

## Trash at 8 km/sec

### National Institute of Technology, Okinawa College

A: Hello. I am Koharu Omori.

C: I am Yuri Ahane.

B: And I am Megumi Nakamura. We are from Okinawa National College of Technology.

C: Imagine the universe. Limitless. Look around you and see the shining galaxies, and planets you have never seen before. If you had the chance to travel through space, what would you like to do in this fascinating universe? Like space, the boundaries of your dreams should also be limitless.

B: I would like to see Earth from a distance where I could see the entire planet with my eyes.

A: I want to visit the red planet Mars.

C: I want to look for aliens.

A: There are many things I want to do.

B: We share a common dream of going to space.

A: But space travel, even under ideal conditions, is a dangerous venture. An additional danger makes it even more difficult to realize our dream. Space debris. Today, we would like to inform you about what causes space debris, how space debris will affect our future, and proposed solutions to recover space debris.

C: Look here.

Do you see that white stuff surrounding the Earth? That's space debris. Space debris is the garbage that exists in outer space. It includes abandoned satellites, debris from collisions between satellites, and discarded booster rockets.

A: Space debris drifts around the Earth at an average speed of 7~8 km per second. At this speed, it would only take 1 minute and 9 seconds to travel 514 km from Tokyo to Osaka. That's pretty fast, right? Furthermore, space debris is increasing every year. It's estimated that there are currently over 100 million pieces of space debris.

C: That's a difficult number to comprehend.

B: Yes, the presence of space debris causes all sorts of problems.

What exactly could happen?

A worst-case scenario is if a manned spacecraft or rocket collides with space debris.

There have already been several instances of small pieces of debris hitting the ISS.

C: Astronauts are constantly exposed to dangers.

A: We earthlings can also be affected by space debris. For example, we use smartphones and the Internet to keep in touch with each other, get all kinds of information, and so on. All of this is thanks to the various satellites in space. But if these satellites collided with space debris and were destroyed, we wouldn't be able to access information the same as before.

B: It has been said that if the satellites we have now were suddenly gone, life would return to the way it was 70 years ago. There would be no more smartphones or laptop computers. Things like air travel, weather forecasting, and communication would all

be negatively affected. These are severe problems. A solution to the problem of space debris must be found as soon as possible.

C: Countries have enacted laws regarding satellites, and various companies are working to make space debris removal a reality. For example, Astroscale, a Japan-based company, is involved in removing space debris. Astroscale attaches magnetic plates to satellites that will be launched. When the satellite is no longer active and becomes debris, Astroscale's satellites use magnets to capture inactive satellites and drop them into the atmosphere.

A: Launching debris-removing satellites is a possible first step in debris removal. Yet, launching a satellite is both technically difficult and cost-prohibitive. So, how can students be involved in debris removal? Get interested and get started!

B: We've started an aerospace club at Okinawa Kosen. One day we'd like to build a satellite to remove space debris. We're gaining knowledge by building a satellite the size of a can, or can-sat. We are also building small model rockets and entering them into contests. And a satellite building project has already been done at another technical college. CubeSat was developed in collaboration with the students at Kochi National College of Technology for Jupiter radio observation. CubeSat was selected for the Innovative Satellite Technology Demonstration No. 2 in 2008. The CubeSat was launched successfully by an Epsilon launch vehicle in 2020.

A: As the demands for communication continue to grow, so too does the problem of space debris. Many of today's space debris removal technologies are technically challenging, costly, and unsustainable.

B: For us, the future engineers in Japan, making a satellite is difficult, but not impossible. We may not be able to make a satellite that can solve space debris removal now. However, we can take steps by gradually acquiring experience and knowledge to build a satellite to remove space debris in the future.

C: Let's start with an interest in space. If you are interested in space and concerned about space debris, take the first step. Start acquiring the skills you will need to build a satellite to help with space debris removal. You could start by making a can-sat. We hope you learn about the universe and dream about it as we do. Then share that dream with your friends and family. As more people become aware of the dangers of space debris, budgets will be set aside for debris control, and companies, nations, and the world will become more proactive and serious about solving this problem. Space is an unknown and fascinating place for us. To unravel the mysteries of the universe and realize our dreams of traveling through space and visiting other planets,

A: Let's protect the environment of space and Earth and build a better future.

ABC: Dream.

B: Thank you for your attention.