TBSRJMUN XXI

Political Committee

TBSRJMUN XXI

Julia C. Lins

Arthur O'Donnell

TABLE OF CONTENTS

Letter to Delegates

Dear esteemed Delegates,

On behalf of us Chairs, we extend an extremely warm welcome to all delegates participating in the Political Committee at TBSRJMUN XXI. We are thrilled to have you on the Political Committee and look forward to witnessing your thoughtful deliberations and contributions to the discussion on two critical topics: "Improving and Ensuring the Safety of Atomic Energy Production'' and "Safeguarding International Space Law and Peaceful Uses."

The Political Committee has chosen to address some pressing challenges related to atomic energy safety and international space law. These topics are important in the global context and we are confident that your dedication will lead to fruitful debates and great solutions.

Our first topic, "Improving and Ensuring the Safety of Atomic Energy Production," calls for comprehensive discussions on the measures, protocols, and advancements required to enhance nuclear safety worldwide. We advise you to examine the latest developments in reactor technologies, safety standards, accident management strategies, and international collaborations, all of which contribute to the continued safe use of atomic energy.

Moving on to the equally significant "Safeguarding International Space Law and Peaceful Uses," this topic requires careful consideration of the legal frameworks and mechanisms governing space activities. With the rapid advancements in space technology and increased interest in space exploration, it is crucial to ensure that space remains a domain of peace and cooperation. We encourage you to explore ways to promote international space law, prevent the weaponization of space, consider environmental risks, and foster peaceful uses of space for the benefit of all nations.

As Chairs, we are beyond honoured and excited to guide you through these discussions. Your knowledge, perspectives, and diplomatic skills will undoubtedly enrich the debates and contribute to meaningful resolutions. We can't wait to see you engage in fierce yet diplomatic debate, cooperate with your fellow delegates, and foster an environment of mutual respect and understanding throughout the conference.

The success of the Political Committee relies on your active participation and commitment to finding cooperative solutions to the complex issues ahead of us. We are confident that your passion for diplomacy and global affairs will drive you to rise to the challenges presented by these topics and work towards creating a safer, more sustainable, and peaceful world.

Once again, a warm welcome to all delegates. Together, let us seize this opportunity to inspire positive change and shape a brighter future.

We wish you all a memorable and productive conference.

Sincerely,

Julia Ciccu Falcon Lins

juliacfalcon@gmail.com

Escola Americana de Brasília

Arthur O'Donnell

arthurdemoraesodonnell@gmail.com

Escola Americana do Rio de Janeiro

Committee Description

The United Nations (UN), upon its founding in 1945, established six General Assembly committees, each consigned to aiding in the resolution of different world issues. The United Nations General Assembly's Fourth Committee, known also as the “Special Political and Decolonization Committee,” lent its creation to the tasks of decolonization, peacekeeping, and political affairs. The Fourth Committee plays a crucial role in addressing a broad spectrum of political and humanitarian issues within the United Nations framework. As a General Assembly committee, all 193 UN member countries are invited to participate in deliberations of the Political Committee.

The Political Committee has been indispensable in overseeing and protecting decolonization around the world, and has actively supported the efforts of non-self-governing territories to achieve their political status and rights, eventually leading to their sovereignty. Examples of this include their support of the liberation of Namibia and former Portuguese colonies like Mozambique, Angola, and Timor-Leste. Not only this, but the Fourth Committee has always been involved in the discussions and evaluation of UN peacekeeping operations. It has reviewed the effectiveness of peacekeeping missions in different conflict zones and has made recommendations for improving their performance and outcomes, playing a hand in bringing peace and the resolution of global conflicts.

Overall, The United Nations General Assembly’s Fourth Committee, known also as the Political Committee, is an integral part of the UN, serving as one of its six General Assembly committees. It has been responsible for aiding in the settling of globally complex political affairs and promoting peace and justice throughout the world- and continues on this mission today. Its discussions and resolutions contribute to shaping policies, promoting cooperation, and advancing the UN's mission of maintaining international peace and security, fostering human rights, and supporting the well-being of affected populations worldwide.

Nuclear Energy: Renewable Energy

Topic A:

Improving and Ensuring the Safety of Atomic Energy Production

Background Information

Introduction

Atomic energy, also known as nuclear energy, has immense potential to serve as a dependable, low-element source of heat and electricity. It also refers to behaviours or legislation that are not harmful to the environment yet cause serious security difficulties. The history of nuclear energy is full of major occurrences and mishaps, prompting the international community to prioritize nuclear security and restoration.

Historical Development of Nuclear Safety

Mentioning Chernobyl: The historical evolution of nuclear safety underwent significant shifts during the mandatory education period for nuclear energy production. Initially, the emphasis lay on exploiting the potential for remarkable advancements in power generation and related objectives. However, over time, the industry gradually grasped the paramount significance of integrating safety measures due to the inherent hazards tied to its vital functions.

The 1950s and 1960s witnessed a series of incidents linked to nuclear fission, notably including events like the Windscale fire in the UK in 1957 and the SL-1 reactor accident in the USA in 1961. These incidents, along with the catastrophic Chernobyl disaster in 1986, served as pivotal reminders of the imperative need to prioritise nuclear safety.

In response, these incidents catalysed the formulation of comprehensive safety protocols, the establishment of regulatory frameworks for licensing, and the implementation of rigorous inspection procedures. This led to the creation of authoritative bodies by various nations, charged with the critical role of overseeing and enforcing these safety measures. These supervisory entities assumed a crucial responsibility in guaranteeing the secure operation of nuclear facilities and effectively managing potential risks associated with nuclear energy production. The memory of Chernobyl, in particular, served as a stark reminder of the catastrophic consequences that could arise without rigorous safety considerations.

International Collaboration and Regulatory Bodies

Recognizing the universal nature of fundamental security, international collaboration became increasingly crucial. A central authority for furthering the peaceful use of nuclear power while ensuring security and freedom emerged with the establishment of the International Atomic Energy Agency (IAEA) in 1957 under the auspices of the United Nations. The IAEA establishes global security flags, performs security assessments of fundamental skills, and offers member states technical assistance in developing and implementing security procedures. Different local agreements and consortia, in addition to the IAEA, have been formed to promote participation and exchange best practices in fundamental security. For instance, the Nuclear Energy Agency (NEA) of the Organization for Economic Co-operation and Development (OECD) and the European Nuclear Safety Regulators Group (ENSREG) in Europe both speed up the compatibility of security procedures with member countries.

Safety Culture and Human Factors

To ensure the safe operation and transportation of radioactive energy sources in nuclear facilities, it is imperative to foster a strong safety culture within these institutions. The concept of safety culture encompasses the collective beliefs, attitudes, and behaviours of individuals and groups towards institutional safety. A robust safety culture encourages critical thinking, a dedication to continuous improvement, and a positive mindset, all while effectively identifying and addressing safety concerns.

In this context, human factors planning plays a crucial role in enhancing foundational safety. This approach takes into account both the strengths and limitations of human operators when designing fundamental facilities. By prioritising human elements, such as control room design, security measures, and training programs, the aim is to minimise the potential for errors stemming from human mistakes. This comprehensive approach is geared towards creating an environment where human capabilities and potential errors are factored in, ultimately contributing to a safer operational framework.

Design and Technology Enhancements

The safety of nuclear energy has been significantly improved by advancements in electronics and atomic reactor architecture. The development of Generation III and III+ reactors shows an improvement in safety characteristics. The Generation III and III+ reactors have passive security features that maintain safety during accidents without relying on real-time human engagement or outside capacity onsets. These gadgets are made to respond immediately to odd conditions and make sure the reactor is securely closed and switched off. Examples of passive security features are self-actuating closure mechanisms, regular distribution methods, and importance-compelled cooling structures. Additionally, because of worries about fuel failures and the potential for active release during accidents, advancements in basic fuel electronics have been made. For example, accident-tolerant fuels are made to resist harsh circumstances, adding an extra layer of security.

Severe Accident Management

When designing new basic reactors with various safety coatings, it is important to take tough accident management techniques into account. Serious accidents involve very improbable but potentially disastrous occurrences that go beyond the plant's intended design basis. Leading calculating programs and simulations are used to simulate different calamity sketches and evaluate probable impacts in order to address serious mishaps. This information is utilised to create comprehensive risk mitigation strategies and pinpoint vulnerable areas in reactor design for increased security.

Emergency Preparedness and Response

Emergency reaction and readiness are crucial elements of fundamental security. Every nuclear power plant must have elaborate crisis response plans that outline how to deal with different fatality summaries. These plans cover everything from emergency chores to arrangements for local specialists' companies. Regular crisis drills and exercises are conducted to evaluate the preparedness of the plant personnel and the effectiveness of the reaction plans. The growth of crisis agreements has been surpassed by communication that is well-informed by actual events, such as the Fukushima Daiichi basic catastrophe.

Current Situation

For nations that host nuclear energy facilities, rebuilding and maintaining the security of nuclear energy production sites is currently of utmost importance. The panorama of fundamental security approaches and procedures continues to be influenced by lingering issues, growing electronics, and dynamic worldwide development notwithstanding considerable gains in nuclear security over time. With an emphasis on administrative innovations, technological breakthroughs, global collaboration, and new security concerns, this section supports a current assessment of the situation of fundamental safety.

Regulatory Developments and Standards

Nuclear security is built on a foundation of internal oversight bodies, international organisations, and safety standards. Together, these solutions increase safety management, advance best practices, and ensure that nuclear capabilities are transferred safely. Setting international standards for nuclear security requires the assistance of the International Atomic Energy Agency (IAEA). The IAEA Safety Standards in connection to nuclear security encompass a variety of subjects, including the design, operation, crisis readiness, and decommissioning of nuclear capabilities. The opportunity to share knowledge learned from earlier accidents and incorporate mechanical advancements is provided by routine inspections and improvements in accordance with these requirements. Strengthening core safety measures has received more attention in the modern era, particularly in response to growing warnings and increasing sciences. Many nations have conducted all-encompassing security reviews of their existing radioactive energy source plants to guarantee they meet the latest security necessities.

Technological Advancements in Nuclear Safety

Electronic developments have significantly improved the safety of nuclear energy production. Inactive safety mechanisms are included in modern atomic reactor designs, which are intended to automatically take over in the event of external mishaps without the need for human intervention or other power sources. Generation IV reactor designs serve as a key example of cutting-edge reactor science. These reactors seek to improve efficiency, sustainability, and safety further. Molten salt reactors (MSRs), sodium-cooled fast reactors (SFRs), and high-temperature gas-cooled reactors (HTGRs) are examples of Generation IV concepts. These designs also incorporate improved waste management capabilities, the possibility of more imaginative opposition, and integrated security elements. Furthermore, the focus of R&D work is on accident-tolerant fuels (ATFs), which are designed to survive harsh conditions and lower the chance of fuel bankruptcy following accidents. ATFs promise reinforced security borders and prolonged fuel existence, donating to enhanced nuclear security.

Safety Culture and Human Factors

The importance of basic manufacturing security culture remains at the forefront of guaranteeing nuclear security. Basic facility operators routinely invest in building a robust security culture among their trained workers. An active safety system promotes open communication, increases safety news collection, and focuses on continual learning from common mistakes and occurrences. Human factors engineering remains a diagnostic tool in nuclear security. Control rooms are designed with user-friendly interfaces, ergonomic concerns, and data accessibility in mind. Operator training programs are designed to address human performance issues and ensure that employees consider putting themselves in the shoes of others when presented with potential impediments.

International Collaborations and Safety Reviews

International cooperation and the distribution of knowledge are key components of reestablishing fundamental security in general. In order to examine compliance with global security criteria, the IAEA conducts basic capability safety reviews in member countries. These reviews help to identify areas for improvement and to share best practices. Following the Fukushima accident, multinational projects like as the European Union's Stress Tests for Nuclear Power Plants were established to assess the security of fundamental facilities in the face of extreme external occurrences such as earthquakes and floods. The lessons obtained from these stress tests have helped to improve the security of nuclear power facilities around the world.

Emerging Safety Challenges

As basic manufacturing evolves, new security issues emerge that necessitate cautious consideration. Among the prominent new security challenges are:

1. **Nuclear Infrastructure Aging:**
   In general, many nuclear energy plants are approaching or have exceeded their original operating lifespan. Maintaining the security of an old foundation involves diligent inspections, maintenance, and, in certain cases, historical continuation programs.

2. **SMRs (Small Modular Reactors):**
   The growth of SMRs creates additional safety concerns, particularly in terms of siting, licensing, and emergency readiness for various limited reactors of geographical proximity.

3. **Cybersecurity:**
   With the increasing digitisation and interconnection of nuclear capabilities, cybersecurity has improved as a vital component of safeguarding fundamental security. Nuclear conveniences must be safeguarded against high-tech dangers in order to withstand illegal approaches and potential sabotage.

4. **Decommissioning and Waste Management:**
   As some nuclear power plants near the end of their operational lifespan, decommissioning and waste management become major issues. Nuclear waste decommissioning and long-term storage necessitate rigorous planning and adherence to safety precautions.

Past UN Actions

The United Nations (UN) has been actively involved in promoting and overseeing the safe and responsible use of atomic energy ever since the creation of the bomb. In order to coordinate international efforts to safeguard nuclear security and prevent nuclear fission meltdown incidents, the UN, functioning as the global committee, is crucial. This section highlights the actions taken by the UN in the past to enhance and guarantee the security of nuclear energy production.

International Atomic Energy Agency (IAEA)

The International Atomic Energy Agency (IAEA), established in 1957 as a separate body inside the UN, is one of the most well-known institutions devoted to fundamental security in regard to atomic energy. The primary objective of the IAEA is to promote the prudent use of atomic energy while keeping the highest standards of security and safety.

As part of its primary security responsibilities, the IAEA creates and disseminates security standards that cover a range of topics related to the design, portability, and disposal of nuclear facilities. These regulations serve as the cornerstone for regional planning and proactive initiatives to enhance security practices everywhere. Technical support is defined more specifically by the IAEA, which also performs security audits of nuclear capabilities to determine how well they adhere to international safety standards.

Convention on Nuclear Safety (CNS)

The Convention on Nuclear Safety is a world accord that has been ratified under the supervision of the IAEA. By promoting international collaboration and enabling the sharing of security-related information with participating states, the CNS, enacted in 1994, aims to improve fundamental security. States that have signed the CNS provide periodic peer reviews of their core security practices. States that evaluate the nation's convoluted security systems and measures are also added to these evaluations. The CNS ensures accountability and transparency in the security accomplishment of radioactive energy source plants and encourages the sharing of best practices to improve overall nuclear security.

Joint Radiation Emergency Management Plan of the International Organizations (JPLAN)

After realising the potential for transnational repercussions from a nuclear fission meltdown event, the UN and IAEA formed the Joint Radiation Emergency Management Plan (JPLAN) along with other international accords. In the case of a nuclear or humanitarian crisis, JPLAN is intended to coordinate international help and response. To help affected nations lessen the effects of a nuclear fission meltdown accident, JPLAN compiles data from numerous international organisations, including the World Health Organization (WHO), the World Meteorological Organization (WMO), and the Food and Agriculture Organization (FAO).

Response to Major Nuclear Accidents

Returning to earlier nuclear fission meltdown disasters has required the UN and other specific mechanisms. In order to allocate relief to problematic areas and evaluate the energy and material consequences of the accident, the UN prepared worldwide assistance in the wake of the Chornobyl nuclear accident in 1986. Similarly to this, UN organisations matched Japan's efforts to manage the nuclear disaster at Fukushima Daiichi in Japan in 2011 and ensure the safety of the impacted population. The UN and WHO reached judgments about the accident's fitness effects and took action to soothe public concerns about information leaks in the future.

Major Bloc Positions

United States of America

The United States is the global leader in fundamental technologies and has a robust basic security program. The nation's regulatory body, the Nuclear Regulatory Commission (NRC), is in charge of regulating the safe transportation of nuclear energy source facilities while ensuring adherence to the highest security standards. The NRC regularly carries out inspections, security assessments, and performance evaluations in order to maintain the highest security standards throughout basic production.

In terms of scientific breakthroughs, the United States has been aggressively creating and implementing Generation III+ and Generation IV reactor designs with advanced security features. The country invests in R&D for cutting-edge reactor technology and disaster-tolerant fuels to further increase nuclear security.

The United States actively participates in international partnerships and exchanges knowledge about attraction with other nations through the International Atomic Energy Agency (IAEA) and other organisations. Comprehensive efforts to improve nuclear energy security are built on the nation's deep involvement in atomic energy and dedication to fundamental safety.

France

Nuclear energy makes a sizable contribution to France's overall power output and the country has a sizable radioactive energy source program. The nation's primary supervisory agency, *Autorité de sûreté nucléaire* (ASN), places a high priority on fundamental safety. The ASN continuously assesses the efficiency of basic facilities and ensures that they are managed securely.

The development and operation of contemporary pressurised water reactors (PWRs) with a range of security redundancies has long been a priority for France. The nation claims a high level of fundamental security in part because of its concentration on standardised reactor designs and past safety responsibilities.

France actively participates in two international safety initiatives: the Convention on Nuclear Safety and the European Nuclear Safety Regulators Group (ENSREG). These programs encourage international cooperation in fundamental safety and enhance best practices.

Japan

Japan has a sizable program for radioactive energy sources, but after the Fukushima Daiichi tragedy in 2011, its position on nuclear energy safety has been under increasing criticism. The incident prompted a thorough evaluation of the country's core security practices.

To ensure more objective and accurate security management following the Fukushima accident, Japan's regulatory framework underwent significant adjustments and outlasted the bureaucratic requirements of the Nuclear Regulation Authority (NRA). The NRA reviewed basaltic and quantity assessments for basic comforts, updated disaster preparedness, and established new security measures.

Japan continues to invest in cutting-edge safety electronics and research, particularly in the areas of fuels that are occurrence-tolerant and seismic elasticity. The nation actively collaborates with international institutions, such as the IAEA, in order to communicate lessons learnt from the Fukushima disaster and drive efforts for basic global security.

Russia

Russia has used nuclear energy for a long time and has a major nuclear power program. The Federal Environmental, Industrial, and Nuclear Supervision Service (*Rostechnadzor*), the nation's principal nuclear regulatory organisation, is in charge of nuclear security and the regulations that regulate agreements.

VVERs (pressurised water reactors) under Russian control are constantly receiving security enhancements. To provide the highest level of security, the country invests in updating its fundamental skills. Russia actively participates in conferences and tirelessly aids the IAEA in order to promote worldwide nuclear security. Furthermore, the country works with other countries to develop cutting-edge nuclear technology like fast reactors and small mobile reactors (SMRs), both of which have built-in security elements.

China

China is rapidly increasing its nuclear energy program to meet rising strength demands. The National Nuclear Safety Administration (NNSA) is in charge of nuclear security in the United States. It enforces security management and conducts nuclear capability security inspections.

China has selected sophisticated nuclear technologies, including Generation III reactors, and is actively researching SMR configuration. The country invests in research and development for leading issues, fuel electronics, and passive security techniques to improve basic safety.

As a party to the Convention on Nuclear Safety and an active member of the IAEA, China participates in international efforts to improve basic security criteria and share best practices. The country's dedication to basic security is demonstrated by its attempts to pick new security measures and technology to entice more nuclear power.

Timeline of Events

1957	The International Atomic Energy Agency (IAEA) was created by the United Nations to promote peaceful uses of nuclear energy while simultaneously guaranteeing security and safety issues. The International Atomic Energy Agency (IAEA) is an important contributor to defining global fundamental security principles and communicating security assessments of basic conveniences around the world.
1979	The Three Mile Island nuclear incident in Pennsylvania, USA, resulted in a partial meltdown of the reactor core. It underlined the importance of strong safety measures, proper operator training, and clear communication in the prevention and handling of nuclear accidents.
1986	The Chornobyl nuclear tragedy in Ukraine was the world's worst nuclear disaster. The accident and subsequent radioactive spill raised worldwide concern about nuclear safety. It prompted the creation of the Nuclear Safety Convention in order to encourage global cooperation and improve nuclear safety.
September 20, 1994	Adoption of the Convention on Nuclear Safety: The Convention on Nuclear Safety, established under the auspices of the IAEA, aims to promote nuclear safety by improving international cooperation and sharing safety-related information among participating countries. Signatory states commit to conduct peer reviews of their nuclear safety measures on a regular basis.
March 11, 2011	Fukushima Daiichi Nuclear accident (Japan): A tremendous shock and an overpowering flow produced the Fukushima nuclear accident in Japan, resulting in triple meltdowns and active emissions. It prompted Japan to upgrade its existing regulatory base and crisis readiness systems, demanding significant reassessments of basic safety in general.
2015	Implementing the Joint Convention on the Safety of Spent Fuel Management and Radioactive Waste Management: The goal of the Joint Convention is to ensure the safe disposal of spent fuel and radioactive waste. It offers a global framework

for radioactive material management that is both safe and environmentally responsible.

2016	The Global Nuclear Safety and Security Network (GNSSN) is under construction. The IAEA formed the GNSSN to encourage member countries to share nuclear safety and security information and knowledge. The network facilitates peer reviews and participation in the global improvement of nuclear safety processes.
2019	The United Nations High-level Conference on Nuclear Safety and Security: The United Nations adopted a high-level convention to address nuclear security and protection issues. The colloquium pushed for a forum for nations to debate their nuclear security responsibilities and share advancements in basic safety.
2020	Small Modular Reactor (SMR) Passive Safety Systems: Continuous R&D has resulted in significant breakthroughs in passive safety systems and SMRs. Passive safety solutions offer superior safety qualities, but SMRs promise scalability and inherent safety benefits, potentially altering the future of nuclear energy production.

Definition of Key Terms

- **Atomic Energy Production**

  The method of obtaining energy from nuclear reactions, specifically nuclear fission or fusion, is known as atomic energy production/creation. It is the carefully controlled release of energy generated when atomic nuclei are smashed or united to produce heat, which is subsequently transformed into electricity or employed for a variety of commercial and academic reasons.

- **Nuclear Fission**

  When an atom's nucleus splits into two or more smaller nuclei, a considerable quantity of energy is released. This nuclear reaction is known as nuclear fission. This process is critical to the generation of nuclear energy because it supplies the heat required for nuclear reactors to generate steam and electricity.

- **Nuclear Fusion**

  Nuclear fusion is a nuclear reaction that occurs when two lighter atomic nuclei unite to generate a heavier nucleus while releasing energy. The sun and other stars are powered by fusion processes, which have the potential to provide humanity with a nearly unlimited source of environmentally friendly energy. However, large-scale practical nuclear fusion for energy generation is still a long way off.

- **Nuclear Safety**

  Nuclear safety refers to the policies, guidelines, and procedures that are in place to ensure the secure and safe operation of nuclear facilities and operations. It includes the design, construction, operation, maintenance, decommissioning, and waste management of nuclear power plants.

- **Passive Safety Systems**

  Passive safety mechanisms in nuclear reactors work without the intervention of a human or an external source of electricity. These systems are designed to automatically respond to unusual situations, assuring the reactor's safe shutdown and cooling without the need for active systems or operator interaction.

❖ Accident-Tolerant Fuels (ATFs)

"Accident-tolerant fuels" are sophisticated nuclear fuel materials designed to endure severe temperatures and lower the chance of fuel failure during accidents or unplanned operating events. In terms of safety margins, performance, and fuel life, ATFs outperform conventional nuclear fuels.

❖ Severe Accident Management

The term "severe accident management" refers to substantial preparations and mechanisms put in place to mitigate the effects of unanticipated and serious incidents that surpass nuclear power facilities' regular safety margins. These measures seek to reduce radioactive leakage, safeguard the environment and public health, and avoid or mitigate significant disasters.

❖ Safety Culture

The collective attitudes, values, and activities of those concerned with workplace safety are referred to as "safety culture." A positive safety culture promotes a strong commitment to safety, open communication, ongoing learning, and a proactive approach to identifying and resolving safety issues.

❖ International Atomic Energy Agency (IAEA)

The International Atomic Energy Agency, a non-governmental organisation within the United Nations, is in charge of promoting the safe and secure use of nuclear energy around the world. The International Atomic Energy Agency (IAEA) creates international nuclear safety standards, conducts safety audits, and provides technical help to member governments.

Further Research

1. National Geographic - Nuclear Energy: https://education.nationalgeographic.org/resource/nuclear-energy/#
2. United Nations - Atomic Energy: https://www.un.org/en/global-issues/atomic-energy
3. Britannica - Nuclear Energy: https://www.britannica.com/science/nuclear-energy
4. International Atomic Energy Agency - What is Nuclear Power? The Science of Nuclear Power: https://www.iaea.org/newscenter/news/what-is-nuclear-energy-the-science-of-nuclear-power
5. Britannica - Nuclear Fission: https://www.iaea.org/newscenter/news/what-is-nuclear-energy-the-science-of-nuclear-power
6. Department of Energy - DOE Explains...Nuclear Fusion Reactions: https://www.energy.gov/science/doe-explainsnuclear-fusion-reactions#:~:text=Nuclear%20Fusion%20reactions%20power%20the,The%20leftover%20mass%20becomes%20energy.

Guiding Questions

- What are the key safety measures and protocols implemented in nuclear power plants to ensure the safe operation of reactors and prevent accidents?
- How do passive safety systems in nuclear reactors differ from active safety systems, and how do they contribute to enhancing nuclear safety?
- What are the latest advancements in accident-tolerant fuels (ATFs), and how do they improve the safety and performance of nuclear reactors?
- How does the concept of "safety culture" impact the overall safety performance of nuclear facilities? What are the factors that contribute to a positive safety culture?
- What are the major challenges faced in the decommissioning of nuclear power plants, and how can they be addressed to ensure safe and efficient decommissioning processes?
- How does international collaboration, through organisations like the International Atomic Energy Agency (IAEA), contribute to improving nuclear safety worldwide?
- What lessons have been learned from past nuclear accidents, such as Chernobyl and Fukushima, and how have they influenced nuclear safety practices and regulations?
- What are the potential cybersecurity threats to nuclear facilities, and what measures are being taken to safeguard against cyberattacks on nuclear systems?
- How do emerging technologies, such as small modular reactors (SMRs) and Generation IV reactors, offer enhanced safety features and contribute to the future of nuclear energy production?
- How does public perception and acceptance of nuclear energy and nuclear safety impact the development and expansion of nuclear power programs?
- What role does human factors engineering play in improving nuclear safety, and how can human errors be minimised in the operation of nuclear facilities?

- How do different countries' regulatory bodies ensure the effective oversight and enforcement of nuclear safety regulations?

Works Cited

National Geographic - Nuclear Energy: https://education.nationalgeographic.org/resource/nuclear-energy/#

United Nations - Atomic Energy: https://www.un.org/en/global-issues/atomic-energy

Britannica - Nuclear Energy: https://www.britannica.com/science/nuclear-energy

International Atomic Energy Agency - What is Nuclear Power? The Science of Nuclear Power: https://www.iaea.org/newscenter/news/what-is-nuclear-energy-the-science-of-nuclear-power

Britannica - Nuclear Fission: https://www.iaea.org/newscenter/news/what-is-nuclear-energy-the-science-of-nuclear-power

Department of Energy - DOE Explains...Nuclear Fusion Reactions: https://www.energy.gov/science/doe-explainsnuclear-fusion-reactions#:~:text=Nuclear%20Fusion%20reactions%20power%20the,The%20leftover%20mass%20becomes%20energy.

ENSREG - What is Nuclear Safety? https://www.ensreg.eu/nuclear-safety

International Atomic Energy Agency - Nuclear Safety and Security https://www.iaea.org/topics/nuclear-safety-and-security

EU Science Hub - Nuclear Safety https://joint-research-centre.ec.europa.eu/scientific-activities-z/nuclear-safety_en

World Nuclear Association - Safety of Nuclear Power Reactors https://www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/safety-of-nuclear-power-reactors.aspx

International Space Station, October 2021

Dima Zel // Shutterstock

Topic B:

Safeguarding International Space Law and Peaceful Uses

Background Information

Introduction

The dawn of space exploration has marked a new era for humankind, allowing us to explore further and reach beyond what we thought possible. Beginning with the launching of satellites, some now believe space exploration to be the key to solving our planet’s environmental problems- and perhaps even finding a new home for our species. However, with so much opportunity, newfound issues arise, and as space exploration progresses, the need for a legal framework to govern activities beyond Earth's atmosphere has become apparent.

Overview

In order to begin the discussion of the relevance of law in space, it must first be acknowledged that it is a very recent subject when looking through a historical lens. Humanity only really started making a serious effort to explore outer space 70 years ago, and therefore, there is minimal historical precedent. Nonetheless, humanity has gone very far in outlining international legal boundaries to maintain peace within space to a relatively successful extent in a short period of time.

Similarly to maritime law, space law can be both national and international. In regards to national space law, The Outer Space Treaty dictates that the country in which the space exploration activity is taking place has the responsibility of regulating the activities of its spacecrafts (UNOOSA).

However, international space law is also indispensable to both regulate and hold governments accountable for their activities in space and concerns itself with various aspects, such as weapons use, environmental preservation, space exploration, liabilities for damages, rescue efforts, and more (Gabrynowicz 1041). This being said, international space law integrates various other fields of law, such as IP law, arms control law, criminal law, and environmental law, and is thus a multi-faceted issue that must be addressed with tact. It is essentially composed of various international treaties, agreements, conventions, United Nations resolutions, and rules and regulations of international organisations (UNOOSA).

History - The Cold War

It is imperative to note, particularly if we are in pursuit of the maintenance of civility and peace within space, that humanity's will to reach it was born out of the conflict between two nations. In 1955, in the middle of the Cold War, the United States and the USSR each embarked on a mission to conquer space, in yet another attempt to prove they were more technologically advanced and had more expendable resources than their counterpart. Beginning with the launching of increasingly advanced satellites, the space race soon escalated with the goal of physically conquering space itself (John F. Kennedy Presidential Library and Museum). In 1957, the USSR launched the world's first artificial satellite, which would result in the first need for international regulations of outer space; the issue would first be presented for debate to the United Nations the following year.

In 1961, the Soviets would successfully send astronaut Yuri Gagarin to the Earth's orbit, marking the first time a man had reached outer space (John F. Kennedy Presidential Library and Museum). As the space race sped up, with both the United States and the USSR sending various people to outer space, the urgency to implement international space laws would only be emphasised.

International Space Station (ISS)

The idea of an international space station was first proposed in 1984 when the United States invited international partners to join its Space Station Freedom program. In 1993, after the end of the Cold War, NASA and Roscosmos resolved to merge their respective space station programs to create the ISS (The International Space Station). Other space agencies such as the ESA, JAXA, and the CSA would later join the project. In November of the year 2000, the first crew of astronauts arrived in the station, marking the start of a new journey of outer space exploration for the world (ISS National Laboratory). To this day, the ISS stands as a symbol as one of the most significant achievements of space exploration and international cooperation.

In 2014, however, conflict arose after Russia's annexation of Crimea, as national space agencies such as NASA temporarily suspended cooperation with Russia's Roscosmos, thus jeopardising ISS operations (Johnson-Freese).

Furthermore, the ISS presented another point of diplomatic contention between the US and China, when, in 2011, the former effectively banned the latter from participating, passing a bill in congress which prohibited any Sino-American collaboration in space, citing national security concerns (Pentland). Although China never was a member, the ethics of its explicit exclusion, considering the goal of the ISS to unite the international community have been questioned.

There have also been complaints that different countries have varying levels of access to research opportunities on the ISS, leading to discussions about the equitable distribution of scientific research and utilisation of the station's capabilities (Harland). Some nations may face restrictions on conducting certain experiments or accessing specific modules due to the arrangements and agreements among the participating countries.

It should, finally, be noted that the International Space Station will come to an end by the year 2030, which leaves a lot of open questions regarding the future of international space collaboration.

Current Situation

Summary:

As of today, world governments are still on their missions to explore space further and further, and as technologies keep advancing, the prospect of space exploration by private bodies grows more and more relevant- and perhaps more in need of regulation. Today, companies like SpaceX, Virgin Galactic and Blue Origin can be said to rival national space exploration bodies, and are even striving to bring space exploration to a commercial market (Weinzierl and Sarang).

Space Debris and Pollution

Space debris refers to man-made objects in orbit around Earth. These potentially pose danger by colliding with operational spacecraft and satellites, causing catastrophic damage and generating more debris (NASA), not to mention the environmental risks. Efforts focus on tracking, disposal measures, and international cooperation for space sustainability.

As of today, the Department of Defense's global surveillance Network tracks more than 27,000 orbital pieces of space debris, yet much more debris exists that is too small to be tracked but large enough to threaten human spaceflight and robotic missions (NASA). Due to the nature of the environment in space, the collision of a spacecraft with even a tiny piece of space debris could prove fatal to the craft.

Commercialisation of Space

The commercialisation of space is a rising phenomenon, as private space exploration companies make more and more rapid advances, rivaling and even surpassing that of national agencies. In 2020, Elon Musk's SpaceX was responsible for being the first private company that sent humans into space. The following year, 2021, saw another four private flights to space, carrying 20 individuals in total (Chebakin). It should be noted, however, that a significant majority of private space agencies benefit from large amounts of public funding (Ben-Itzhak) (Waldek)- and thus should be held accountable to the same degree that national agencies are.

There is, however, no shortage of issues that arise with the privatisation of space. Namely, the exorbitant amounts of fuel that are required to power just one of these flights can utilise as much as two million times the fuel *per second* of the average car.

Not only this, but studies have shown that the release of soot and fuel at atmospheric levels pose significantly higher risks for the environment, 500 times more than fuel released on the ground (McKenna)- so that the rise of commercial flights may pose a very serious threat to the earth's ozone layer, the risks of collisions, space debris, and the question of liability notwithstanding. Therefore, it is clear that in the very near future, the need for environmental regulations on commercial flights will become undeniable (Kluger).

Space Colonisation

It should be noted that the UN previously outlined outer space and celestial bodies to be considered "common heritage" to the world, attempting to prevent any country from making sovereignty claims over areas of space and outer planets. The Moon Agreement of 1984 also reinforced that no nation shall make sovereignty claims over other celestial bodies (UNOOSA). However, it is crucial to note that only one member of the P5, France, is a signatory on this treaty, which indicates that other countries may have aspirations to control parts of space or other planets in the future.

The significance of this is emphasised when considering the exorbitant amount of government funding that space agencies are given access to, and the value of minerals that can be found in space.

Past UN Actions

First Space Laws and Agreements

In 1959, the United Nations formed the Committee on the Peaceful Uses of Outer Space (COPUOS) in order to better regulate the scientific and legal aspects of outer space activity. In 1967, The foundational document of International Space Law, the "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies," commonly known as the Outer Space Treaty, was adopted by the United Nations General Assembly. This treaty is considered by many to be the foundational document of space law, as it set out basic principles that would come to create the foundation for international space law, and did things such as emphasise the rules of exploration and strict use of outer space for peaceful purposes, prohibit the placing of nuclear weapons in space, and attempt to prevent celestial bodies from national appropriation and colonisation.

Liability and Registration

The Outer Space Treaty also paved the way for further developments in International Space Law. In 1972, the Liability Convention was adopted by the UN, establishing rules for liability for damage caused by space objects on Earth and in space. This convention provides a framework by which to resolve disputes and compensate affected parties in the event of damages caused by space activities.

Lastly, in 1976, the Registration Convention was introduced, which required states to register their space objects with the UN, in an attempt to enhance transparency and accountability in space activities and help prevent harmful interference or collisions.

Remote Sending and Telecommunications

In 1986, The "Principles Relating to Remote Sensing of the Earth from Outer Space" was adopted by the UN, as an extension of the principles of International Space Law to remote sensing activities. These principles emphasised the peaceful use of remote sensing data and the free dissemination of this data, subject to national security and other legitimate concerns.

The International Telecommunication Union (ITU) regulations for satellite orbit allocation and frequency coordination were also established.

Space Debris Mitigation

In 2007, in response to the growing concern over space debris, the UN formulated the "Space Debris Mitigation Guidelines." It encouraged sovereign nations to adopt measures to minimise the creation of space debris and ensure the safe disposal of defunct space objects.

Space Stations

The "Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space" was adopted in 1968, as space stations became prominent in space law. It ensures the safe return of astronauts and space objects and promotes international cooperation and humanitarian values.

Commercial Space Activities

In 1976, as commercial space activities grew in prominence, the UN developed the "Convention on Registration of Objects Launched into Outer Space" and the "Convention on International Liability for Damage Caused by Space Objects" in 1972, both addressing private companies and entrepreneurs venturing into space exploration.

The Moon Agreement and the Moon and Mars Colonisation

In 1984, the Moon Agreement, officially the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies," also known as the Moon Agreement, was introduced- aiming to establish a legal framework for the exploration of celestial bodies in outer space. However, key nations, such as the United States and Russia, have not agreed to sign on to the agreement, which seriously limits its power on influencing current space missions.

Militarisation of Space

In regards to the militarisation of space, the Outer Space Treaty also dictates that weapons must not be placed in outer space, whether for defensive or offensive purposes, but military satellites and other space-to-earth technology is permitted.

Major Bloc Positions

United States

It is not unreasonable to say that the United States has major aspirations to reach and colonise celestial bodies such as the Moon and Mars. From the United States's government funding of SpaceX explorations and their refusal to sign on to treaties that aim to prohibit the colonisation of space, it does appear that the United States has future ambitions to control extraterrestrial land. Being the country in the world with the most advancement in terms of space exploration, and showing little signs of stopping, the United States concerns itself primarily with what it has stated to be "great competition" in outer space from China and Russia, the former of which the United States has permanently suspended any potential chance at collaboration with. All in all, the United States has interests in furthering space exploration and perhaps even colonisation, as well as preventing the militarisation of space from actors such as China and Russia, whose release of space debris could well jeopardise space missions in the future.

Russia

Russia's positions and aspirations in regard to space exploration very closely mirror the United States, but with a strong allyship to China, particularly in matters regarding the prohibition of weaponry in space. In recent years, President Putin has put more focus on space exploration, attempting to capture Russia's Space Race glory. However, extraterrestrial collaboration with other advanced countries, namely the US, the UK, and Japan, has experienced strain due to their current war with Ukraine. Russia has not demonstrated great environmental concern in regard to space exploration nor with things such as space debris or the release of harmful gases. The notoriously underfunded Roscosmos has also been experiencing serious challenges and has been described as "falling apart" (Skibba), despite Putin's demonstrated wishes for its revival. This being said, Russia has demonstrated serious concerns over the militarisation of space, having submitted, along with China, a draft UN treaty arguing for the prohibition of the use or threat of the use of force against space objects.

China

China, as a relatively new actor in the extraterrestrial domain, has already demonstrated both great threat and potential in regard to its activities in outer space- being the third country to ever launch a human being into space. China has demonstrated interest in extraterrestrial technology, which caused controversy in 2007 with an anti-satellite destruction test, which created large amounts of space debris and generated great backlash from the international community (Nagashima). China is expected to work closely with Russia in the coming years, particularly after the dissolution of the ISS in 2030, to further both nations' domination of space. Both nations have also been accused in the past of attempting to restrict other nation's access to freely utilise space. Further, China has stated plans of placing human beings on the moon by 2030 and is putting significant resources into expanding its space station in the coming years. Having, however, become a major space power in the last decades, and showing no signs of stopping, questions have arisen regarding possible future intent to develop and station weapons in space that could come at the risk of international safety.

United Kingdom

The United Kingdom has been a major space power since the Cold War, being a participant in the ISS and with consistently successful satellite launches over the years. Recently, the UK government has demonstrated interest in the commercial space market and aims to increase its market share of the global space sector from 5% to 10% by 2030 (International Trade Administration). A strong ally to the USA, the UK recently entered into The Technology Safeguards Agreement, which aims to facilitate US companies to operate from UK spaceports, strengthening the two nation's collaboration. Together with pledging large amounts of funding to its national space program, the United Kingdom Space Agency has also recently backed programs of nuclear energy production in order to fuel its space missions. The UK demonstrates particular concerns over environmental damage that space exploration may cause and has goals to turn its major spaceports into carbon-neutral operations by 2030.

Japan

Despite historically being a major space power, Japan has experienced setbacks and challenges in its mission to further technological competitiveness, such as the failure to launch its cutting-edge H3 rocket earlier this year. This being said, Japan has also made great advancements and has been investing in private space companies, the most salient of which, is space, which will attempt to land on the moon this year, which would be a revolutionary advancement (Goswami). Its allyship with the United States is also promising, as The U.S.-Japan Space Pact promises stronger collaboration in space exploration between the two nations. Japan's Strategic Headquarters for Space Development bill also calls for the nation to become an independent space power in collaboration with its allies (Nagashima), strengthening plans for industrial and scientific technology infrastructures. Japan has also been one of the countries to demonstrate concerns over Chinese space advancements that could possibly become military threats. With this said Japan has recently demonstrated interest in furthering defence-related space technology in the future. Japan is also one of the leading nations in the monitoring of space debris and human activity within space.

Timeline of Events

October 4, 1957	Launching of Sputnik-1, the first artificial satellite, by the USSR. This marked the commencement of the space race and of government's interests in space technology.
December 12, 1959	The Permanent Committee on the Peaceful Uses of Outer Space was established in the United Nations.
April 12, 1961	The first astronaut, Yuri Gagarin, orbited the earth, marking the first time a human reached outer space.
January 27, 1967	The Outer Space Treaty was established, laying the groundwork for international space law.
July 20, 1969	United States astronaut, Neil Armstrong, stepped onto the surface of the moon, marking the first time any human reached the moon.
March 29, 1989	The first commercial space flight was launched in the United States by Space Service, Inc.
November 20, 1998	The first piece of the International Space Station was launched, marking a breakthrough in international collaboration in outer space.
January 25, 2004	First long range robotic rovers land on Mars, achieving significant advancements for the scientific exploration of the planet.
December 22, 2007	Space Debris Mitigation Guidelines were endorsed by the UN General Assembly, signifying increased consciousness of the potential environmental ramifications of space exploration.

Definition of Key Terms

- **Space Colonisation**

  The use of outer space or celestial bodies other than Earth for permanent habitation. Specifically, colonisation of other planets may also refer to the process of a government attempting to make sovereignty claims over extraterrestrial land.

- **Space Debris**

  Any non-functional, artificial objects, including fragments and elements thereof, in the Earth's orbit.

- **Common Heritage of Mankind**

  A concept of international law that establishes a locality as belonging to all of humanity, so that all of its resources be available for everyone's use and benefit, which emphasises the importance of said place's preservation for future generations.

- **Commercialisation**

  The organisation, managing, transforming, or running of something with the purpose of financial gain.

- **Liability**

  Legal responsibility for something.

- **Satellite**

  An artificial body placed in orbit around the earth or moon or another planet in order to collect information or for communication.

- **Militarization of outer space**

  The placement of defensive or offensive technology in outer space. Military activity may be included in peaceful uses of outer space, with most advanced militaries today relying on satellites for command and control, communication, monitoring, missile prevention, early warning, and navigation. Not to be confused with weaponisation of outer space.

Further Research

1. United Nations Office for Outer Space Affairs:

   A Timeline of the Exploration and Peaceful Use of Outer Space

2. United Nations Office for Outer Space Affairs:

   Space Law

3. Space Foundation:

   International Space Law

4. World Economic Forum:

   What's the environmental impact of space debris and how can we solve it?

5. Space law: Its Cold War origins and challenges in the era of globalization.
6. NASA

   Space Debris and Human Spacecraft

7. NASA

   Space Commercialization

8. Georgetown Law Review:

   The Environmental Impacts of the New Space Race

9. Brookings:

   The promise and perils of the new space boom

10. National Library of Medicine:

    Mars Colonization: Beyond Getting There

Guiding Questions

- Should countries be prevented from laying claim to territories in outer space?
- Should countries be permitted to extract any valuable minerals from other planets? If so, how should the ownership of said minerals be regulated?
- Should there be more plans for international collaboration in space?
- What should be the ramifications for space pollution? Should there be further restrictions and regulations, given the increase in flights?
- Under what circumstances should private flights for touristic purposes be permitted? Should they be permitted at all, given the environmental risks?
- Should there be further regulations put upon private companies? If so, how?
- Should private companies get to enjoy the same benefits and protections in outer space as national agencies? How should issues of liability be addressed in the context of private businesses?
- How should the ISS be addressed? Should the UN have a say in which countries participate in the ISS? Should it be extended beyond 2030?
- What measures should be taken in regards to the potential militarisation of space? Should there be an exception made for the placement of defensive weapons? Do weapons belong in space at all?

Works Cited

- Ben-Itzhak, Svetla. “Analysis | Companies are commercializing outer space. Do government programs still matter?” *Washington Post*, 11 January 2022, https://www.washingtonpost.com/politics/2022/01/11/companies-are-commercializing-outer-space-do-government-programs-still-matter/. Accessed 23 July 2023.

Chebakin, Val. “Private spaceflight in 2022.” *Space Adventures*, 22 March 2022, https://spaceadventures.com/private-spaceflight-in-2022/. Accessed 23 July 2023.

Gabrynowicz, Joanne Irene. “Space law: Its Cold War origins and challenges in the era of globalization.” *Suffolk University Law Review*, vol. 37, 2004, p. 1041. *HeinOnline*.

Goswami, Namrata. “Japan Is Changing the Game for Space Powers.” The Diplomat, 10 January 2023, https://thediplomat.com/2023/01/japan-is-changing-the-game-for-space-powers/. Accessed 27 July 2023.

Harland, David M. “International Space Station (ISS) | Facts, Missions, & History.” *Britannica*, 15 June 2023, https://www.britannica.com/topic/International-Space-Station. Accessed 23 July 2023.

International Trade Administration. “United Kingdom Space Launch Program.” International Trade Administration, 21 April 2021, https://www.trade.gov/market-intelligence/united-kingdom-space-launch-program. Accessed 27 July 2023.

ISS National Laboratory. “History and Timeline of the ISS.” *ISS National Lab*, https://www.issnationallab.org/about/iss-timeline/. Accessed 23 July 2023.

John F. Kennedy Presidential Library and Museum. “The Cold War.” *JFK Library*, https://www.jfklibrary.org/learn/about-jfk/jfk-in-history/the-cold-war. Accessed 23 July 2023.

Johnson-Freese, Joan. "Why NASA Isn't on Speaking Terms With China or Russia." *Slate*, 13 April 2014, https://slate.com/technology/2014/04/nasa-banned-from-contact-with-russia-and-china-politics-and-the-iss.html. Accessed 23 July 2023.

Kluger, Jeffrey. "Is Space Travel Good for the Environment? No." *Time*, 19 April 2023, https://time.com/6273065/space-travel-climate-impact/. Accessed 23 July 2023.

McKenna, Phil. "Space Tourism Poses a Significant 'Risk to the Climate.'" *Inside Climate News*, 29 June 2022, https://insideclimatenews.org/news/29062022/space-tourism-climate/. Accessed 23 July 2023.

Nagashima, Jun. "The Militarization of Space and its Transformation into a Warfighting Domain." The Sasakawa Peace Foundation, 17 July 2020, https://www.spf.org/iina/en/articles/nagashima_02.html. Accessed 27 July 2023.

NASA. "Space Debris and Human Spacecraft." *NASA*, 26 May 2021, https://www.nasa.gov/mission_pages/station/news/orbital_debris.html. Accessed 22 July 2023.

Pentland, William. "Congress Bans Scientific Collaboration with China, Cites High Espionage Risks." *YouTube*, 7 May 2011, https://www.forbes.com/sites/williampentland/2011/05/07/congress-bans-scientific-collaboration-with-china-cites-high-espionage-risks/?sh=94227d545629. Accessed 23 July 2023.

Skibba, Ramin. "Russia's Space Program Is in Big Trouble." WIRED, 20 March 2023, https://www.wired.com/story/russias-space-program-is-in-big-trouble/. Accessed 27 July 2023.

UNOOSA. "51/122. Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/spacelaw/principles/space-benefits-declaration.html. Accessed 23 July 2023.

UNOOSA. "Moon Agreement." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html. Accessed 24 July 2023.

UNOOSA. "Space Law." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html. Accessed 23 July 2023.

Waldek, Stefanie. "NASA grants $279M to six private satcom providers, including $70M for SpaceX." *TechCrunch*, 21 April 2022, https://techcrunch.com/2022/04/21/nasa-grants-279m-to-six-private-satcom-providers-including-70m-for-spacex/. Accessed 23 July 2023.

Weinzierl, Matthew, and Mehak Sarang. "The Commercial Space Age Is Here." *Harvard Business Review*, 12 February 2021, https://hbr.org/2021/02/the-commercial-space-age-is-here. Accessed 23 July 2023.