty). Moreover, three nuclear-armed countries – India, Pakistan and Israel – are not NPT members, and North Korea withdrew from the NPT in 2003. These states lie outside the treaty's constraints and pursue their weapons development independently. In practice, the current legal framework constrains proliferation to some extent but relies heavily on political commitments, diplomacy and technical verification rather than on strict enforcement mechanisms.

According to ICAN statistics, the global nuclear weapons budget in 2023 was $91.4 billion, an almost 13% rise from 2022. The net increases were to Western countries, with law making C$100 million to the United States, $51.5 billion, $8.3 billion, Russia, $6.1 billion, France, $8.1 billion, across China and the United Kingdom. The largest increases in nuclear weapons spending were as follows, significantly increased spending on nuclear weapons contributed to global spending rising 34% from 2019 to 2023., United States (45.5%), United Kingdom (43.2%) Pakistan (59.8%) Global nuclear weapon states possessed 9,585 warheads as of January 2024, according to a Stockholm International Peace analysis Institute (SIPRI) analysis. Currently, 20 developing nuclear weapons companies received new contracts totaling $7.9 billion and C$31 billion in 2023. However, it did various work in the United States and England on this issue and set aside more than $6 million for other

On June 13, 2025, the Israeli Air Force launched a massive bombardment known as "Operation Rising Lion" against Iran. This Israeli operation involves about 200 warplanes targeting superiors developed with Iran's nuclear weapons program, locations with ballistic missile infrastructure, military headquarters and the homes of senior nuclear scientists directly. Many known officials, including Hussein Salami, who is known as the Commander of the Revolutionary Guard, died during these attacks.The International Atomic Energy Agency said there was no clear evidence of an explosion or radiation leak at the Natanz facility, and that the attacks did not hit any of the Fordow or Bushehr facilities.

3.7. Major Parties Already in Place

French Republic: France developed up to roughly 540 warheads during the Cold War and tested its first bomb in 1960. France has reduced its stockpile by around half during the 1990s, although it prioritizes modernization over unilateral reduction.France has its own independent nuclear weapons and is one of the five states recognized by the NPT. There are an estimated 290 warheads in use, plus an additional 80 that are pending dismantlement in France. Almost all of France's warheads are ready on short notice and on operational aboard aircraft or submarines. France is modernizing its nuclear power with the updating or upgrading of its missile submarines, nuclear capable aircraft, ASMPA air launched cruise missile, and M51 submarine-launched missiles. France reiterated its commitment to maintain "under 300" nuclear weapons, carrying on Nicolas Sarkozy's 2008 stance.France maintains complete national authority over its arsenal and does not share American warheads. France has not signed the TPNW but is a supporter of the NPT in international affairs, claiming that nuclear deterrence is currently essential for its own security and the security of Europe.

Russian Federation: Russia accumulated a Cold War arsenal that rivaled that of the United States after detonating its first nuclear bomb in 1949. Although they are not as large as they were during the Cold War, Russia frequently highlights its current military might in both international negotiations and its continuing military operations.One of the two biggest nuclear powers in the world right now is Russia. Approximately 1,718 of its 5,460 total warheads are thought to be mounted on missiles or at bases. While certain projects have been postponed, Russia is still modernizing its nuclear capabilities with new Borei-class nuclear submarines, the improved Sarmat (RS-28) intercontinental ballistic missile, and a next-generation bomber (PAK DA). Additionally, Moscow improves its non-strategic (tactical) nuclear weapons by rehearsing with planes capable of carrying nuclear weapons and short-range missiles.According to Russia's official ideology, nuclear deterrence is essential to its security, and new policy documents expand the range of situations in which nuclear weapons could be deployed. Russia continues to participate in the New START deal as a recognized nuclear-weapon state under the NPT, despite suspending certain data exchanges in 2023.

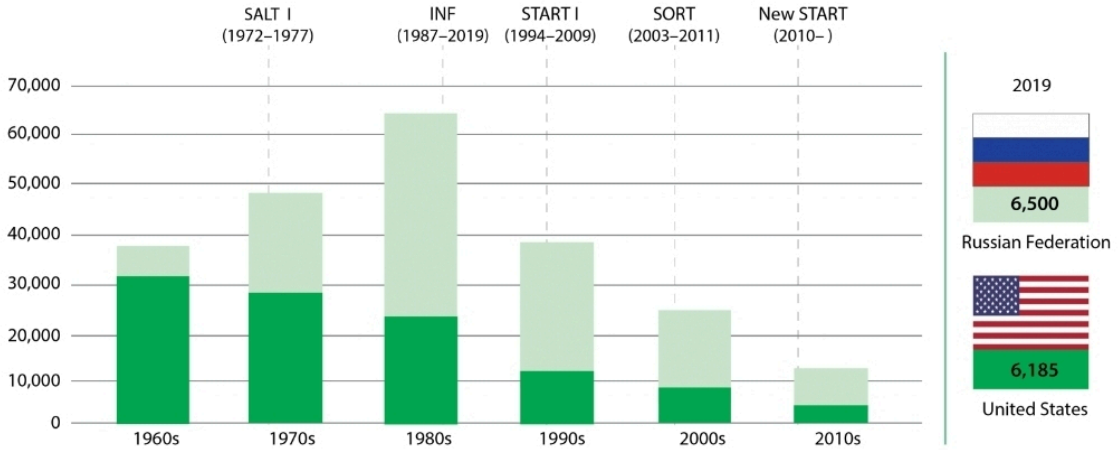
The State of Israel: Israel is thought to have worked with France to covertly enhance its nuclear capability in the 1960s. Israel is still the only Middle Eastern nation with nuclear weapons, but it neither acknowledges nor agrees to deals to reduce its arsenal.Regarding its nuclear weapons, Israel continues to pursue a policy of “purposeful ambiguity”. According to the majority of experts, Israel possesses about 90 nuclear weapons. Israel has never formally acknowledged or denied possessing nuclear weapons, and it has not ratified the NPT or any other nuclear arms control agreements, in contrast to the other nuclear-armed states. Fighter planes, land based missiles , and even submarine-launched missiles on its Dolphin-class submarines are thought to be capable of delivering Israeli warheads. Israel stresses the concept of deterrence without publicly addressing numbers or theory due to its "nuclear ambiguity" strategy. However, its arsenal's existence is publicly recognized on a global scale.Israel maintains that, particularly in light of regional crises, nuclear weapons serve as a deterrence against existential threats. It often advocates for Middle East security arrangements and has not participated in recent disarmament treaties or discussions such as the TPNW.

The United Kingdom: In the past, the UK constructed its first bomb in 1952 and then joined the American Polaris and Trident programs. The UK and the US also collaborate closely; for

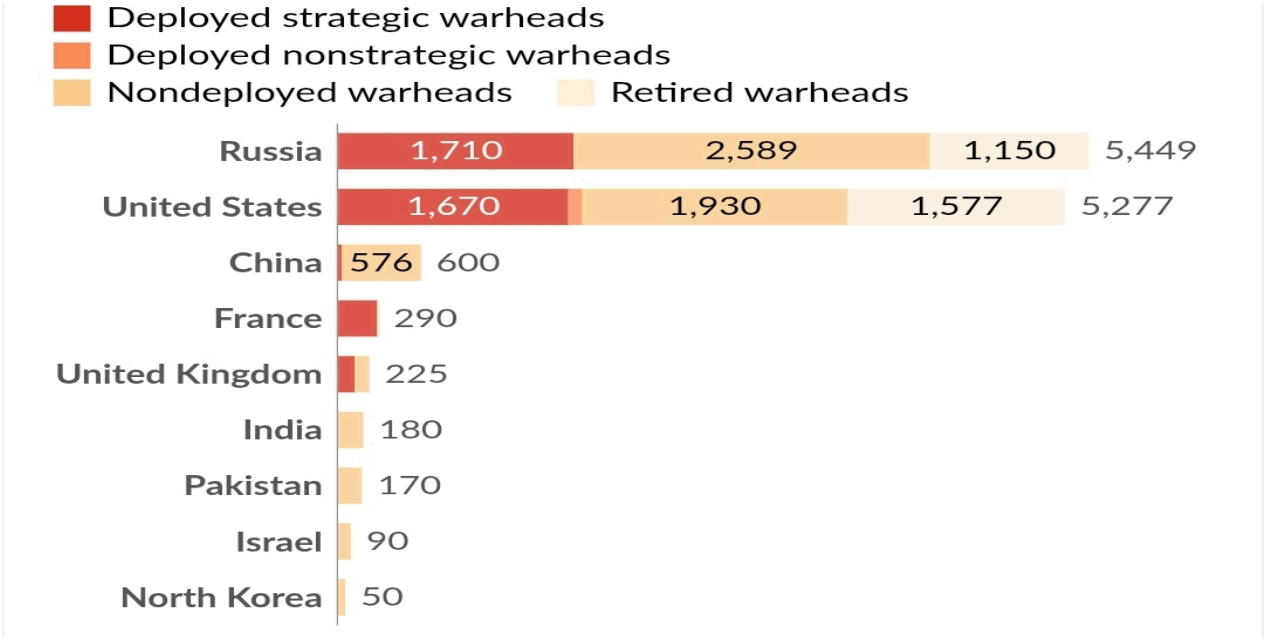
instance, British engineers collaborate with US facilities on warhead development, while the US coordinates some of its nuclear submarine and missile tests.The United Kingdom's submarine fleet serves as a constant nuclear deterrence. There are currently about 225 warheads in the UK's arsenal, of which 120 of those are actively in use. The United Kingdom is upgrading its Trident submarine-launched missiles and replacing its outdated submarines with new models. Additionally, British officials are working with the United States to expand warhead facilities and invest in new nuclear bombs. According to analysts in 2024, the UK's warhead stockpile, which currently stands at around 225, is being reviewed and may eventually rise as the result of increased tensions and a determination to oppose Russia. The UK has not joined the TPNW and is a nuclear-weapon state under the NPT.The current strategy is to maintain a minimal but effective deterrent, even as London emphasizes that it shares the objective of eventual disarmament. Although the British deterrent is now completely integrated with NATO, it is still under UK control.

The United States of America: The United States has not ratified the new Treaty on the Prohibition of Nuclear Weapons (TPNW), in contrast to some other nations. In the past, the United States accumulated massive forces during the Cold War and created the first atomic bombs in 1945. The United States is now engaged in a comprehensive modernization program and possesses the greatest nuclear arsenal in the world. According to U.S. sources, there are around 3,700 nuclear weapons in the arsenal. Every delivery system, including bombers, submarines, and missiles are being updated. For instance, the B-21 Raider stealth bomber and new Columbia-class ballistic missile submarines (SSBNs) are being developed to replace outdated systems. The United States, which is a nuclear-weapon state under the 1968 Nuclear Non-Proliferation Treaty has stated that it will maintain a sturdy deterrent until eventual disarmament is achieved. Washington withdrew from other Cold War weapons limitation agreements, including the INF deal in 2019, but it still abides by the NPT and the New START deal, which caps the number of deployed nuclear warheads at 1,550.

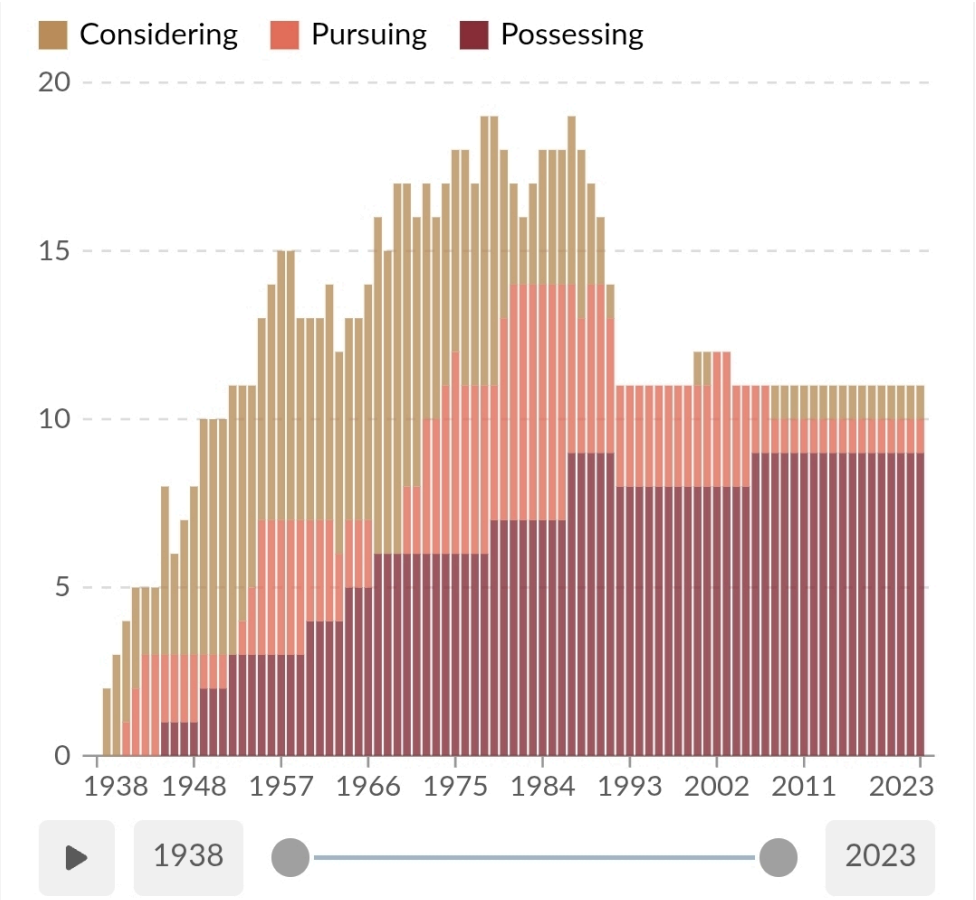
3.8. Global Data



The most devastating weapon ever made in world history is the nuclear weapon. It has a powerful effect that can completely destroy cities, cause painful deaths and genetic diseases that will last for years. There have been close to 2000 nuclear tests so far, and they have only been used for war purposes in two places so far. It is known that there are an estimated 13,400 nuclear weapons in the world. No matter how much nuclear disarmament will bring us closer to world peace, it is very difficult to achieve this. The United Nations, the UN, has been supporting nuclear disarmament since the day it was founded. In 1946, the General Assembly passed a resolution calling for the regulation and control of atomic energy for peaceful purposes and the elimination of atomic weapons. The treaty on the non-proliferation of nuclear weapons is NPT, the partial test ban treaty is PTBT, the comprehensive test ban treaty is TPMW, which has not yet entered into force. In addition, it has provided for the creation of safe nuclear weapon-free zones. Thanks to bilateral agreements made so far, both Russia and the USA have reduced their nuclear weapons stockpiles significantly in the last 50 years. The START Treaty, signed in 2011, limited the strategically determined number of warheads to 1550. However, with the expiration of this treaty in 2025, it opened the door to many concerns. The UN called for a global arms infiltration into this situation.



Technical nuclear warheads are made for extra-battlefield use: against weapons industries, military bases, or critical infrastructures; tactical warheads are made to be used along the lines. According to the estimated numbers as of 2025, Russia has 5,449 warheads; the United States, 5,277; China, 576; France, 290; the United Kingdom, 225; India, 180; Pakistan, 170; Israel, 90; and North Korea, 50. A major part of these warheads is deployed and can be quickly utilized from ballistic missiles, submarines, or bomber bases, while others not deployed or have been retired pending destruction. Since actual figures are a secret of each nation, these estimates were based on open sources, historical data, and leaks that surface off and on. Nuclear warheads have quite differing powers of violence and destruction, which by far threaten global security. Although nuclear-armed States have never been in greater numbers in their actual possession at the present time, no State whatsoever has voluntarily eliminated all of its nuclear weapons, with the exception of South Africa. In history, several sTechnical nuclear warheads are made for extra-battlefield use: against weapons industries, military bases, or critical infrastructures; tactical warheads are made to be used along the lines. According to the estimated numbers as of 2025, Russia has 5,449 warheads; the United States, 5,277; China, 576; France, 290; the United Kingdom, 225; India, 180; Pakistan, 170; Israel, 90; and North Korea, 50. A major part of these warheads is deployed and can be quickly utilized from ballistic missiles, submarines, or bomber bases, while others not deployed or have been retired pending destruction. Since actual figures are a secret of each nation, these estimates were based on open sources, historical data, and leaks that surface off and on. Nuclear warheads have quite differing powers of violence and destruction, which by far threaten global security. Although nuclear-armed States have never been in greater numbers in their actual possession at the present time, no State whatsoever has voluntarily eliminated all of its nuclear weapons, with the exception of South Africa. In history, several A number of states considered developing nuclear weapons or initiated programs in this direction, but the vast majority abandoned these initiatives. More than a dozen countries ran such programs in the late 1970s, but today, only Iran continues its efforts to produce nuclear weapons while Syria occasionally entertains the option.



With the creation of the first atomic bomb in the late 1940s, the number of nuclear weapons only started to increase. After that, it expanded quickly during the Cold War's decades. The number of nations actively pursuing the development of nuclear weapons, or at least considering it, approached twenty by the 1960s and 1970s as a result of the proliferation of new potential nuclear powers. Only a small number of these nations have allowed nuclear weapons to enter their militaries as of this writing, and several of them have withdrawn from this course of action. The world's nuclear weapon count peaked in 1986 at over 60,000, the largest number ever noted. This number has gradually decreased in the wake of arms reduction treaties and a growing international nuclear treaty regime. The source claims that by 2010, there were less than 20,000 nuclear weapons left. Although it is happening more slowly now than it was in the past, the quantity of nuclear weapons is still decreasing. There are still at least 10,000 nuclear weapons in existence. China, France, and Russia are among the few nations that are still building up their nuclear weapons arsenals.

3.9. Possible Considerations for the Future

The United States will continue to play a major role in ensuring and shaping international cooperation in nuclear science. Although the U.S. cannot compete with Russia and China in terms of the number of nuclear weapons, this does not diminish its global power. The reason is that factors such as technology, international alliances, political influence, and a strong economy are just as important as numbers. Considering all these factors, we can say that in the future, investments in nuclear technology in the U.S. will increase. As evidence, after the pandemic, countries (especially the Western bloc) stood together and carried out nuclear research jointly, generating significant financial gains.

Moreover, recent developments and disputes have profoundly influenced nuclear weapons and nuclear science. The competition among major world powers has not only escalated diplomatic tensions but also increased the likelihood of nuclear and cyberattacks. For example, preventing a country from using its nuclear weapons through cyberattacks has been gaining importance in military strategies. This shows that in the near future, before nuclear disarmament can be achieved, states will first develop technologies to protect themselves against cyberattacks. Therefore, it is evident that in the short term, states will continue to show interest in nuclear science and nuclear weapons.

A new variable related to strategic characteristics emerges particularly strongly as independent goals. The security policies of the images, having the correct structure targets and being able to appear better according to the defensive views. However, one only has to look at the conflict between the great powers to see how complex this process is. Considering that artificial intelligence-supported systems are being initiated in nuclear planning today, it is possible to predict that this process will become more complex in the future. Some analysts even claim that international security systems will work on the logic of "prioritization". This is the same symptom as page ranking growth in internet search engines.

As a result, the balance of nuclear power depends not only on how large the weapons stockpile is, but also on how these weapons are deployed, what political purposes they serve, and how states respond to crises. More complex strategic approaches that go beyond numerical superiority will shape nuclear power in the coming years. This suggests that the diplomatic and technological steps necessary for nuclear disarmament will become much more complex.

4. Questions to Further Asking

1- How can CERN foster innovation in alternative energy sources to reduce reliance on nuclear technologies with dual-use risks?

2- What ethical responsibilities should scientists and research institutions bear when engaging in nuclear-related scientific advancements?

3- How should policies regarding intellectual property rights be adopted to protect transactions carried out within the scope of CERN international cooperation?

4- How should CERN manage relations between it, International Arms Organizations (such as NATO and Shanghai) and states that have invested heavily in nuclear decontamination.

5- In what ways can CERN contribute to ensuring that nuclear research is directed exclusively toward peaceful scientific and medical applications?

5. Case Studies

1. Development & Past Usage of Nuclear Weapons

Nuclear weapons are one the of the most significant and at the same time most dangerous developments of the 20th and 21st century. The initial start of nuclear weapon development was in WWII where the governments were scared of falling behind and Nazi Germany developing nuclear powers. This led to the Manhattan Project (1942–1945), a major project funded by the US and including leading physicists such as J. Robert Oppenheimer, Enrico Fermi, and Niels Bohr.The findings from this project such as nuclear fission and chain reactions led to the production of the first atomic bombs, which were detonated on Hiroshima and Nagasaki in August 1945.Despite the end of the war, these bombs were an alert for how dangerous and powerful nuclear weapons are.

The cold war led to more developments toward nuclear weapons.The Soviet Union detonated its first atomic bomb in 1949, ending the United States' dominance on nuclear weapons. The outcome was the creation of the hydrogen bomb, which the US tested in 1952 and the USSR tested in 1953 as both countries hurried to produce more powerful versions. This nuclear breakthrough made it more destructive by using nuclear fusion instead of only fission, placing whole cities at risk of catastrophic destruction.During this period, nuclear proliferation attracted international attention. In the years that followed, China (1964), France (1960), and the United Kingdom (1952) joined the nuclear group, while Israel, India, and Pakistan carried out secret attempts. At the time countries wanted to have a power to secure themself and be ready for attack and they saw nuclear powers as a solution.

To stop nuclear powers from spreading and causing more harm, the Nuclear Non-Proliferation Treaty (NPT) was formed in 1968,recognizing five countries with nuclear weapons. However, nuclear crises like the Cuban Missile Crisis in 1962 demonstrated how close a nuclear war may be.The period from the 1970s to the 1990s saw the reduction and control of nuclear assets. Treaties such as the Intermediate-Range Nuclear Forces Treaty (INF, 1987), the Strategic Arms Reduction Treaty (START I, 1991), and the Strategic Arms Limitation Talks (SALT I and II) placed restrictions on warheads and delivery systems. Another objective of the Comprehensive Nuclear Test Ban Treaty (CTBT, 1996) was to stop explosive testing.Even through all these there are ongoing developments for nuclear powers.

Despite these developments, nuclear weapons remain crucial to global security in the twenty-first century. North Korea has been the only state in the modern era to openly build and test nuclear weapons since 2006. Meanwhile, the United States, Russia, and China are upgrading their arsenals, developing hypersonic delivery technologies that could affect nuclear control systems, and investing in cyber and artificial intelligence capabilities.

Even though they are not as dangerous as they were during the Cold War, nuclear weapons are still a dangerous threat for humans. The history of nuclear weapons generally follows a pattern: every scientific advancement, including fusion, fission, and delivery technologies, has been quickly militarized for the purposes of national security and power. At the same time, the fear of their use has led to the creation of international treaties, arms-control agreements, and safeguards. The development of nuclear weapons continues to pose the fundamental question of the nuclear

age: how to combine the necessity for humanitarian action to prevent devastation with state security and scientific advancement.

2. The Bombings of Hiroshima and Nagasaki

The bombings of Hiroshima and Nagasaki in August 1945 are considered one of the most debated and frightening events of the 20th century. These bombings were the first and only example of nuclear science being used in warfare. The United States carried out this bombardment to ensure Japan's withdrawal from World War II and to prevent other countries from invading Japan. American officers and statesmen were aware that these bombs would not only kill Japanese civilians and soldiers but also affect their own troops and allied soldiers. Beyond the military reasons for this bombardment, there were also political reasons. During the same period, there was significant tension between the Soviet Union and the United States. By demonstrating the capacity and power of nuclear science, it not only put pressure on Japan but also intimidated the Soviet Union, which it regarded as a potential rival.

Looking at the issue in detail, on August 6, 1945, the uranium-based bomb called "Little Boy" was dropped on Hiroshima. Within seconds, almost the entire city was destroyed, and approximately 70,000 civilians died instantly. Three days later, the plutonium-based bomb named "Fat Man**"** was dropped on Nagasaki. This bomb ended the lives of 74,000 civilians. The damage caused by these bombs was not only immediate. Due to burns caused by heat, radiation-related illnesses, injuries, and damaged environmental conditions, 140,000 people died by the end of 1945. Those who survived endured lifelong physical and psychological suffering.

The effects of the attacks were not only physical. They also caused great social and cultural wounds. Local populations were killed, families were torn apart, and survivors faced severe stigmatization in Japanese society. Survivors experienced long-term poverty, health problems, difficulties in finding employment, and challenges in marriage. However, the massive destruction also increased the Japanese people's sense of unity and solidarity.

These bombings clearly demonstrate that scientific developments and discoveries can actually produce very destructive results. Nuclear energy, discovered for the purpose of generating power, ultimately created an event that humanity will never forget. This situation also shows that science can be used both for the benefit and for the harm of humanity. To prevent such outcomes, international oversight, as well as ethical supervision and a sense of responsibility, must be developed.

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