SMALL SATELLITE MISSIONS SYMPOSIUM (B4)
Design and Technology for Small Satellites (6A)

Author: Prof. Hironori Sahara
Tokyo Metropolitan University, Japan, sahara@tmu.ac.jp

Mr. Takanori Toraya
Tokyo Metropolitan University, Japan, toraya-takanori@sd.tmu.ac.jp
Mr. Sota Inomata
Tokyo Metropolitan University, Japan, inomata-sota@sd.tmu.ac.jp
Mr. Nobuyoshi Suzuki
Tokyo Metropolitan University, Japan, suzuki-nobuyoshi@sd.tmu.ac.jp
Mr. Yukiya Hanada
Tokyo Metropolitan University, Japan, hanada-yukiya@sd.tmu.ac.jp

TECHNOLOGIES FOR MICROSATELLITE ON DISTURBANCE SUPPRESSION, PROPULSION, AND RELIABILITY ASSESSMENT

Abstract

Microsatellites are now in vogue in the world and will be engaged in the more complicated space missions, which requires the higher specifications to its subsystems: the more precise attitude pointing accuracy and stability for attitude control, orbit transfer ability with propulsion, allocation and reallocation of the finite resources such as human power, financial budget, power supplying in a microsatellite project, and so on.

We, Space Systems Laboratory (SSL) in the Tokyo Metropolitan University, have been devoting ourselves to develop **subsystems and technologies for microsatellites**, especially such as attitude control, propulsion, and reliability assessment.

As for **attitude control**, reaction wheel is usually used but causes serious disturbance to decrease accuracy and stability for attitude control. We designed and fabricated those reaction wheel for microsatellite that has thin flywheel in a large diameter compared with its thickness, and constructed a control rule for the reaction wheel to **suppress the disturbance** by itself and actualize the **highly precise attitude control**.

Propulsion is very few to be installed in microsatellite so far because a propulsion system is awfully expensive in manufacturing and management and microsatellite itself is now in the dawn so that its orbit transferring is not desired by now. However, the space missions by microsatellite are expected to be the more complicated and orbit transferring will also be necessary in near future. Here, we are developing an **integrated propulsion system** which is capable to work as **both monopropellant and bipropellant propulsions**, which actualizes small impulse bit and large total impulse for precise orbit control and large orbit transferring such as formation flight mission and self de-orbit, respectively.

Not only the above subsystem developments but also **reliability assessment** in microsatellite is conducted by us. Conventionally, human resources and financial budget allocates not so effectively, and no wonder the resources are reallocated against the primary and better judgment. Here, we applied **game theory** to the **resource allocation and reallocation**, and proposed the better allocations of financial budget, for example, in taking subsystem reliabilities into consideration.

We now aims to apply our results to scheduled or ongoing microsatellite projects, the details will be introduced in the paper and presentation.