Committee: Forensic Junior Group Discussion

Question: Combating the pollution of space

Student Officers: Maria Meri, Eleanna Gogou

PERSONAL INTRODUCTION

Dear Delegates,

My name is Maria Meri and I am 15 years old. I will be serving as one of the co-chairs in this year's CS MUN conference in the FORENSIC JUNIOR DISCUSSION committee. This is going to be my first time chairing and I look forward to having an amazing conference. In our committee, we are going to discuss issues with humanitarian and environmental aspects. Our world is developing and so do the problems that arise. This is why in this conference you are going to have the chance to debate and share your personal opinion concerning global issues which concern everyone around the world. This study guide will provide you with useful information in order to fill you in with our topic which is "combating space pollution". I hope this study guide is helpful in order to understand the topic better and be ready for the upcoming conference!
If you have any questions or you need help don't hesitate to contact me or my fellow co-chair.

Email: mariameri2004@gmail.com

Best regards, Maria Meri

Dear delegates,

My name is Eleanna Gogou and I will be serving as a co-chair in the 7th Campion Model United Nations in the Forensics Group Discussion. I am awaiting with pleasure those 2 exciting days on which, with the help of my co-chairs,our committee will flourish. For most of you, this conference will be a first time experience.This is my first time chairing. Our goal as Student Officers is to make this experience unforgettable and help you become competent delegates. In our committee, you will have to deal with an environmental issue. The most important lesson that you must all learn and remember throughout your MUN experience and your life is that all actions have consequences and without sufficient caution

and regulation any action will have detrimental effects. This is what I want you to remember throughout your preparation. See you in October!

If you have any questions or you need help don't hesitate to contact me or my fellow co-chair.

Email: eleannagogou@gmail.com

Best regards, Eleanna Gogou

DEFINITION OF KEY TERMS

1. Space pollution

Generally space pollution is characterized as the pollution provoked by natural micrometeoroid and man-made orbital debris in space. The term “pollution” refers to the destruction of the natural environment. However space pollution includes only man-made orbital debris since they negatively affect the spacecraft as well as the earth’s occupants.[1]

2. Space Debris

Space Debris and, likewise called space junk, is considered fake material that is circling Earth yet is never again practical. This material can be as huge as a disposed of rocket organize or as little as a minuscule chip of paint. A great part of the garbage is in low Earth circle, inside 2,000 km (1,200 miles) of Earth's surface; be that as it may, some debris can be found in geostationary circle 35,786 km (22,236 miles) over the Equator[2]

3. Satellites

A satellite is a moon, planet or machine that circles a planet or star. For instance, Earth is a satellite since it circles the sun. Similarly, the moon is a satellite since it circles Earth. For the most part, "satellite" alludes to a machine that is propelled into space and moves around Earth or another body in space.[3]

4. The International Space Station (ISS)

The International Space Station (ISS) is a space station, or a tenable counterfeit satellite, in low Earth circle.The ISS is the biggest human-made body in low Earth circle and can frequently be seen with the unaided eye from Earth. The ISS comprises pressurized home modules, auxiliary supports, sun based clusters, radiators, docking ports, test straights

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[1] Encyclopedia.com. (2019). *Space Pollution | Encyclopedia.com*. [online] Available at:https://www.encyclopedia.com/environment/educational-magazines/space-pollution [Accessed 22 Jun. 2019].

[2] Gregersen, E. (2019). *Britannica School*. [online] School.eb.co.uk. Available at: https://school.eb.co.uk/levels/advanced/article/space-debris/474044 [Accessed 22 Jun. 2019].

[3] NASA. (2019). *What Is a Satellite?*. [online] Available at: https://www.nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-is-a-satellite-58.html [Accessed 22 Jun. 2019].

and mechanical arms. ISS parts have been propelled by Russian Proton and Soyuz rockets and American Space Shuttles. [4]

5. Low Earth Orbit (LEO)

A Low Earth Orbit (LEO) is an Earth-centered orbit with an altitude of 2,000 km (1,200 mi) or less (approximately one-third of the radius of Earth), or with at least 11.25 periods per day (an orbital period of 128 minutes or less) and an eccentricity less than 0.25.

6. CubeSats

CubeSats are miniature satellites that have been used exclusively in low Earth orbit for 15 years, and are now being used for interplanetary missions as well. In the beginning, they were commonly used in low Earth orbit for applications such as remote sensing or communications.

7. Anti-satellite weapons (ASAT)

Anti-satellite weapons (ASAT) are space weapons intended to debilitate or devastate satellites for vital military purposes. A few countries have operational ASAT frameworks. Albeit no ASAT framework has yet been used in fighting, a couple of countries have shot down their own satellites to exhibit their ASAT capacities in a show of power. Just the United States, Russia, China, and India have shown this ability effectively.[5]

8. Kessler Syndrome

Kessler Syndrome (or an ablation cascade) is an idea up circumstance made by the NASA researcher Donald J. Kessler in which the measure of space debris in circle is big enough to cause space collisions to happen regularly. This would make space for the most part unusable for quite a long time on the off chance that it occurred at an extraordinary dimension.

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[4] Garcia, Mark. "International Space Station." *NASA*, NASA, 12 Jan. 2015, www.nasa.gov/mission_pages/station/main/index.html.

[5] "Anti-Satellite Weapon." *Wikipedia*, Wikimedia Foundation, 19 June 2019, https://en.wikipedia.org/wiki/Anti-satellite_weapon

TIMELINE

Date	Description of Events
1946	It was the first (US designed) rocket that reached the edge of space. WAC Corporal
1957	First artificial satellite “Sputnik”. (USSR)
1961	The entire population of artificial objects in near-Earth orbit was 50 objects.
1961	the Ablestar launch vehicle deployed its payload
1966	First artificial satellite around the Moon. (Luna 10)

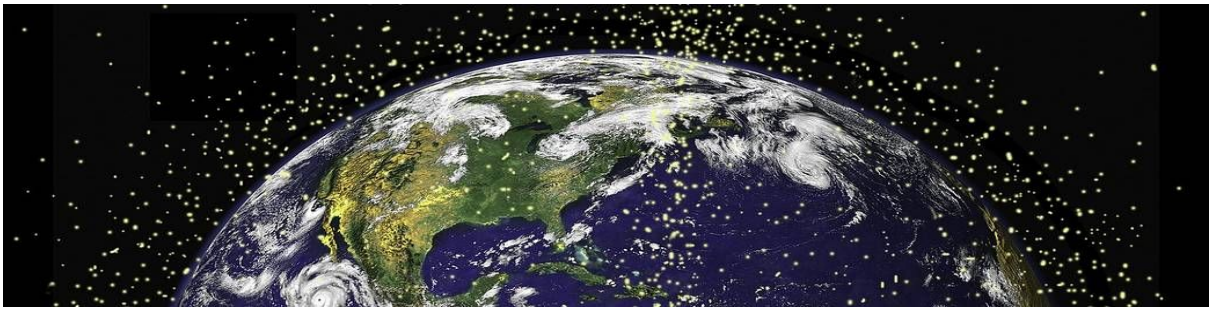
1968-1982	the former Soviet Union conducted 20 tests, creating somewhere over 700 debris fragments, 301 of which are still in orbit.

1971	First space station. (Salyut 1)
1972	First human-made object that had been sent on escape trajectory away from the Sun (by NASA).

1978	Scientist Donald J. Kessler proposed the Kessler Syndrome
1985	the United States tested its own system,
1991	199 Cosmos 1934, was smacked by a small bit of debris from its sister-satellite Cosmos 926.
1996	The abandoned Pegasus Hydrazine Auxiliary Propulsion System (HAPS) from the STEP II mission that had launched 2 years previously suddenly exploded.
1998	NASA started integrating data from the Goldstone radar antenna into their debris tracking program.

2007	China tested an anti-satellite weapon by destroying a defunct probe with a rocket that exploded and created the largest breakup in history adding a further 3,000 trackale space debris .
2009	A dead Russian probe struck and destroyed an operating US communications satellite creating further 2,000 pieces of space debris.

Causes



Humans have the undoubted ability to pollute the places they have been given. Space is not an exception to this vicious rule. After 60 years of Space Exploration space junk/debris has accumulated around the earth to a point where it has started to get serious. This can lead to a theory known as the Kessler Syndrome which could mean that the space surrounding earth will become so full of space junk that no vehicle will be able to get through it. As a result, the exploration of space will probably be suspended and the doors of understanding human existence will close. Most importantly, it will mean the end of satellite communication networks. It will be smaller and far more difficult to navigate the world, where humankind will be locked in.

Early in the Space Age, little thought was given to objects left in orbit as part of satellite launches. Once a mission was completed there was nothing to do with the vehicles, therefore they were just left there floating in space. Nevertheless, as time has gone by, the number of them has rapidly increased creating the problem we are now facing.

Until June 1961, the whole populace of fake items in close Earth circle was a little more than 50 objects. In 1961, the Ablestar dispatch vehicle sent its payload, the Transit 4A satellite, and detonated a little more than an hour later. The explosion created about 300 debris fragments. Somewhere in the range of 1968 and 1982, the previous Soviet Union directed 20 tests, making someplace more than 700 garbage pieces, 301 of which are still in

the circle. In 1985, the United States tried its very own framework. Every one of these explosions were creating a huge issue. The International people group chose to control and diminish space garbage. In 1968 through 1988 the measure of space Jung continuously diminished it at that point had an a moderate increment from 1992 to 2006. The primary crash between inventoried satellites was in 1991. A little piece of debris from Cosmos 926 hit its sister-satellite "Universe 1934". In June 1996, the deserted Pegasus Hydrazine Auxiliary Propulsion System (HAPS) from the STEP II mission that had propelled 2 years beforehand all of a sudden detonated. The unexpected discontinuity of the rocket stage created 700 bits of unmistakable debris. In 1998, NASA began

incorporating information from the Goldstone radar radio wire into their garbage following sproject.

In 2007 China tried an anti-satellite weapon by decimating an old test with a rocket that detonated and made the biggest separation in history including a further 3,000 identifiable space garbage. In 2009 a dead Russian test struck and annihilated a working US correspondences satellite making further 2,000 bits of space debris.

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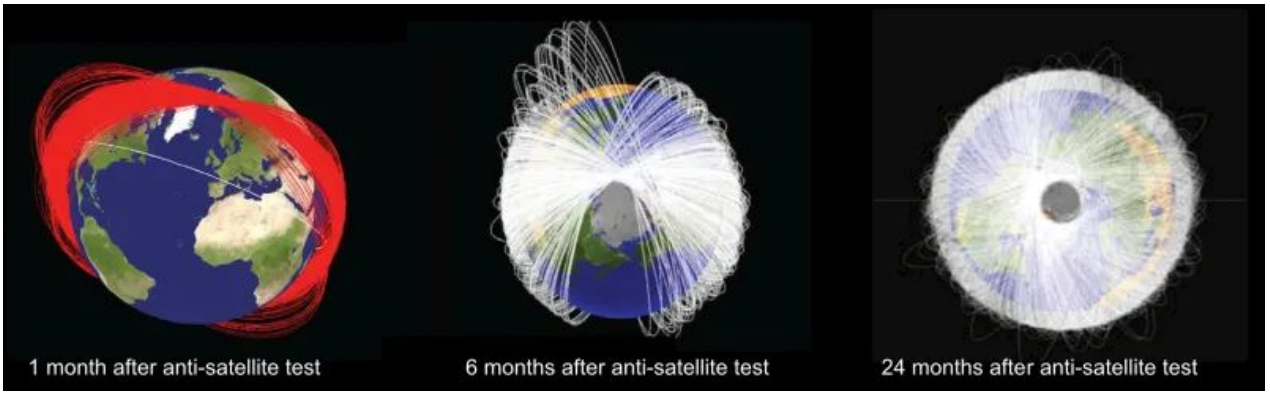


TOPIC DISCUSSION

Space debris is flying around the Earth at 17,000 km/h at different orbits. Imagine multiple cars driving in various directions. A 1 cm fleck paint, driving at a typical collision speed of 35,000 km/h has the same impact potential as an object weighing 250 kg driving at 96 km/h, a 10 cm object has the impact energy of approximately 7kg of TNT. The Space Surveillance Network has spotted more than 750,000 pieces of junk around 1 to 10 cm in size, whilst there is 150 million space debris of smaller sizes. Over 500 vehicle flights since 1957 have created clouds of aluminium dust from engines, nuclear-powered satellites, along with droplets of fuel and liquid and radio experiments from the 1960s that have left strands of copper wire floating around. At the larger end of the scale, junk includes defunct satellites, empty rocket stages, discarded shields and even lens caps.

The oldest known item still in orbit is NASA's Vanguard 1 which was launched in 1958. In 2002 an unidentified object was found from the Apollo 12 mission of 1969. Paint Flecks are being detached from them due to the radiation and are damaging spaceships and satellites. In 2016 a piece of micro debris cut a hole in the solar panel of a Sentinel 1A Satellite and in 2017 astronaut Tim Peake revealed how pain flecks believed to be smaller than a millimetre (mm) made a serious dent in the Coppola of the International Space Station. An imaginary box known as the pizza box is projected around the International Space Station (ISS) and other vehicles. It is a mile deep, 30 miles wide, and 30 miles long and if any pieces of space junk enter the pizza box area NASA along with its partners do whatever's possible to protect the spaceship and the crew.

For the time being there have not been any big-time collisions, however, we do not want one to occur. In 1978, the NASA scientist Donald J. Kessler proposed that if space debris continues to smash and explode with each other. a layer of space debris will be created that will be impossible to go through for spaceships for generations. He predicted that the number of objects that we keep launching into Low Earth Orbit (LEO) can create such a dense environment above the planet that inevitable collisions could cause a cascading effect. The space junk and shrapnel generated by one collision could cause even more future collisions. As a result the amount of Space debris could overwhelm the orbital

space entirely. It is speculated that by the year 2015 this kind of collisions will become more common and create more and tinier non-trackable bits of junk to clog up around the earth.

The theory goes that as that time goes by large objects will smash and break them into smaller bits making a chain reaction that will result into a situation where there will be billions of untraceable pieces of space debris making it impossible to leave earth without encountering an impact. In essence, the Kessler Syndrome warns that we could ourselves into a world where we cannot send out satellites or rockets. Government Space Agencies and Corporate operators are working together in the interagency space debris Coordination Committee where they have developed guidelines about limiting space junk. The current thinking is that eliminating already existing space debris is not feasible, as a result, most plans aim at the protection of spaceships and satellites from collisions and further damage. Also, it is vital to protect old missing satellites from colliding into each other and creating further untrackable space debris. Future Satellite networks and space stations are expected to have a maximum orbital last time of 25 years after which they are sent into the atmosphere where they will burn down. In 2013 NASA said they aim to concentrate on the mitigation of the problem.

POSSIBLE SOLUTIONS

In order to combat space pollution, two major things should be considered. Firstly how to remove the current space debris and secondly how to stop further pollution.

New technologies

At the present time, designers are utilizing model satellites and robot arms to see how a shuttle would approach a crazy satellite, move around it, and seize it. One of ESA's specialists is Jesús Gil Fernández, who clarifies what might happen once the e. Deorbit waste gathering satellite is in the circle and drawing nearer a crazy satellite: "When we are certain we are moving like a solitary item, as though we were moving, however without contacting one another, we can move the mechanical arms to get the launcher connector ring. And after that, once we have gotten these, we can likewise clip another system, so we can control the objective satellite with 'two hands' suppose. So it makes it simple to bring it down to the Earth and annihilate it in the reemergence, or in the south Pacific Ocean." Another methodology being considered inside the. Deorbit undertaking includes utilizing nets flung into space to catch enormous pieces of room garbage.

Furthermore, It is necessary to minimize the potential for break-ups during operational phases so if anything goes wrong the craft should be safe and shouldn't break. It should also be considered to eliminate the probability of accidental collision in orbit. Moreover, intentional destruction must be avoided so as other harmful activities. Finally, it is necessary to limit the long-term presence of spacecraft and launch vehicle orbital stages in the Low Earth orbit (LEO) region after the end of their mission.

Government's assistance

In order to destroy the debris organizations and engineers need financial support since the cost of these experiments is highly elevated. Governments from all around the world should provide financial support in order for a goal to be accomplished. Furthermore, it is the government's duty to create and establish new laws in order to eliminate the pollution caused by human beings. Governments should further ensure the elimination of

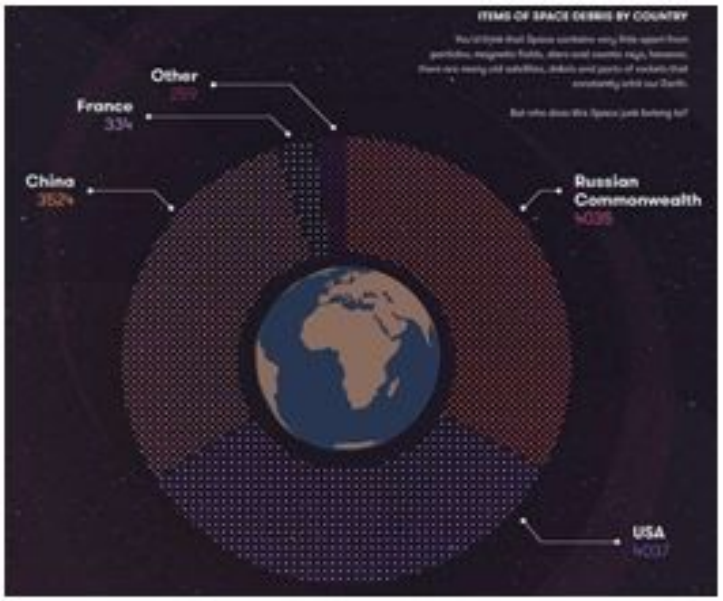
anti-satellite weapons which cause and let in space big pieces of garbage which are difficult to destroy.

Education

In order to solve the issue in necessary the future generations and today's students to be corrected informed about space pollution and the negative effects it might have in the future. Only if schools ensure that students are going to be right citizens the problem will be eliminated.

Correct public information

Space pollution is an issue which has come up in the last years. This is why a lot of citizens are not fully and corrected informed. It is important for everyone to be informed about the current important issues this is why public speeches by experts should be organized, public leaflets and posters created and articles in magazines, newspapers and on the web should be published.



MAJOR COUNTRIES AND ORGANISATIONS INVOLVED

Countries:

France

France without anyone else is the fourth-greatest supporter of "space junk" including spent rockets, resigned satellites and parts from old missions – all of which can harm or pulverize satellites and the global space station.

France remotely trails the main three, the previous USSR, the US and China. It is noted that little more than 500 listed articles are inferable from France alone, speaking to only 3% of the all out number in circle. Furthermore, quite a bit of this French trash can be followed to a solitary occasion, in 1986, when a spent French rocket stage broke into at any rate 465 pieces. In 1965, France also turned into the third nation, after the Soviet Union and the United States, to dispatch its very own satellite into space. Today, France is a basic piece of the European Space Agency (ESA), situated in Paris. Moreover, ESA, as an office, is in charge of less than 100 garbage things, or scarcely 0.5%.

China

China has topped the rundown of the world's significant polluters of the close Earth space condition,[6] trailed by the United States and Russia, the Russian Federal Space Agency Roscosmos said on Friday. Altogether, the three primary space forces produce 93% of space flotsam and jetsam, as per an announcement distributed on the office's site. "As per gauges, 40% of space flotsam and jetsam is delivered by China. However given their growing presence in space, China is also considering developing giant space-based lasers as a possible means for combating junk in orbit.[7]

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[6] "China Leads In Outer Space Pollution." *24/7 Space News*, www.spacedaily.com/reports/China_Leads_In_Outer_Space_Pollution_999.html.

[7] Williams, Matt. "China Has a Plan to Clean up Space Junk with Lasers." Phys.org, Phys.org, 17 Jan. 2018, phys.org/news/2018-01-china-space-junk-lasers.html.

USA

President Donald Trump marked the third space order of his administration Monday, asking the Defense Department and the Commerce Department to venture up the United States' capacity to track protests in space and shield against the expanding danger from flotsam and jetsam in a circle around the Earth.

The U.S. military is now following in excess of 23,000 articles in space around the Earth and a few organizations are wanting to add thousands of additional satellites to circle throughout the following couple of years.

Russia

Russia has less satellites in space than the U.S. or on the other hand China, yet it is the undisputed pioneer as far as the measure of debris and space junk it has left gliding about the Earth's circle, as indicated by figures.

The U.S. represents 33% of the world's rocket, with 371 U.S. satellites circling the Earth, trailed by China with 113 satellites, and Russia with 111, a report by the Central Research Institute for Engineering stated, Interfax announced.

The three top satellite administrators likewise lead the world as far as the measure of room flotsam and jetsam they produce. Russia is the most noticeably awful wrongdoer with 6,125 bits of room junk in the circle, trailed by the U.S. with 4,627, and China with 3,672.

By Oct. 31, the all-out number of items in the Earth's circle had achieved 16,886, including 1,153 shuttle and 15,733 dormant "space objects."

Somewhere in the range of 80 percent of all space flotsam and jetsam is gathered in low Earth circle, making concern develop among research researchers and space authorities as of late.

Russia has additionally been accused for natural harm brought about by one of its Proton-M rockets detonating close to the Baikonur Cosmodrome this late spring. Kazakhstan has requested that Russia pay $89.5 million in remuneration for the harm caused by toxic synthetic concoctions discharged in the blast.

India

India's devastation of one of its satellites has been marked a "terrible thing" by the head of Nasa, who said the rocket test made 400 bits of orbital garbage and represented a danger to space explorers locally available the International Space Station (ISS).

Jim Bridenstine was tending to representatives five days after India shot down a low-circling satellite in a rocket dispatch that it says raised the nation to the tip-top level of room powers.

The satellite broke into pieces, huge numbers of which are hazardously enormous however too little to even think about tracking, Bridenstine said. "What we are tracking right now, objects big enough to track – we're talking about 10cm (four inches) or bigger – about 60 pieces have been tracked."

Be that as it may, 24 of the pieces were going over the ISS, said Bridenstine."That is a terrible, terrible thing to create an event that sends debris at an apogee that goes above the International Space Station," he said, adding: "That kind of activity is not compatible with the future of human spaceflight."

"It's unacceptable and Nasa needs to be very clear about what its impact on us is."

The US military tracks protest in space to anticipate the crash hazard for the ISS and for satellites. It is following 23,000 items bigger than 10cm. That incorporates around 10,000 bits of room flotsam and jetsam, of which about 3,000 were made by a solitary occasion: a Chinese enemy of satellite test in 2007, 530 miles over the surface.
Because of the Indian test, the danger of impact with the ISS has expanded by 44% more than 10 days, Bridenstine said. Be that as it may, the hazard will disseminate after some time as a significant part of the garbage will wreck as it enters the climate.

India's service of outside issues said at the season of the dispatch the test was done in the lower climate to guarantee that there was no space flotsam and jetsam. “Whatever debris that is generated will decay and fall back on to the Earth within weeks,” it said.

National Aeronautics and Space Administration (NASA)

In excess of 500,000 bits of garbage, or "space garbage," are followed as they circle the Earth. They all movement at paces up to 17,500 mph, quick enough for a generally little bit of orbital flotsam and jetsam to harm a satellite or a shuttle. The rising populace of room flotsam and jetsam builds the potential threat to all space vehicles, yet particularly to the International Space Station, space transports and other shuttles with people on board.

NASA takes the risk of impacts with space flotsam and jetsam truly and has a long-standing arrangement of rules on the best way to manage every potential crash danger. These rules, some portion of a bigger assemblage of basic leadership helps known as flight rules, indicate when the normal vicinity of a bit of flotsam and jetsam expands the likelihood of a crash enough that equivocal activity or different insurances to guarantee the wellbeing of the team are required.

For the most part, NASA and the DoD collaborate and share obligations regarding portraying the satellite (counting orbital flotsam and jetsam) condition. Additionally, NASA has a lot of long-standing rules that are utilized to evaluate whether the danger of such a nearby pass is adequate to warrant equivocal activity or different safeguards to guarantee the wellbeing of the group.

A few crash evasion moves with the van and the station have been led during the previous 10 years.

NASA actualized the combination appraisal and crash evasion process for human spaceflight starting with transport mission STS-26 of every 1988. Before dispatch of the principal component of the International Space Station in 1998, NASA and DoD together created and executed a progressively refined and higher constancy combination appraisal process for human spaceflight missions.

In 2005, NASA executed a comparable procedure for chose automated resources, for example, the Earth Observation System satellites in low Earth circle and Tracking and Data Relay Satellite System in a geosynchronous circle.

In 2007, NASA stretched out the combination appraisal procedure to all NASA flexibility satellites inside low Earth circle and inside 124 miles (200 kilometres) of a geosynchronous circle.

Inter-Agency Space Debris Coordination Committee (IADC)

The Inter-Agency Space Debris Coordination Committee (IADC) is a universal gathering of legislative bodies for the coordination of exercises identified with the issues of man-made and normal flotsam and jetsam in space. The main role of the IADC is to trade data on space flotsam and jetsam look into exercises between part space organizations, to encourage open doors for co-task in space flotsam and jetsam inquire about, to survey the advancement of progressing co-usable exercises and to recognize trash moderation alternatives.

Individuals from the IADC are the Italian Space Agency (ASI), British National Space Center (BNSC), Center National d'Etudes Spatiales (CNES), China National Space Administration (CNSA), Deutsches Zentrum fuer Luft-und Raumfahrt e.V. (DLR), European Space Agency (ESA), Indian Space Research Organization (ISRO), Japan, National Air transportation and

Space Administration (NASA), the National Space Agency of Ukraine (NSAU) and Russian Aviation also, Space Agency (Rosaviakosmos).

One of its endeavours is to suggest trash moderation rules, with an accentuation on cost adequacy, that can be considered during arranging and structure of shuttle and dispatch vehicles so as to limit or kill age of garbage during tasks. This archive gives rules to flotsam and jetsam decrease, created by means of accord inside the IADC.

European Space Agency (ESA)

The European Space Agency (ESA) is Europe's entryway to space. Its main goal is to shape the improvement of Europe's space capacity and guarantee that interest in space keeps on conveying advantages to the residents of Europe and the world.

ESA is a universal association with 22 Member States. By planning the money related and scholarly assets of its individuals, it can attempt projects and exercises a long ways past the extent of any single European nation.

ESA's responsibility is to draw up the European space program and bring it through. ESA's projects are intended to discover progressively about Earth, its quick space condition, our Solar System and the Universe, just as to create satellite-based innovations and administrations, and to advance European ventures. ESA additionally works intimately with space associations outside Europe.

The countries that belong in ESA are the following: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland and the United Kingdom. Slovenia is an Associate Member. Canada takes part in some projects under a cooperation agreement. Bulgaria, Croatia, Cyprus, Malta, Latvia, Lithuania and Slovakia have cooperation agreements with ESA.

China National Space Administration (CNSA)

China National Space Administration (CNSA) is the legislative association of the People's Republic of China in charge of the administration of room exercises for non-military personnel use and global space participation with different nations and plays out the comparing administrative capacities.

UN INVOLVEMENT

United Nations Office for Outer Space Affairs (UNOOSA)

The United Nations Office for Outer Space Affairs is a part of the United Nations Secretariat, located at the United Nations Office in Vienna, Austria. It is tasked with implementing the decisions of the United Nations General Assembly and of the United Nations Committee on the Peaceful Uses of Outer Space.

The United Nations Committee on the Peaceful Uses of Outer Space (COPUOS)

It was established in 1959 (shortly after the launch of Sputnik) as an ad hoc committee. In 1959, it was formally established by United Nations resolution 1472 (XIV). The mission of COPUOS is "to review the scope of international cooperation in peaceful uses of outer space, to devise programmes in this field to be undertaken under United Nations auspices, to encourage continued research and the dissemination of information on outer space matters, and to study legal problems arising from the exploration of outer space."

UN General Assembly on 22 December 2007 resumed discussion of the Report of the Committee on the peaceful Uses of Outer Space(A/62/20) Res.62/217

Research Questions

Delegates can consider the negative effects space pollution might have. More specifically the limitation of the human researches in space and as a result the affection of the technology progress. Delegates should consider the impact of human pollution on human lives, on our planet and our environment.

https://www.space.com/6720-space-littering-impact-earths-atmosphere.html
https://www.davidreneke.com/the-consequences-of-space-debris/
https://www.encyclopedia.com/environment/educational-magazines/space-pollution

Finally, it would be useful in order to be more informed to research causes of space pollution which might come up in the future except for the Satellite launches which all know they cause the major problem.
Consider previous attempts to solve the issue:
Such as the Spade Programme:
https://www.nasa.gov/offices/oct/early_stage_innovation/niac/gregory_space_debris_elimination.html
And the Space Nets:
https://www.bbc.com/news/science-environment-45565815

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