UN OOSA

Georgia Tech
Model United Nations

Committee
United Nations Office
for Outer Space Affairs

www.gtmun.gatech.edu October 6-7, 2025 General Assemblies

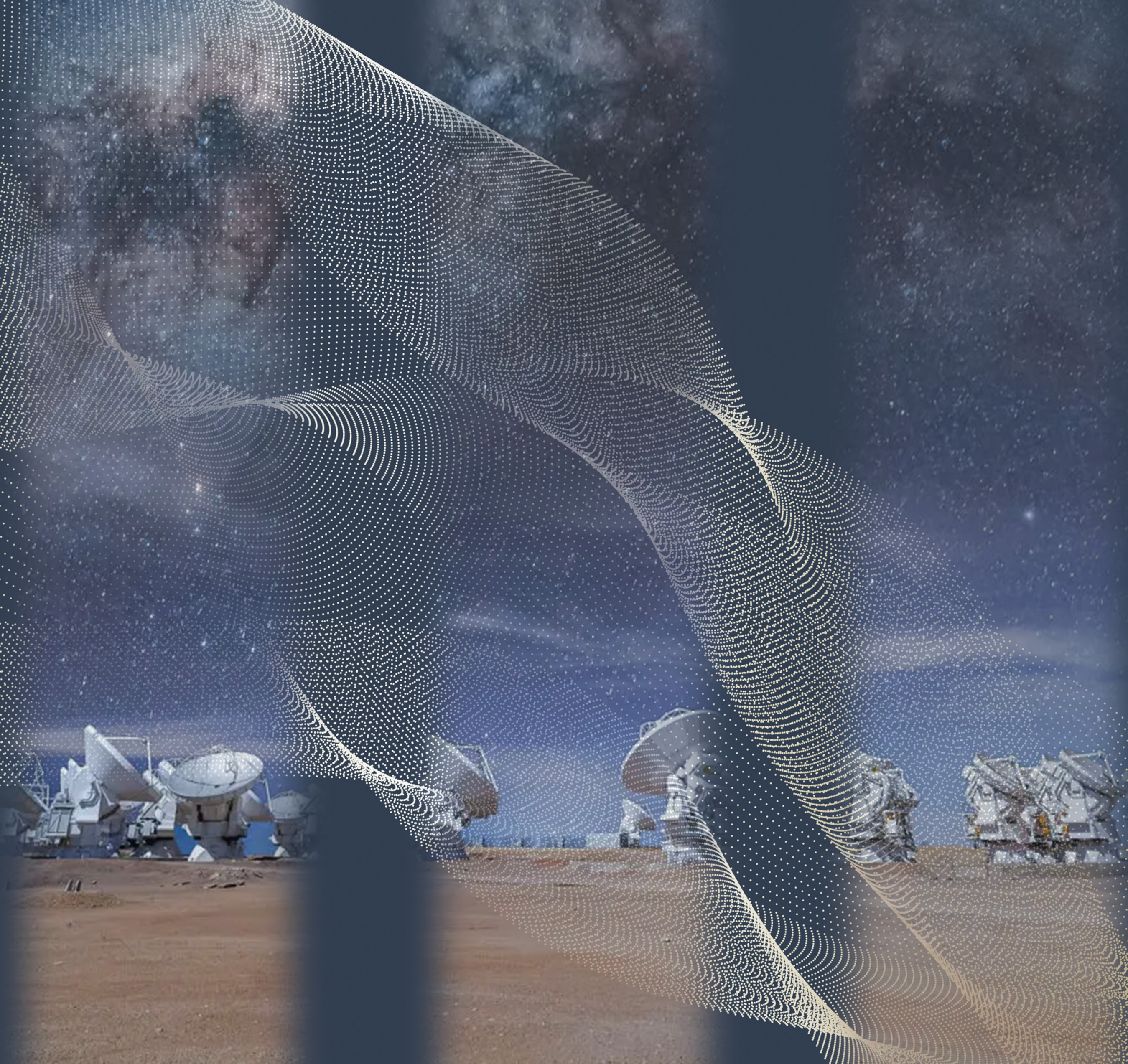

Photo by Alex Pérez
A great view of the ALMA antennas during the night in the Chajnantor Plateau

#GTMUN2025

Bridging technology and diplomacy.

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Letter from the Secretary General

Esteemed Delegates,

It is my greatest honor to welcome you to the 26th Georgia Tech Model United Nations Conference. My name is Victoria Rodriguez, and I have the privilege of serving as the Secretary General for the 2025 session.

As a mechanical engineering student here at Georgia Tech, I can confidently say that participating in Model United Nations (MUN) has opened several personal, academic, and professional doors. In this journey of 13 years, I've had the opportunity of being a delegate, a director, a mentor, and finally, a Sec-Gen. Sometimes a breeze, sometimes an up-hill battle filled with blood, sweat and tears. I've made several friends and won awards along the way, but what I truly carry with me are the important things: the value of empathy, the courage to speak when it matters, and the humility to listen when others have something to teach.

This year, we are bringing you our largest GTMUN to date. With approximately 900 delegates joining us in 16 committees, we are proud to be one of the most dynamic forums for debate in the Southeastern United States. And I can promise you that it will also be the best GTMUN yet, given the tireless work of our Secretariat and staff, who have poured their hearts and souls into building a conference that you will remember long after the gavels fall.

GTMUN is more than just a conference; it is an opportunity for exploration. Through the years, we have cultivated a space where you can explore different positions on the global stage, discover new ways to approach problems and craft solutions, and test the kind of delegate you want to become. You will experiment with speeches, refine your negotiation style, and create crisis arcs that challenge both you and your peers in committee. Just as Georgia Tech is a hub for innovation, GTMUN is the best space to challenge you intellectually, diplomatically, and personally.

But the value of this conference goes beyond leadership, teamwork, and public speaking. Like our slogan says, "bridging technology and diplomacy," GTMUN is about bringing ideas closer to people. It's about connecting logic with compassion, ambition with responsibility, and creativity with collaboration. I hope the skills you foster during this year's conference (and the friends you make along the way) will be something you carry with you far beyond these two days.

As you prepare for this conference, I encourage you to bring all your energy, passion, and curiosity into every committee session. Debate boldly, listen openly, and collaborate sincerely. On behalf of the GTMUN Secretariat, I welcome you to the GTMUN 2025 Conference. We cannot wait to see the impact you will make.

Wishing you the best of luck as you prepare for your committee,

Victoria Rodriguez

Secretary General of GTMUN 2025

Position Paper Rubric

What is a *Position Paper*?

A position paper is a paper which describes how a country intends to address the topics of the committee, detailing tangible solutions to committee issues and connection to the country's policies. A position paper should contain details for each topic that will be addressed by the committee.

Formatting Requirements

- 12-point font, double-spaced Times New Roman
- 1-2 pages per topic (excluding Works Cited page)
- A Works Cited page with citations in MLA format
- Files submitted in .pdf format with title "GTMUN25_{short committee name}_{assigned country name}.pdf"
- e.g., "GTMUN25_DISEC_GERMANY.pdf" or "GTMUN25_UNOOSA_United_States.pdf"

Start each topic page with

- Committee: [Name of committee]
- Delegation: [Name of delegation]
- Topic: [Topic name/description]

In order to be eligible for awards, delegates must submit a position paper and receive a score of at least **12/20 (for single-topic committees)** or **24/40 (for double-topic committees).**

	Great (5)	Good (4)	Adequate (3)	Poor (1)
Background	• Detailed description of the topic (including dates and stakeholders) • Several facts and statistics • Discusses many relevant UN documents and resolutions	• Basic description of topic (including some dates and stakeholders) • Some facts and statistics • Discusses some relevant UN documents and resolutions	• Minimal description of topic (with no or few dates and stakeholders) • Few facts and statistics • Misses some key relevant UN documents and resolutions	• Unclear or incorrect description of topic • Incorrect or missing facts or statistics • No mention of relevant UN documents and resolutions
Policy	• Country's detailed history with issue • Detailed present position (or a strongly-defended inferred position) of country • Several references to statements from appropriate officials or documents • Several facts and statistics	• Country's basic history with issue • Present position (or reasonable inferred position) of country • Some references to statements from appropriate officials or documents • Some facts and statistics	• Sparsely describes country's history with issue • Present position (or basic inferred position) of country • Few references to statements from appropriate officials and documents • Few facts and statistics	• Incorrect or missing description of country's history with issue • Incorrect present position (or unreasonably inferred position) of country • No references to statements from appropriate officials and documents • Incorrect or missing facts and statistics
Solutions	• Detailed personal objectives • Proposes well-supported potential solutions • Identifies delegates to work with and provides strong reasoning for selections • Actionable, reasonable solutions which are within the scope of the committee	• Expresses personal objectives • Proposes reasonable potential solutions • Identifies delegates to work with and provides reasonable justification for selections • Actionable solutions within the scope of committee	• States personal objectivew • Proposes potential solutions • Identifies delegates to work with • Actionable solutions	• No proposed goals or plans • No potential collaborators mentioned • Implausible or missing actionable solutions
Mechanics	• No grammar, spelling, or punctuation errors • Numerous and diverse citations from appropriate sources	• Few grammar, spelling, or punctuation errors • Citations from appropriate sources	• Some grammar, spelling, or punctuation mistakes • One or two citations from inappropriate sources	• Many grammar, spelling, or punctuation mistakes • No citations from appropriate sources


Director
PPBD
NIGER
FINLAND

Introduction to Committee

The United Nations Office for Outer Space Affairs (UNOOSA) is the body of the United Nations in charge of facilitating international cooperation in outer space, promoting the peaceful use of space science, strengthening the access of developing countries to space technologies, and assisting its member states in establishing regulatory frameworks for space activities. This committee was established the 13th of December 1958, to support the previously established Committee on the Peaceful Uses of Outer Space (COPUOS). Later, the committee was moved to be under the Department of Political and Security Council Affairs in 1962, and subsequently, under the Department for Political Affairs in 1992.

UNOOSA's main roles and responsibilities include assisting in capacity building through training and funding (specially for developing nations who require guidance in creating sustainable space infrastructure), risk management and reduction, revising and renewing international space law frameworks, promoting transparency and sustainable development of space activities, and providing a forum space for agencies to develop solutions collaboratively.

Disclaimer

Model United Nations provides an opportunity for delegates to engage diplomatically with topics of global importance and explore possibilities for conflict resolution in a meaningful way. Many of the topics at hand may involve sensitive or controversial subject matter. We ask delegates to be respectful and professional when engaging with their committee and communicating with fellow delegates and GTMUN Conference staff. The content warning below is meant to warn you of potentially controversial topics that are present in the content of this background guide, as well as content that may appear in other aspects of the committee (e.g. debate, speeches, directives), so that you can prepare yourself before reading this background guide and participating in the committee.

At GTMUN, we take equity violations very seriously and require delegates to fully comply with our equity guidelines. Failure to do so will result in an immediate disqualification from awards, and you may be asked to leave the conference. Please remain respectful in committee, and avoid overgeneralizations as well as take into account individual differences and contexts during your speeches. If you have any questions regarding our equity guidelines, we encourage you to contact one of our staff members.

If, because of this committee's content warning, you have any questions or concerns, please feel free to reach out to our staff via email at gtmunconference@gmail.com.

Topic 1

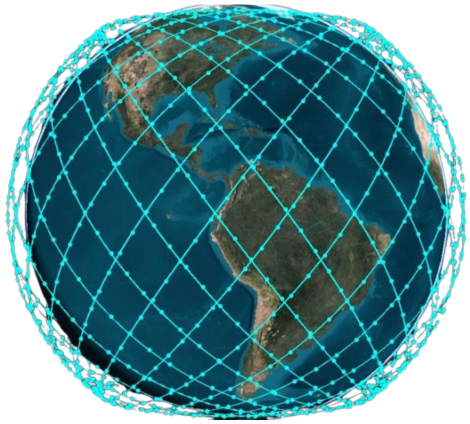
Addressing Satellite Megaconstellations

Key Terms and Acronyms

Mega Constellation	A large network of satellites, often hundreds or thousands, working together in orbit to provide global services, most commonly broadband internet.
Low Earth Orbit (LEO)	The region of space within about 160–2,000 kilometers above Earth's surface. Satellites in LEO have short orbital periods and are used for communication, Earth observation, and mega constellations.
Deorbit	The intentional process of moving a satellite out of orbit, usually by lowering its altitude so it burns up in Earth's atmosphere at the end of its mission.
Space Debris	Non-functional satellites, fragments, or other human-made objects left in orbit that no longer serve a purpose. These can pose collision risks to active spacecraft and satellites.
Kessler Syndrome	A theoretical scenario where collisions between objects in orbit create more debris, leading to a chain reaction that makes certain orbits unusable and threatens future space missions.
COPUOS	The Committee on the Peaceful Uses of Outer Space, a United Nations body that develops international cooperation and guidelines for the safe and sustainable use of outer space.
Outer Space Treaty	A 1967 UN treaty that forms the foundation of international space law. It declares outer space the "province of all mankind," prohibits national appropriation, and restricts the placement of weapons of mass destruction in orbit.

Introduction

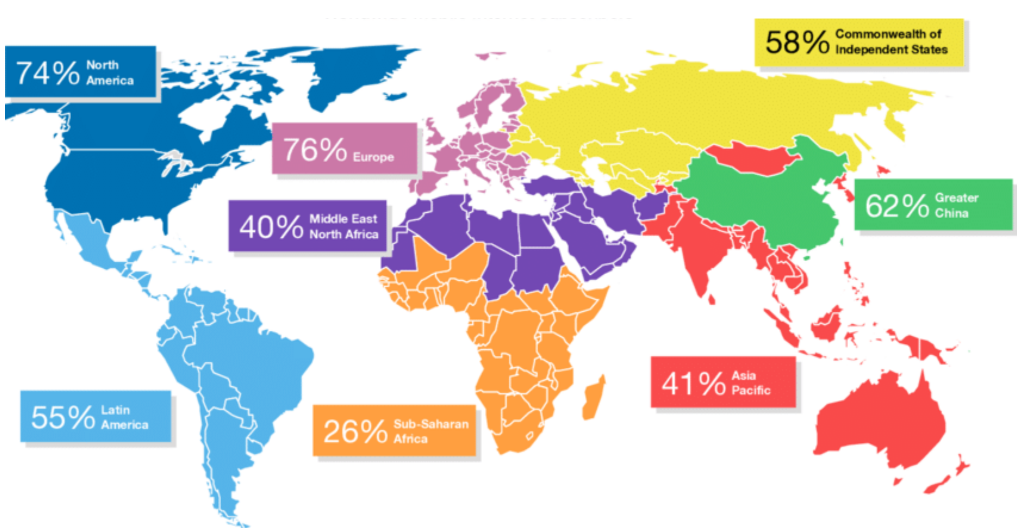
Satellite mega constellations are interconnected networks of satellites that work together to deliver broadband internet service across the globe. Traditional satellite systems often rely on a few units, but mega constellations are composed of hundreds or thousands of small satellites flying in low Earth orbit (LEO).[1] The primary focus of these networks lies in the telecommunications sector, where they are becoming commercially relevant due to the potential for enhancing global connectivity and distribution of internet services. Since these satellites have a modular design and are made with inexpensive components unlike their counterparts, their deployment is more feasible and affordable than traditional space infrastructure.[2]



Phase one of a satellite megaconstellation as it blankets the Earth's Low Orbit

In the past five years, the scale of satellite mega constellation launches has increased at an unprecedented rate. In 2023, 2166 out of 2664 satellites launched (translating to about 81%) originated from the United States. Out of these, 1935 units belonged to Starlink, the mega constellation operated by SpaceX.[3] The race to establish satellite networks has collected interest from different companies, amounting to 500,000 satellites currently proposed worldwide.[4] If these proposals come to fruition, mega constellations could constitute most active satellites in orbit by 2030.[1]

The rise of mega constellations comes at a critical time for global connectivity. Although more than three billion people worldwide already have access to the internet, vast populations (particularly those in remote regions) remain offline. Terrestrial communication networks are common and rapidly expanding in urban areas but cannot always reach communities that are geographically isolated. By covering the planet "like a blanket," mega constellations promise to bridge the digital divide by offering internet access in remote areas.[2]



Access to mobile internet is not equally distributed across the world

However, this expansion carries significant risks and concerns. Currently, satellites developed for mega constellations have a life cycle of 5 to 7 years and are required to deorbit after this period. If current proposals are realized, there could be the equivalent of a Jeep Cherokee worth of satellite metals re-entering and burning up in the Earth's atmosphere every hour.[4] Moreover, the rocket launches required to maintain these constellations could emit soot into the atmosphere equal to seven million diesel dump trucks circling the Earth annually.[4] Despite these concerns, there have been little governmental considerations of the environmental risks associated with launching and maintaining satellites at such a massive scale, as well as, the long-term consequences of these projects.

History/Timeline

1967	The Outer Space Treaty enters into force under COPUOS, establishing the first core legal framework governing activities in space and emphasizing that outer space must b used for peaceful purposes.[5]
2012-2013	Projects like OneWeb are conceived with the goal of delivering global broadband via LEO satellite constellations. These early initiatives mark the shift toward high-density, low-altitude systems.
2013	The International Charter: Space and Major Disasters showcases how satellites can aid humanitarian missions, though it doesn't yet address mega-constellations.[6]
2019	Starlink operational batch of 60 satellites launch begins; project proposal unveiled.
2020	COPUOS, along with the IAU, includes "Dark and Quiet Skies for Science and Society" in conference agendas to spotlight how mega-constellations interfere with astronomy.[7]
2020	The SATCON1 workshop results in recommendations to reduce harmful satellite reflections, later leading to the IAU's establishment of the Centre for the Protection of the Dark and Quiet Sky from Satellite Constellation Interference. The AAS maintains a "living document" tracking mitigation efforts.[8]
2021	A report presented to COPUOS's Scientific & Technical Subcommittee (STSC) lays out 40 recommendations on mitigating the impacts of mega-constellations, especially on astronomy.[9]

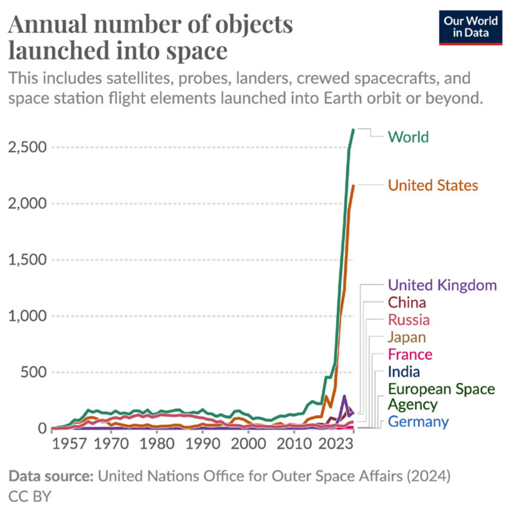
2022	A COPUOS STSC presentation warns that "around half of all debris in space" stems from mega-constellations, predicting that up to 100,000 satellites could be in orbit by 2030. The exponential rise in LEO debris is flagged as deeply concerning.[10]
2024	A scientific study quantifies how burning satellites release ozone-depleting aluminum oxide, a pollutant whose levels rose eightfold between 2016 and 2022.[11]
2025	At COPUOS STSC's 62nd session, member states address varied issues, including space sustainability and emerging constellation projects.[12]
2025	Kuiper's first production satellites deployed.
2025	The UN Scientific and Technical Subcommittee examines a detailed paper titled Mega Satellite Constellations: Challenges, Implications, and Solutions. The report aims to guide future governance frameworks.[13]
2025	China accelerates its state-backed mega-constellation expansions and pushes forward its sovereign satellite autonomy alongside Europe's IRIS.[2]
2025	Reuters flags rising competition: China's SpaceSail plans a constellation of up to 15,000 satellites by 2030, signaling geopolitical competition for orbital dominance.[14]
2025	ESA warns that orbital overcrowding is intensifying, with projections of nearly 500,000 objects in LEO by 2050. Experts caution about collision risks and the looming specter of Kessler Syndrome.[15]

Amending the Outer Space Treaty of 1967

Current Developments

Space Debris and Orbital Congestion

The most pressing concern surrounding satellite mega constellations is the issue of space debris and orbital congestion. When compared to traditional satellite systems, LEO satellites gather much closer to the planet's surface. Mega constellations rely on this proximity and the large number of connections (satellites) to deliver continuous coverage. Due to this, regulators mandate LEO satellites be deorbited within five years of completing their mission in order to mitigate the risk of collision and reduce possibility of debris.[16]



Annual number of objects launched into space

This precaution is meant to mitigate the Kessler Syndrome, a scenario in which the density of LEO satellites causes a chain reaction of collisions that fills the atmosphere with vast amounts of debris, making future space missions hazardous or impossible and potentially trapping humanity on Earth. However, even with these deorbiting measures in place, large constellations still release significant material into the atmosphere. At peak deployment, Starlink alone could contribute to 29 tons of satellites burning up in the upper atmosphere every day.[4]

Astronomical Observation Interference

The International Astronomical Union has raised urgent concerns about light pollution generated by tens of thousands of additional satellites. These objects have the ability to reflect sunlight, which could dramatically alter how we view the night sky. At full deployment, it is estimated that one in every fifteen points of light visible from Earth could be a moving satellite rather than a star. Additionally, the probability of increased orbital collisions could leave the night sky resembling a shaken-up snow globe," which would obscure scientific research and our ability of viewing the night sky.[4,8]

Simulation of astronomical view of the night sky with projected maximum deployment of mega-constellations

Equity and Access

Finally, there is intense debate over the political and economic dimensions of equity and access to global connectivity. Proponents of mega constellations, particularly companies like Starlink, state that these systems are essential to connect the third of the world's population which remains offline. However, United Nations' data indicates that 95% of the world's population is already covered by mobile broadband networks. The real barriers to internet access are affordability, digital literacy, and infrastructure at the local level, not lack of coverage. As an example, an unlimited residential Starlink subscription costs $120 monthly, which is out of reach for many communities that are the intended beneficiaries of these networks.[17]

Case Studies

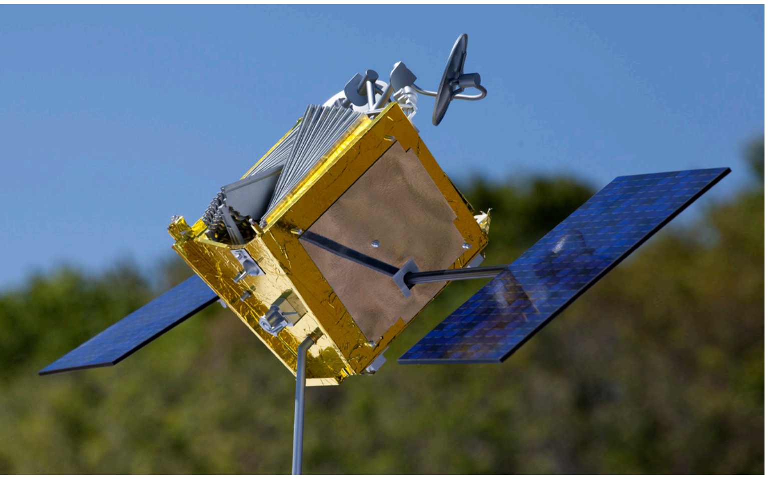
Starlink (SpaceX)

Starlink, operated by SpaceX, is currently the largest and most ambitious satellite internet constellation in operation. It employs thousands of satellites in LEO to deliver "high speed, low-latency broadband to users worldwide".[18] As of August 1, 2025, there are 8094 Starlink satellites in orbit, out of which 8,075 are operational. Despite being an impressive advancement in telecommunications and engineering, the scale has raised significant concerns among astronomers and spaceflight experts. Starlink is now regarded as the single greatest collision hazard in Earth's orbit, with fears that the deorbiting of thousands of satellites could contribute unpredictable amounts of metal into the atmosphere, which could influence global climate patterns.

View of Starlink's satellites in-orbit. SpaceX's mega-constellation could permanently change the way the astronomers view the night sky.

The mega constellation orbits at approximately 345 miles above Earth and is visible to the naked eye as trains of moving lights. This visibility has disrupted both optical and radio astronomical research. In 2021, Thomas Schildknecht, Deputy Director of the Astronomical Institute of the University of Bern and Swiss representative to the International Astronomical Union (IAU), warned at the European Space Agency's space debris conference that mega constellations threatened the "pristine night sky," which should be considered cultural heritage in need of protection. Similarly, a report from the American Astronomical Society (AAS) likened mega constellations to terrestrial light pollution, estimating that the sky could brighten by a factor of two to three due to diffuse sunlight reflected by Starlink spacecraft.[19]

OneWeb (Eutelsat Group)


A OneWeb satellite before launch and deployment

Founded in 2012, OneWeb is a commercial LEO satellite constellation operated by the Eutelsat Group with satellites built by Airbus. The system is designed to provide broadband connectivity to underserved regions, with the explicit goal of bridging digital divides through international collaboration.[20] Its constellation consists of 648 satellites, supported by a global network of ground stations and user terminals.

OneWeb satellites use electric propulsion systems powered by xenon for orbital maneuvers, with operational lifespans that vary depending on altitude: satellites orbiting at 500 kilometers are expected to last more than seven years, and satellites at 1,200 kilometers have shorter lifespans of around five years. Between 2020 and 2023, OneWeb completed a series of launches to build its network.[20] Though smaller than Starlink, OneWeb is notable for its diverse international ownership and partnerships, positioning it as a key player in the satellite broadband market.

Project Kuiper (Amazon)

Amazon's Project Kuiper is a recently launched LEO broadband network that began full-scale deployment in April 2025. Its mission is to provide fast, reliable internet service to communities worldwide, leveraging agreements with multiple launch providers. It has been described as the largest commercial launch procurement in history.[21]

Amazon has stated a strong commitment to responsibly operating this mega constellation. Its satellites are designed with controlled deorbit systems, which actively lower their orbits at the end of service life to accelerate atmospheric reentry and reduce debris. The company

Amazon's Project Kuiper is currently one of the largest's launch procurement and commercial collaboration projects in the field of mega constellations is also testing sunshades to decrease satellite reflectivity and minimize interference with astronomical observations. In addition, Project Kuiper has joined the European Space Agency's Zero Debris Charter, and has aligned itself with international efforts to promote orbital sustainability.[22]

Guowang (China SatNet)

China's Guowang mega constellation, overseen by the state-owned company China SatNet, was established in 2021 and represents one of the most ambitious non-Western satellite projects to date. While officially presented as a commercial communications system, analysts fear that Guowang may also serve military purposes by providing China with a tactical advantage in future conflicts. Comparisons have been drawn to MILNET, a U.S. military communications concept, and some reports suggest the constellation could support a hybrid defense network similar to SpaceX's military-focused Starshield project.[23]

As of August 2025, China has placed 72 Guowang satellites into orbit, which is a minuscule fraction of the 12,992-satellite fleet filed with the International Telecommunication Union (ITU). According to filings, the system will include one shell of satellites operating between 500–600 kilometers in altitude, and another shell at approximately 1,145 kilometers. If fully deployed, Guowang could rival or surpass Western mega constellations in both scale and strategic significance.[24]

China launches Gouwang satellites amidst worries of government and military surveillance

Directives / QARMAs

How can the international community establish effective standards for preventing orbital congestion and mitigating the risk of collisions, including scenarios like the Kessler Syndrome?
Should there be binding international regulations requiring satellite operators to deorbit spacecraft within a fixed time frame, and if so, how can compliance be monitored and enforced?
What measures can be taken to protect astronomical research and preserve the visibility of the night sky as part of humanity's cultural and scientific heritage?
How can satellite mega constellations be structured to reduce the global digital divide, considering that cost, affordability, and digital literacy remain barriers beyond simple "coverage"?
What steps should be taken to study and mitigate the atmospheric and climate effects of rocket launches and satellite re-entry on a massive scale?
How should the international community respond to the potential dual-use nature of mega constellations, balancing commercial innovation with concerns over militarization of space?
In what ways can existing treaties be updated or supplemented to address the unique challenges posed by satellite mega constellations?

Topic 2

Preparing a Global Response in Case of Asteroid Collision

Key Terms and Acronyms

Asteroid	A small rocky body that is in space orbiting the Sun
Comet	Combination of ice and dust that is in space orbiting the Sun
Meteoroid	A small particle from an asteroid or comet orbiting the Sun
Meteor	The fireballs or "shooting stars" caused when meteoroids enter a planet's atmosphere at high speed and burn up
Meteorite	A piece of meteoroid that survived atmospheric burn and landed on Earth's surface
NASA	National Aeronautics and Space Administration, a U.S. government agency responsible for the nation's civilian space program and aeronautics
Near-Earth objects (NEOs)	Asteroids or comets which passes close to the Earth's orbit, scientifically defined as within 45 million km of Earth's orbit
Low-Earth Orbit (LEO)	Region of space up to ~2000km above Earth where most satellites operate
International Asteroid Warning Network (IAWN)	UN-endorsed network that shares data on detecting and tracking Near-Earth Objects
Space Mission Planning Advisory Group (SMPAG)	Group of space agencies that coordinate possible asteroid deflection missions

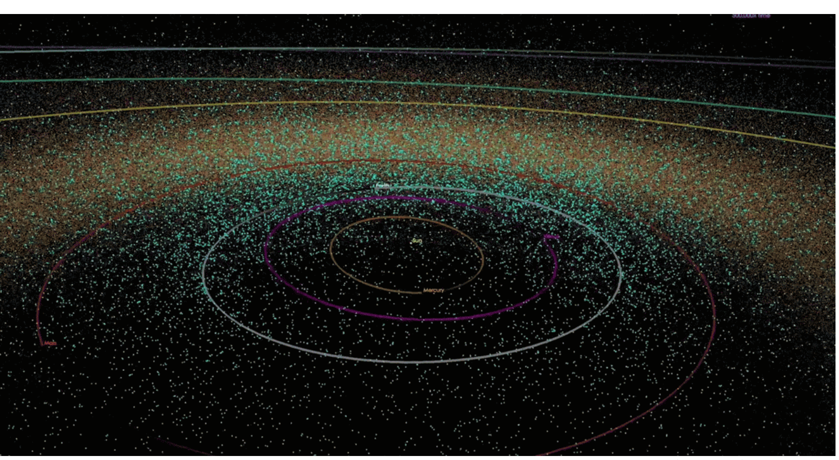
Committee on the Peaceful Uses of Outer Space (COPUOS)	UN body that oversees international cooperation and laws on peaceful space use
Outer Space Treaty of 1967	Core treaty banning weapons of mass destruction in space and making states responsible for space activities.
Liability Convention of 1972	Treaty holding launching states liable for damage caused by their space objects on Earth or in space
Launching States	Countries responsible for objects they launch or procure to launch into space
Affected States	Countries harmed by space activities, entitled to assistance or compensation

Introduction

On June 30, 1908, a small asteroid entered Earth's atmosphere and detonated over the remote forests of Siberia. The blast, known as the Tunguska event, flattened an estimated 80 million trees across 2000 square kilometers and produced fires visible for miles. Eyewitnesses reported a blinding flash of light, a shockwave that shattered windows, and a roaring sound. Because the impact zone was far from major cities, the event attracted little immediate attention. Had the trajectory shifted by just a few hours, the asteroid would have devastated St. Petersburg, then the capital of Tsarist Russia.[1]


Site of the Tunguska Event. It's speculated that it may have been caused by an iron meteorite that exploded above the ground or bounced back to space

Today, the challenge of planetary defense has grown more complex. Humanity not only faces the hazard of Near-Earth Objects (NEO), but also the rising risks of mega-constellation satellites in Low Earth Orbit (LEO). As explained in the first topic of this background guide, the development and deployment of systems such as Starlink are creating new dangers for orbital congestion. According to a report presented at the UN Committee on the Peaceful Uses of Outer Space (COPUOS), the expansion of such constellations is "deeply changing space activities worldwide".[2] Scientific modeling of the Starlink Phase 1 constellation suggests a 30-40% increase in short-term collision probability, a 70.2% chance of at least one collision over its lifetime, and a 25.3% rise in secondary collision cascades if an initial crash occurs.[3] The growing density of objects in orbit complicates future attempts to track, deflect, or destroy hazardous asteroids.


Mapping of the positions of known near-Earth objects (NEOs) at points in time over the past 20 years. Asteroid search teams supported by NASA's NEO Observations Program have found over 95 percent of near-Earth asteroids currently known

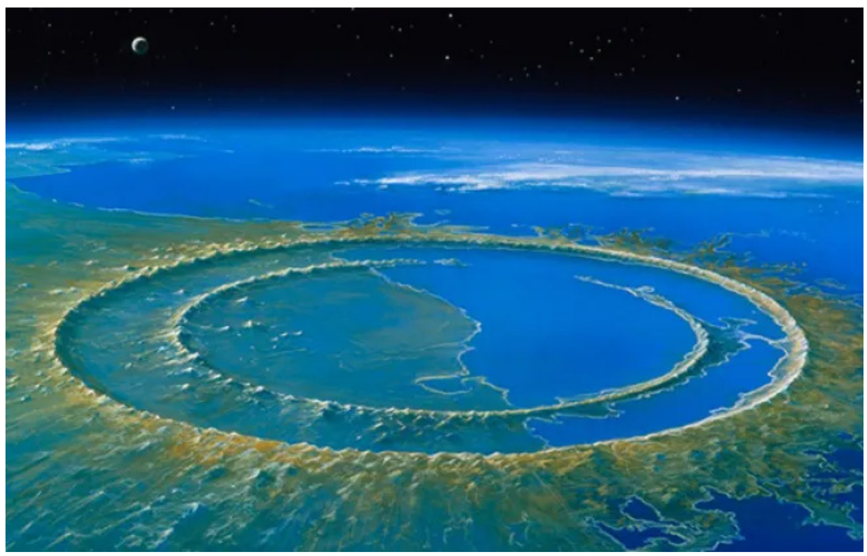
Despite the increasing risks of collision, there is no global authority or binding protocol to manage an asteroid threat.

Existing mechanisms such as the International Asteroid Warning Network (IAWN) and the Space Mission Planning Advisory Group (SMPAG) facilitate data-sharing and technical discussions, but they cannot mandate missions, allocate funding, or resolve liability in the event of failure. This lack of a unified framework is precisely what makes UNOOSA's role so critical, as the body that facilitates international cooperation, information-sharing, and the establishment of treaties. For this topic, delegates must design a practical framework and coordination plan that could guide both the United Nations and member states in the event of an asteroid threat and/or collision.

History

The first asteroid discovered by humans was Ceres, credited to Italian astronomer Giuseppe Piazzi on January 1, 1801.[4] At first, Ceres was considered a planet, but as more objects like Ceres were discovered between Mars and Jupiter, it was soon reclassified. The discovery of Pallas in 1802, Juno in 1804, and Vesta in 1807 all lead to the confirmation of an entire population of small bodies that we now call the asteroid belt.

The Cretaceous–Paleogene extinction event, also colloquially known as the extinction of the dinosaurs, was theorized to have been caused by an asteroid.[5] This asteroid would have had a diameter of 10km and would have landed in what is now the Yucatán Peninsula, leaving behind the Chicxulub crater.

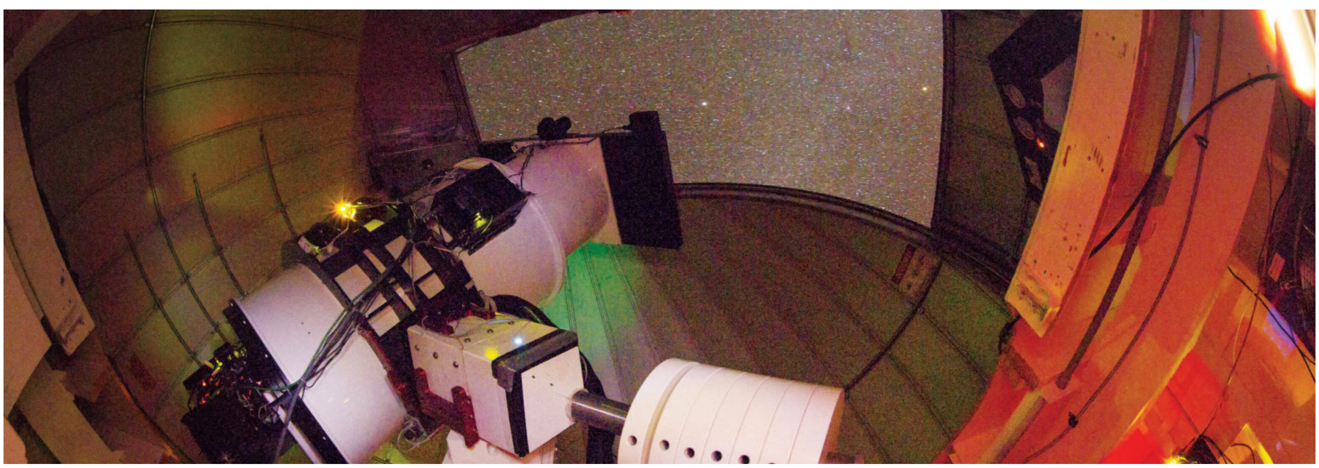


Artistic representation of the Chicxulub crater in the Yucatan Peninsula, Mexico. The Asteroid is estimated to have been bigger than Mount Everest in its diameter

More recently, we saw an incident where the near collision of an asteroid created observable damage on Earth's surface. On February 15, 2013, the Chelyabinsk meteor burnt up and exploded in the Earth's atmosphere approximately 30 kilometers above the surface.[6] Despite not reaching the surface, the meteor's explosion released a shockwave with energy equivalent to 500 kilotons of TNT. This resulted in damage to 7,200 buildings and the hospitalization of 1,500 people in 6 different cities in Russia.

For an asteroid to survive our atmosphere and hit Earth's surface, it must be at least 25 meters across.[7] As the size of the asteroid gets larger, so too do the effects of the asteroid's impact. Tunguska, which as stated previously would have decimated St. Petersburg, was 50 meters. Simulations show that a 100-meter asteroid would destroy buildings in a 9-mile radius, shatter windows of buildings within 60 miles, and cause significant seismic activity across the planet.[8]

After the Chelyabinsk meteor event, the Space Mission Planning Advisory Group (SMPAG) and International Asteroid Warning Network (IAWN) were established by a UN General Assembly resolution on 16 December 2023.[9] This network aggregates and exchanges information from a variety of international sources, like NASA, ESA, the UK Space Agency, the University of Hawaii, and the International Astronomical Center. When a credible asteroid impact threat is verified, the IAWN distributes an alert containing all the relevant information to all UNOOSA member states. Once an asteroid threat is found, the SMPAG then activates, meets to prepare scenarios for reconnaissance and deflection, and then makes a recommendation to address the threat.[10] The SMPAG actively participates in international asteroid impact threat exercises that mock real scenarios and practices making recommendations to be prepared in case of a real emergency. For example, a hypothetical asteroid impact exercise done in 2024 meticulously planned actions to be taken for reconnaissance and deflection upon verifying a real asteroid threat.[11]

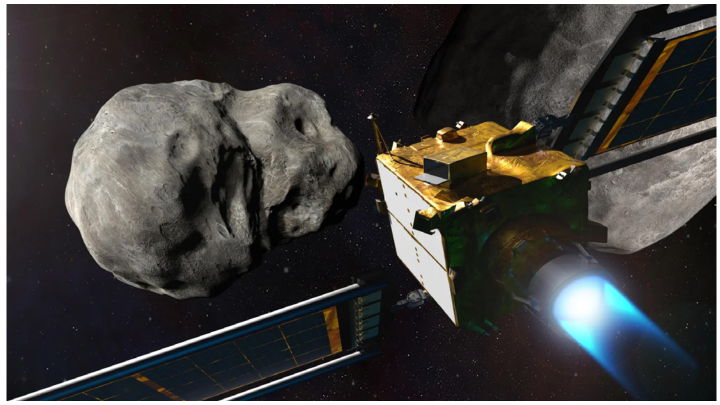


ATLAS Project Telescope in Hawaii

In 2017, the Asteroid Terrestrial-impact Last Alert System (ATLAS), developed by the University of Hawaii's Institute for Astronomy and funded by NASA, became a pioneering early warning system for detecting approaching near-earth objects (NEOs).[12] ATLAS is a global network of four 0.5-meter telescopes located in Hawaii, South Africa, and Chile and is the first survey capable of full nighttime sky coverage every 24 hours.[13] ATLAS has transformed planetary defense by providing the capability to detect a 100-meter asteroid up to three weeks in advance. Over its operation, ATLAS has discovered more than 1,200 near-Earth asteroids and several asteroids that entered Earth's atmosphere, demonstrating its effectiveness as a crucial planetary defense tool.

Current Developments

DART

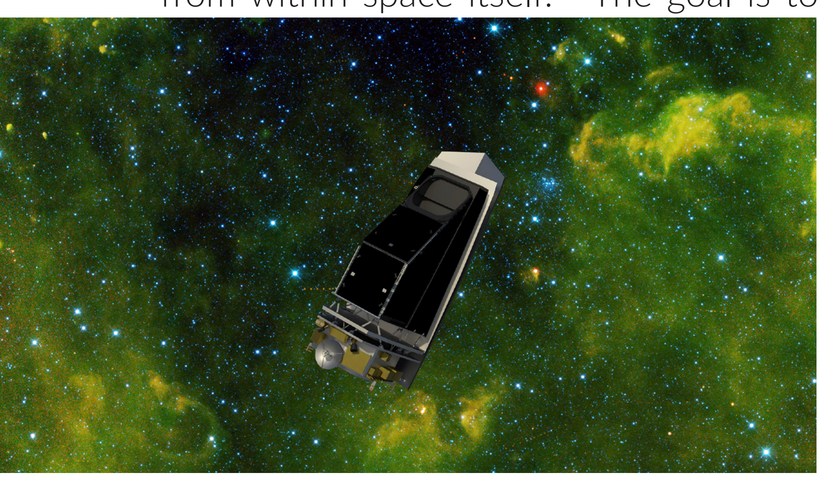


Double Asteroid Redirection Test (DART), the world's first demonstration of asteroid deflection technology

In 2022, NASA's Double Asteroid Redirection Test (DART) was the first experiment of planetary defense with the goal of preventing imminent collisions of asteroids with Earth.[14] This successfully changed the trajectory of the asteroid Dimorphos and showed the viability of kinetic impact in preventing asteroid impacts. In this way, the experiment piloted a method of mitigating an asteroid from outer space itself, eliminating any collateral damage. Unfortunately, this kinetic impact method has not gone through enough testing to be completely reliable if we did have an immediate asteroid threat to redirect. In 2024, the European Space Agency (ESA) launched Hera, a spacecraft which will arrive at Dimorphos in 2026 with the main intent to analyze the kinetic impact technique used by DART to turn kinetic impact into a repeatable and reliable method for planetary defense from asteroids and other space debris.

NEO Surveyor

Even after the expansion of ATLAS and other new telescope efforts, we know there are many asteroids that we are not aware of. In 2024, an AI-powered algorithm found over 27,000 new asteroids from old telescope images.[15] Building off the NEO detection mission NEOWISE, NEO Surveyor has a planned launch in late 2027 which will greatly expand NEO detection and characterization by surveying from within space itself.[16] The goal is to discover as many potentially hazardous asteroids larger than 140m as possible, and it is projected to discover 200,000 to 300,000 new NEOs with sizes as small as 10m.



Near-Earth Object Surveyor, an infrared space telescope designed to help advance NASA's planetary defense efforts

As of 2021, NASA has achieved its goal of discovering 90% of NEOs larger than a kilometer and has discovered 40% of NEOs larger than 140 meters. With efforts like NEO Surveyor and the recently constructed Rudin Observatory, the detection and prediction of NEOs is continuing to improve; however, there is always the chance that we miss an imminent asteroid and/or cannot avoid an impact.

2024 YR4

ESA is actively monitoring near-Earth asteroid 2024 YR4

On December 27, 2024, the 2024 YR4 asteroid was discovered with an estimated diameter of about 60 meters by ATLAS, with a chance of impacting Earth on December 22, 2032.[17] At discovery, it was calculated to have about a 1% chance of colliding. This initial risk assessment caused the IAWN to trigger additional worldwide observations, including spectral and photometric studies from major telescopes like the Very Large Telescope (VLT) and the James Webb Space Telescope (JWST). The probability of impact peaked at about 3% in January, and then declined until February 25, 2025, when the probability of asteroid 2024 YR4 impacting Earth in 2032 had been reduced to 0.001%. It is now considered to have no significant risk to Earth, but in 2024 YR4 still has a small chance of 3.8% to impact the moon.[18] While it ended up being no threat, SMPAG also held an ad hoc meeting on January 31, 2025, where it was able to conclude that it was too premature for action and continued to monitor it until the safe assessment in February.[19]

Consideration Points

Technology and Control

Another central question in developing a global framework for planetary defense is who should bear the financial and logistical burden. While wealthier nations already fund detection systems and space missions, states in the Global South argue that survival is a global public good. If all humanity faces the consequences of an asteroid strike, then all humanity should share both the responsibility and the benefits of defense. For many countries in the Global South, space-based technologies are already vital lifelines. They support agriculture, disaster management, and climate monitoring, yet these same nations often struggle to access discussions on space security and sustainability on equal terms.[21] Their dependence on other country's space technologies emphasizes their vulnerability. In the event of an asteroid deflection, even if the mission succeeded globally, the resulting fragments could devastate regions least prepared to recover.

Liability and Responsibility

Even if humanity succeeds in establishing an asteroid deflection mission, questions remain about who bears responsibility if things go wrong. A deflection attempt could alter the asteroid's path only slightly, shifting the impact zone from one country to another, or debris fragments could rain down on a region which was not originally in danger. If damage occurs, who will compensate the affected populations?

International space law provides some guidance but leaves significant ambiguity. The Outer Space Treaty of 1967 establishes that states are internationally responsible for national space activities.[24] The Liability Convention of 1972 further stipulates that a launching state is liable for damage caused by its space objects on the surface of the Earth or to aircraft in flight, and liable for damage in outer space if fault can be established.[25] It is unclear if an asteroid redirected by human intervention is considered a "space object," and how collaboration between multiple states affect liability.

Signing of the Outer Space Treaty of 1967

The problem is compounded by political distrust. Smaller states worry that without strong frameworks, they could be uncompensated in the event of collateral damage, especially if the responsible power refuses to accept liability. A powerful country which attempts deflection could also be accused of deliberately steering the asteroid toward a rival's territory.

The Nuclear Option

One of the most controversial questions in planetary defense is whether nuclear devices should be considered as a last-resort deflection method. On the one hand, the sheer explosive power of a nuclear detonation could significantly alter the trajectory of a hazardous asteroid, potentially preventing loss of life. On the other hand, the nuclear approach raises serious risks and legal complications. From a technical standpoint, a nuclear explosion could shatter the asteroid into smaller fragments and prevent a single catastrophic impact, but the fragments could remain on a collision course with Earth, making smaller impacts across a wider area. Even with a successful deviation, the resulting debris might re-enter the atmosphere unpredictably, posing dangers to people and infrastructure on the ground. Another complication is the possibility of radioactive contamination. If the explosion causes fragments to absorb or disperse radioactive material, these remnants could fall back to Earth and contaminate land, water sources, and ecosystems. This would create a long-term environmental damage, which would be slower and more familiar than the immediate impact

The Outer Space Treaty of 1967 prohibits the placement of "nuclear weapons or any other weapons of mass destruction" in orbit or on celestial bodies.[20] This creates a legal gray area: is a nuclear device used strictly for asteroid deflection considered a "weapon" or a tool for planetary defense? Some argue that exceptional circumstances could justify a narrowly defined exemption, while other nation states fear that opening this door would erode the broader prohibition on space-based weapons. Moreover, the treaty contains provisions for "launching states" and "affected states" in the case of radioactive or contaminated fallout that includes identifying impact areas and supporting cleanup operations. It also encourages all capable states and international organizations to assist an affected state upon request.[20]

Further questions are raised considering the specific case of asteroid collision: if a nuclear deflection attempt results in unintended damage, it is unclear who bears the responsibility and liability. Additionally, it is unclear if nuclear options should be deployed only under UN authorization, or if member states with capacity should act independently.

Evacuation and Humanitarian Response

The International Asteroid Warning Network (IAWN) serves as the global network responsible for discovering, tracking, and characterizing potentially hazardous Near-Earth Objects.[22] In some scenarios, the window for asteroid deflection may simply be too short. If deflection occurs only months or weeks before impact, the only feasible option may be the mass evacuation of millions of people. While evacuations are a primary mechanism for saving lives, the scale of such an operation would exceed the capacity of any single country, particularly in the Global South, where resources for large-scale emergency management are limited.

The consequences of an impact could be devastating on multiple scales, from the destruction of a single metropolitan area, to the collapse of a state, to the devastation

The U.S. Air Force conducted airlift operations to transport approximately 124,000 people from Kabul, Afghanistan, as part Operation Allies Refuge in August 2021. The operation was one of the largest air evacuations of civilians in American history

of an entire region. Municipal and national governments in some countries have already developed mass evacuation procedures, but these are often designed for localized disasters such as hurricanes, wildfires, or floods. Successful evacuation planning requires more than government action,it should incorporate coordination with nongovernmental organizations (NGOs), such as the Red Cross, and voluntary networks that can provide food, shelter, communications, and medical care.[23] Scaling these models to the level of an asteroid strike would test even the most advanced systems.

Civil vs. Military Leadership

A key uncertainty in planetary defense is the question of who should lead global response efforts. At the present, there is no clear international consensus or legal framework defining leadership roles in the event of an asteroid threat.

Proponents of civilian leadership argue that agencies such as NASA, ESA, JAXA or ISRO are best placed to coordinate response efforts because of their scientific expertise and history of international cooperation. Civilian control is also more consistent with the principles of the Outer Space Treaty of 1967, which emphasizes the peaceful uses of outer space and discourages its militarization.[24] Entrusting asteroid defense to civilian bodies could reduce suspicions between states and help ensure transparency in decision-making.

However, the military possesses much of the critical infrastructure that would be required for an urgent asteroid response, like communication networks, satellite tracking systems, heavy-lift rockets, and in some cases, nuclear devices. For example, in the United States, the responsibility for national security space operations (including planetary defense) falls under the U.S. Space Force, established in 2019 as a separate branch of the armed forces.[26]

If planetary defense is led by military organizations, other states may view such missions as a cover for weapons testing or strategic dominance, particularly given the long-standing concerns over the militarization of outer space.[27] Such distrust could undermine the very cooperation needed for a successful mission. Excluding the military entirely is unrealistic given the assets they control.

Directives / QARMAs

Should the use of nuclear devices for asteroid deflection be permitted under international law, and if so, under what conditions?

Who has the authority to approve nuclear deployment, and how should liability for unintended consequences (radioactive contamination or redirected impacts) be addressed?

How should costs of planetary defense be distributed between nations, and what mechanisms can ensure equitable access to early-warning systems, evacuation support, and post-impact recovery?

How should the international community address the issue of long-term displacement and "asteroid refugees"?

How should existing treaties (Outer Space Treaty and the Liability Convention) be updated or interpreted to cover asteroid deflection missions?

Should planetary defense be led primarily by civilian agencies, by the military, or through a hybrid model?

If military assets are used, what role should the UN and UNOOSA play in ensuring oversight, transparency, and accountability?

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