

FORUM:	United Nations Commission on Science and Technology for Development
ISSUE:	Measures to Regulate Space Debris to Secure Space Sustainability and Security
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Introduction

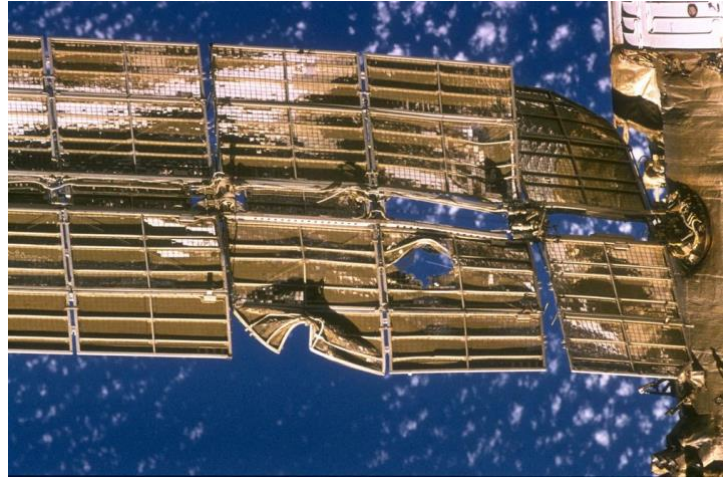
Space debris, often called space junk, is a piece of man-made object discarded in Earth orbit. Space debris includes dead satellites, fragments of machinery, paint flecks, etc. When a space shuttle is launched, its parts such as fuel tanks, boosters, and paint flecks are thrown away in the space. Also, when satellites expire, they become a part of the space debris. Currently, there are about 20,000 pieces larger than 10 centimeters, 500,000 pieces larger than 1 centimeter, and 100 million pieces larger than 1 millimeter. Even pieces as small as the size of 1 micrometer are in present in space. Those space debris orbit the Earth at high speeds – traveling at 17,500 mph, according to NASA.



Background

Even now, the amount of space debris is increasing. As space expeditions continue, space debris will continue to increase. All space debris, whether small or large, are a threat. This is because even small particles can cause a catastrophic damage when it travels at 17,500 mph. But, the degree of harm caused by space debris depends on varying size. Space debris larger than 1 centimeter can disable an operational spacecraft or even cause an explosion of the spacecraft. Smaller space debris can cause small damage or disable one part of the system. Space debris causes a number of harmful effects on humans. It makes

space travel harder. This is because there is a higher chance of getting hit by space debris. When a space debris, regardless of its size, strikes a traveling space shuttle, it may threaten the safety of the astronomer. For example, windows of a space shuttle are frequently replaced because of how easy it could be damaged by a small space debris about the size of 1 millimeter. In addition, it could further contribute to the creation of



space debris if satellites are destroyed. Satellites, even space stations, are damaged by large or small space debris. For example, on May 21th, 2021, the international space station has been damaged by a small debris. Since international space station is where astronomers from many different countries live, this even poses threat to astronomer's life. Moreover, antisatellite system poses another problem. Antisatellite system is a system designed for the destruction or incapacitation of satellites. When a satellite is destroyed by antisatellite system, it creates thousands of space debris. For instance, on January 11, 2007, China destroyed its weather satellite and created more than 3,000 fragments.

Problems Raised

Destruction of Spacecraft and Satellites

As previously mentioned, space debris travel at about 17,500 mph. Even a small space debris could cause disastrous damage to any object in their orbit, let alone a large one which can destroy an entire spacecraft or satellite. Small space debris can damage critical parts of spacecraft and satellites. When these large or small particles hit a spacecraft or a satellite, it will destroy them. This makes the situation even worse because when a spacecraft or a satellite is destroyed, they will break into thousands of large or small parts, causing even more space debris. Also, astronomers either traveling to or staying at an international space station could be seriously injured or killed. According to records, there has been a reported case when a space station was struck by a space debris.

Difficulty in Detection of Small Space Debris

Not all space debris can be detected. Large space debris is detectable by using ground-based sensor. However, small space debris which accounts for the majority of the existing space debris cannot be detected using the same technology. This is because it is too small. Therefore, it is impossible to know



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about possible collision. Although collision of small space debris is not as destructible as that of large space debris, the collision can still give a critical damage to either a spacecraft or satellite. Also, since it is impossible to prevent or prepare for it, the collision will give larger damage.

International Actions

IADC

Inter-Agency Space Debris Coordination Committee (IADC) is an inter-governmental forum which works to provide solutions for the problems caused by space debris. IADC has 13 members, which are national or international space organizations, including NASA (United States), CNSA (China), UKSA (United Kingdom), ESA (Europe), KARI (Korea) etc. In order to mitigate space debris, IADC created a number of mitigation guidelines. Limiting debris release during normal operations and avoiding intentional destruction and other harmful activities are examples of its mitigation guidelines. And these guidelines act as a basis of seven space debris mitigation guidelines produced by United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS).

NASA

National Aeronautics and Space Administration (NASA) is a US government's independent agency that conducts space programs and space researches. As being the world's largest space agency with the largest budget, NASA has already conducted several programs to mitigate space debris. NASA has focused to prevent and limit the space debris. NASA curtailed the creation of new space debris and designed satellites that are not damaged by small space debris. NASA also worked to protect astronomers on a mission. They did this by working on spacecraft shielding, shortening the mission, etc. Last but not least, NASA contributed a lot in making guidelines to mitigate the space debris.

Key Players

UNITED STATES

United States, a country that is investing a lot on various space projects, is involved deeply to this issue. United States has NASA, the world's largest space agency, and contributed a lot to mitigate space debris to secure space sustainability and security. Based on NASA's guidelines, United States created Orbital Debris Mitigation Standard Practices (ODMSP) in order to limit the debris. United States also added space debris section on its national space policy.



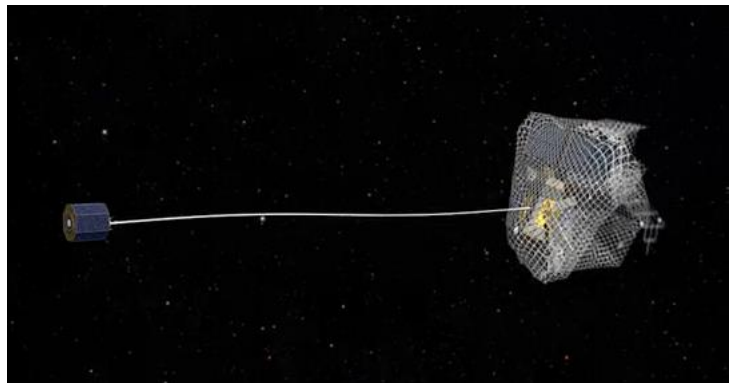
COPUOS

The Committee on the Peaceful Uses of Outer Space (COPUOS) is a committee set up by General Assembly to control all actions in the space for peace and development. The committee works for an international cooperation to encourage all members to peacefully use outer space. COPUOS created Working Group on Space Debris to create guidelines for space debris. They suggested 7 space debris mitigation guidelines having considered those that were made by IADC. The Scientific and Technical Subcommittee (STSC) of COPUOS meets annually to discuss about near-Earth objects, disaster management, global navigation satellite systems etc.

Possible Solutions

Cleaning up the space debris

Currently, it is impossible to clean space debris. This is because space debris travels too fast. However, several attempts to clean up space debris has been conducted. One example is ELSA-d, ELSA-d is a system that can capture space debris. One of the practical way to clean



up the space debris is de-orbiting. De-orbiting by defection is to go out of the orbit. Its mechanism is simple. It is simply pushing space debris out of their orbit and to the outer space. There are numerous other possible ways to clean the space debris including burning it in the atmosphere, capturing it etc. If it becomes possible to clean up space debris in the future, the space debris will be captured and the number will decrease. As space debris cleaning technology advances, scientists hope that the speed of cleaning debris will exceed the speed of new debris being produced.

Minimizing the new space debris

As it is currently challenging to clean up the existing space debris, reducing new space debris that will be created in the future is another solution. One way is to produce reusable machinery used in space shuttle. For example, SpaceX has created reusable launching system, which lands rocket back to the land. This significantly reduces the amount of space debris created per space mission. Moreover, making an agreement not to launch antisatellite missile will decrease the creation of new space debris. As it is mentioned previously, when a satellite is destroyed by an antisatellite missile, thousands of space debris are created. Discussing about other ways to deal with dead satellite is necessary.

Glossary

Space debris

Any human-made object in orbit about the Earth that no longer serves a useful function.

Satellite

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

Antisatellite

A system designed for the destruction or incapacitation of satellites

Space station

A large artificial satellite used as a long-term base for manned operations in space.

NASA

National Aeronautics and Space Administration

COPUOS

The Committee on the Peaceful Uses of Outer Space

IADC

Inter-Agency Space Debris Coordination Committee



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