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SPACE DEBRIS SYMPOSIUM (A6)
Space Debris Removal Issues (5)

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ACTIVE DEBRIS REMOVAL USING THE CHARGED SATELLITE

Abstract

Since the launch of the Sputnik I in 1957, a number of artificial satellites have been launched to expand the range of space activities. Meanwhile, the number of space debris, which is the collection of human's objects orbiting around Earth such as spent rocket fragments and defunct satellites, is increasing every year. As of January 2012, the number of categorized space debris by ground-based observations exceeds 16,000. The space debris in the low earth orbit flies at about 7 km/h, these have a potential to break up operational satellites or the International Space Satellite (ISS) and to lead to risk of ISS crew's life. This is a huge social issue for space exploration, thus the active removals of existing space debris is required.

One way to remove the space debris is that a removal satellite is launched, space debris are captured by the satellites and are entered to the Earth's atmosphere changing its orbits. However, a large amount of propellant is required to remove the space debris by a conventional gas jet. Thus, recently JAXA has developed the ElectroDynamic Tether (EDT) for the orbital change of space debris. The EDT extends a tether (wire) from the removal satellite, obtains the Lorentz force by interfering between the tether carrying current and the earth magnetic field, and changes the orbit of the space debris using its force without propellant. However, the extension of the tether is a very complicated technology and has many issues to be solved.

Therefore, this study proposes other method for the orbital change of the space debris exploiting the *charged satellite*. Although the charging phenomenon of satellite due to the space plasma should be avoided in general, there have been some researches about the control of the satellite's orbit and attitude using the charge of satellite actively. In this study, applying the technology of the charged satellites to the removal of the space debris, the way of orbital change of space debris and dropping them into the earth atmosphere without propellant is examined and evaluated. As a result, it was found that the orbital change by the charged satellite is more efficient compared to the EDT as the initial inclination and eccentricity increase.