

**Forum:** United Nations Office for Outer Space Affairs (UNOOSA)

**Issue #2:** Addressing the consequences of unsustainable space exploration

**Student Officers:** Alberto Norte and Ria Harten

**Position:** Chairs of the United Nations Office for Outer Space Affairs (UNOOSA)

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## Introduction

In 1957, the Soviet Union launched the Sputnik satellite, which became the first human-made satellite to orbit Earth. Since then, thousands upon thousands of satellites have been sent into outer space; many of these satellites are currently out of use and are now considered debris, or "space junk." In the six decades following the launch of Sputnik, the amount of space debris in Earth's orbit has become exorbitant. In fact, over 27,000 pieces of space debris are tracked by the United States' Department of Defense, with there being much more space junk that cannot be tracked due to their small size (NASA). The presence of space debris in itself represents a danger for human missions in outer space, and the sheer amount of debris existent at the moment only exacerbates the risks.

Space debris represents a danger to present and future space exploration. It is estimated that pieces of space debris can travel at over 20,000 kilometers per hour, meaning that collisions with any man-made satellite could cause severe damage, not to say total destruction. The threat that space debris poses is therefore evident. If there is no effective way to limit its creation, the risks it poses for space exploration will only increase alongside the amount of space

debris, which will ultimately hinder humans' ability to explore space. It is imperative that measures are taken in order to make space exploration more sustainable, to ensure that humans will be able to continue exploring it for generations in the future.

## Definition of Key Terms

**Satellite:** Satellites are objects, whether natural or not, which move around another object. Natural satellites can be found in space and moons are great examples of this, as they move around planets. Artificial satellites are those which are made by humans and sent into space and move around the planet. The International Space Station, for example, is an artificial satellite.

**Space debris:** The term "space debris" or "space junk" is used to refer to artificial objects orbiting the planet that no longer work. Space debris can vary substantially in dimensions and appearance, so the term entails variety.

**Outer Space:** There are variations as to when the Earth's atmosphere ends and outer space starts, however, estimates go from an elevation of 80 km up until 100 km, the latter of which is sometimes referred to as the Karman line.

**Orbit:** An orbit is a set path that an object takes around another orbit or center of gravity. An object that orbits another object is called a satellite and when an object is "in orbit" it means that it is following an orbital path.

**Constellation:** In essence, a constellation is a group of things. In the context of space, the word "constellation" is generally used to refer to a group of stars. However, there can be artificial constellations which are made up of satellites.

## General Overview

Human's fascination with space exploration has led to substantial expeditions to space. Thousands of satellites have been sent into orbit for an

array of reasons. However, standard protocol for a very long time was that, once satellites had surpassed their expected lifetime, they would just sit in space. In the long term, unfortunately, pieces of space debris have begun to amass around the planet, causing several problems and threatening the future of space exploration.

### **Collaboration between space agencies**

Action taken on this issue would be to encompass all space missions. In other words, the collaboration from all the planet's space agencies would be crucial to ensure that everyone is contributing their grain of sand. Space pollution is an issue that threatens the work of all space agencies and that poses a risk to the lives of any astronaut sent into space, regardless of their nationality. Collaboration between space agencies has been achieved before; the International Space Station is a great example of multiple nations coming together in the interest of space exploration.

Recently, unfortunately, geopolitical tensions, particularly between Russia and traditionally Western nations like the U.S., the U.K., and France, have boiled over into space. Russia announced that they would be leaving the International Space Station and communication between the Russian space mission and those from other countries has been harmed. This has led to some dangerous situations, such as one that took place in 2022 involving the ISS. Russia, as part of a program to test military capabilities to shoot down missiles, shot down a Russian missile in space, causing many pieces of debris to scatter into space. The ISS had to alter its path in order to avoid hitting a piece of debris that had originated in the shot-down satellite.

The importance of keeping open lines of communication goes beyond an issue of safety. Over time, it is important that a solution is implemented to limit space pollution that everyone can implement. This is because, even if one nation does not collaborate, their space missions would still pose a risk to everyone. It is crucial that a solution is found that will really limit space pollution

and that communication between different space agencies is maintained throughout this process.

### **Threat to economic opportunities**

The issue of space pollution has become more prominent with the passing of time. Because of this, many projects already in the works failed to take into account space pollution as a priority. Additionally, a new boundary for space exploration has been the ability to profit off of it. This being said, there are ongoing for-profit projects that threaten to further pollute outer space. It is important that these projects develop a manner in which to severely limit their potential for pollution.

An example of this situation would be Starlink's mega constellation needed for internet provision. Over 3,000 satellites have been launched as a part of the Starlink program, with potential for more in the future. These satellites, Starlink says, are designed to deorbit once they are no longer functional and burn up in the Earth's atmosphere upon reentry. This does not take into account the whole picture, though. It can take up to five years for satellites to deorbit and burn up upon coming back to Earth. Due to this, satellites that have become obsolete would, for up to five years after becoming dysfunctional, become flying pieces of debris that can threaten everything around them.

As mentioned, more than three thousand satellites in orbit at the moment belong to the Starlink program, and there is a plan for there to eventually be up to 42,000 satellites in the network. Each of these has an expected lifespan of 5 years, after which they have the potential to become dangerous space debris for additional five. This presents a massive problem, as having thousands upon thousands of satellites flying around Earth and being in the way of other operational satellites poses a massive risk to other space missions. In addition to all of this, time is of the essence. Launching of Starlink satellites has accelerated in recent times and the first ones, launched in 2019, are due to become no

longer operational as soon as 2024, meaning by then there could be thousands of satellites in orbit as space debris.

Given the advancement of Starlink and other's advancement in their work already, and the fact that these are private companies, means that solutions to the problem would also have to encompass them. The fact that these projects are already in the works also play into the fact that a solution needs to be agreed upon soon, so that, if modifications need to be made to satellites before they are launched, they can be done as soon as possible, especially to prevent further launches of satellites that have potential to become space debris in the future.

## **Major Parties Involved and Their Views**

### **United States**

In 2022, the U.S. government introduced legislation that would legally enforce a five-year lifetime for satellites, after which point they must be discontinued and configured to burn up in the Earth's atmosphere. Previously, there was a guideline set at a 25-year lifespan, but it was not legally enforced. This legislation applies to satellites launched only by American operators. However, mega constellations like Starlink are exempt from the rule due to those satellites already being in orbit.

### **China**

There have been multiple instances in which Chinese-made space devices have become space debris in recent times. For example, in 2020 a Chinese rocket reentered Earth's orbit and two villages in Côte d'Ivoire were hit by objects. In April 2022, Indian authorities also found pieces of a Chinese rocket that had launched in February of that year. This has led to China being accused of being somewhat careless in their launches, creating backlash from the

People's Republic, where the Ministry of Foreign Affairs said that Chinese space exploration is "in accordance with international law and...customary practice."

## European Union

The EU has funded a project called REDSHIFT, which is meant to determine ways to create space exploration devices that are guaranteed to burn up in the atmosphere upon reentry, as well as developing measures to protect population from potential falling debris, and creating mitigation guidelines for space debris. REDSHIFT has been experimenting with various technologies to address the problem. The European Space Agency has also created the Space Debris Office, which tracks space debris and tries to predict how pieces of space debris will act so that, accordingly, measures can be taken.

## Russia

Russia has been testing anti-satellite military technology, which has involved shooting down their own satellites for research purposes. However, these have created hundreds of pieces of space debris that have threatened other satellites. In 2022, for example, the International Space Station had to swerve to avoid hitting debris from Cosmos 1408, a Russian satellite which had been destroyed in such a test in November 2021. That satellite alone created an estimated 1,500 trackable pieces of debris. Russian collaboration with other nations' space agencies have broken down along with diplomatic ties in recent years, leading to a complication in negotiations to reduce space debris.

## Timeline of Events

<b>Date</b>	<b>Description of event</b>
October 1957	Sputnik is launched into space by the USSR, marking the first successful launch of a man-made satellite into space.
January 1958	The US puts its first artificial satellite in orbit, Explorer 1.

April 1961	Yuri Gagarin becomes the first man in space.
June 1961	The Thor-Ablestar rocket explodes. This became the first satellite breakup and produced over 200 recorded fragments of space debris.
July 1969	The US puts a man on the moon.
1979	NASA created ODPO, the Orbital Debris Program Office, as the issue of space debris became more pressing. ODPO seeks to work with international space agencies to mitigate the effect of space debris.
October 1993	The Inter-Agency Space Debris Coordination Committee (IADC) is created as a way to coordinate measures to combat space debris. Space agencies from all over the world are part of the IADC.
1997	CORDS, the Center for Orbital and Reentry Debris Studies, was established. CORDS has created a database in order to predict collisions and model the movement of space debris.
November 1998	The ISS is launched into space.
2001	The US adopts the Orbital Debris Mitigation Standard Practices (ODMSP), an official guideline for U.S. space missions to mitigate and monitor orbital debris.
2007	The United Nations adopts the Space Debris Mitigation Guidelines, which were meant to apply to space agencies all over the world.

## **UN involvement, Relevant Resolutions, Treaties and Events**

UNOOSA has passed a number of resolutions relevant to space debris. The focus has been more on commissioning research on the matter, in order to determine how to best address it in a way that all nations can get on board with a resolution. A focus has been put on this issue more since the 2010s and it has become more and more prevalent in the years since.

Additionally, the UN adopted the Space Debris Mitigation Guidelines in 2007 that established a series of regulations that space agencies around the world should follow in order to limit the impact of space debris. However, enforcement of these guidelines has not been thorough and it has led to minimal action in the fight against increasing build up of space debris.

## **Evaluation of Previous Attempts to Resolve the Issue**

The actions taken so far in order to resolve the issue share a commonality, they are all to be enforced in the long term. The reality is that there is a pressing issue to resolve this matter and there needs to be solutions that can have an effect sooner. With this said, there are some promising efforts in the fight against unsustainable space exploration. Particularly, the European Space Agency has been doing significant research on how to optimize the use of technology to solve the issue.

Regulations introduced by national governments and the United Nations have created frameworks for future solutions, but, as mentioned, lack immediacy. It is important that different approaches are taken to minimize further damage to outer space. This is crucial in order to ensure that space is protected as much as possible for the future of space exploration.

## **Possible Solutions**

Regulations are a possible solution to immediately limit further damage to space. These should encompass limiting the launch of new satellites unless they comply with established regulations to promote sustainability and cap the number of launches that do not, at least for the time being. These regulations could provide a short term relief to the current situation while research progresses to determine more effective long term solutions.



Using improved technology in order to develop more effective disposal and reentry methods would also be essential in any solution to the issue. These are both aspects of space exploration that are deteriorating the environment in space and need to be addressed as soon as possible. Additionally, using technology in order to improve tracking methods for space debris could potentially help with preventing collisions in space of different pieces of debris.

Another way in which this issue could be targeted could be to seek the removal of space debris currently present in space. This should not be proposed as the sole solution, but could accompany other policies. This could be done through different means, whether through collection via aircraft designed for the matter or through controlled destruction; the latter would likely create more, smaller pieces of debris so the idea needs to be developed further. In this way, not only would the rate of pollution decrease but the levels of space pollution would also be decreased, creating a safer environment in outer space to foster further, sustainable exploration.

## **Sustainable Development Goal (SDG)**

This issue is closely linked with SGD 9, Industry, Innovation and Infrastructure. Outer space now plays a role in the economy as industrial sectors seek to expand into it. However, given space is an environment that needs to be handled with significant care, it is important that through the use of technology, sustainable and innovative infrastructure for space exploration is developed that ensures that space will be available for exploration for long into the future.

## **Bibliography**

"Addressing the Danger of Space Debris." *EC R&I Success Stories*, 3 June 2019,  
[ec.europa.eu/research-and-innovation/en/projects/success-stories/all/add](https://ec.europa.eu/research-and-innovation/en/projects/success-stories/all/add)

ressing-danger-space-debris.

Amos, Paul Rincon & Jonathan. "Russian Anti-Satellite Test Adds to Worsening Problem of Space Debris." *BBC News*, 16 Nov. 2021, [www.bbc.com/news/science-environment-59307862](http://www.bbc.com/news/science-environment-59307862).

"As More Space Junk Falls to Earth, Will China Clean up Its Act?" *The Guardian*, 29 July 2022, [www.theguardian.com/world/2022/jul/29/as-more-space-junk-falls-to-earth-will-china-clean-up-its-act](http://www.theguardian.com/world/2022/jul/29/as-more-space-junk-falls-to-earth-will-china-clean-up-its-act).

"A Brief History of Space Exploration: The Aerospace Corporation." *Aerospace Corporation*, 1 Apr. 2023, [aerospace.org/article/brief-history-space-exploration](http://aerospace.org/article/brief-history-space-exploration).

Cao, Sissi. "Will Starlink Satellites Become Space Junk One Day? SpaceX Has an (Imperfect) Plan." *Observer*, 16 Oct. 2020, [observer.com/2020/10/spacex-starlink-satellite-collision-risk-space-debris/](http://observer.com/2020/10/spacex-starlink-satellite-collision-risk-space-debris/).

"Constellation." *Cambridge Dictionary*, [dictionary.cambridge.org/dictionary/english/constellation](http://dictionary.cambridge.org/dictionary/english/constellation). Accessed 28 Apr. 2023.

"The Edge of Space." *NASA*, [science.nasa.gov/edge-space](http://science.nasa.gov/edge-space). Accessed 7 Apr. 2023.

"Orbit." *Education*, [education.nationalgeographic.org/resource/orbit/](http://education.nationalgeographic.org/resource/orbit/). Accessed 7 Apr. 2023.

"Satellite." *Cambridge Dictionary*, [dictionary.cambridge.org/dictionary/english/satellite](http://dictionary.cambridge.org/dictionary/english/satellite). Accessed 8 May 2023.

"Space Debris." *Encyclopædia Britannica*, 18 Mar. 2023, [www.britannica.com/technology/space-debris](http://www.britannica.com/technology/space-debris).

"Space Exploration." *National Archives and Records Administration*, [www.archives.gov/research/alic/reference/space-timeline.html](http://www.archives.gov/research/alic/reference/space-timeline.html). Accessed 21 Apr. 2023.

"The U.S. Is Getting Serious about Space Junk." *NBCNews.Com*, 3 Oct. 2022, [www.nbcnews.com/science/space/us-getting-serious-space-junk-rcna50473](http://www.nbcnews.com/science/space/us-getting-serious-space-junk-rcna50473).

Wattles, Jackie, and Katie Hunt. "International Space Station Swerves to Avoid Russian Space Debris, NASA Says." *CNN*, 25 Oct. 2022, [edition.cnn.com/2022/10/25/world/iss-maneuver-russia-space-junk-scn/index.html](http://edition.cnn.com/2022/10/25/world/iss-maneuver-russia-space-junk-scn/index.html).

"Who Owns Our Orbit: Just How Many Satellites Are There in Space?" *World Economic Forum*, [www.weforum.org/agenda/2020/10/visualizing-earth-satellites-space-space/](http://www.weforum.org/agenda/2020/10/visualizing-earth-satellites-space-space/). Accessed 30 Apr. 2023.

## Appendix

- I. "The U.S. is getting serious about space junk"
  - A. <https://www.nbcnews.com/science/space/us-getting-serious-space-junk-rcna50473>
  - B. Article by NBC News that talks about a great deal about space junk, what it is, how it has been handled in the past, and how it is expected to be treated in the future.
- II. "Addressing the dangers of space debris"
  - A. <https://ec.europa.eu/research-and-innovation/en/projects/success-stories/all/addressing-danger-space-debris>

- B. Article published by the European Commission discussing the use of innovative technology to provide a long term solution to space pollution and its consequences.
- III. "Who owns our orbit: Just how many satellites are operating in space"
  - A. <https://www.weforum.org/agenda/2020/10/visualizing-earth-satellites-space-spacex/>
  - B. Article by the World Economic Forum that explains the use of satellites currently in orbit with plenty of useful graphs and visuals to facilitate understanding.