

# UNISEC-Japan Statement on


## Contribution to the Long-Term Sustainability of Outer Space Activities

### Introduction

UNISEC-Japan, as a community of university-based organizations promoting hands-on space engineering education and research, recognizes the growing importance of ensuring the long-term sustainability of outer space activities.

All members of UNISEC should remain aware of the conditions in outer space that we have used or intend to use for scientific and educational purposes. The spatial density of objects has become high enough that collisions between space objects could trigger a cascade phenomenon (the “Kessler Syndrome”), in which each collision generates debris that increases the likelihood of further collisions. Therefore, we must carefully consider the impact of our satellites on the long-term sustainability of outer space activities.

### International Context and Guiding Principles


In promoting safe on-orbit operations, it is advisable to comply with the [UNOOSA Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space \(COPUOS\)](#) .

- **Guideline 3** calls for limiting the probability of accidental collisions in orbit. When available orbital data indicate a potential collision, an avoidance maneuver should be considered.
- **Guideline 6** recommends minimizing the long-term presence of spacecraft and launch vehicle upper stages in low-Earth orbit (LEO) after mission completion. We should therefore estimate the orbital lifetime of our satellites and make efforts to ensure that they do not remain in orbit longer than necessary.

In addition, we recall the [UNOOSA Guidelines for the Long-Term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space](#) .

- **Guideline B.1** promotes providing updated contact information and sharing information on space objects and orbital events. Accordingly, all satellites developed under UNISEC-affiliated programs should be properly registered with the United Nations after launch.
- **Guideline B.8** encourages increasing the trackability of space objects and implementing debris mitigation standards, thereby supporting the development of space programs, particularly those of developing countries utilizing small satellites, in a way that promotes the long-term sustainability of outer space activities.

### UNISEC-Japan Strategic Initiatives for Sustainable Space Operations

In response to the increasing risk of orbital collisions and to ensure the long-term sustainability of space activities, UNISEC-Japan first commits to full compliance with [Japan’s Space Activities Act](#) , which is consistent with the aforementioned international guiding principles.

Building upon this legal foundation, and in order to effectively implement compliance within the small satellite community, UNISEC-Japan is committed to advancing “space safety engineering” through the following strategic initiatives, supported by rigorous research, development, and educational efforts:

## 1. **Advancing Future Projections and Risk Assessment in Outer Space**

To ensure the long-term sustainability of outer space activities, UNISEC-Japan will further advance future projections of the space object population in the LEO region. Such projections reveal how many satellites can be deployed into which orbital regions and also provide a basis for assessing collision risks as well as for considering appropriate mitigation measures when our activities in outer space lead to an increase in space objects in the LEO region.

## 2. **Promoting Post-Mission Disposal and Collision Avoidance Maneuvers**

To minimize the long-term presence of non-operational satellites and to reduce the probability of imminent collisions in the short term, UNISEC-Japan commits to advancing the development of promising technologies that ensure sufficient Post-Mission Disposal (PMD) and Collision Avoidance Maneuver (CAM). These technologies will be standardized across PMD and CAM operations, forming the technical backbone of responsible outer space activities.

## 3. **Enhancing Satellite Positioning Accuracy and Ground Control Capabilities**

UNISEC-Japan commits to advancing high-precision satellite navigation and control technologies while simultaneously enhancing the operational capabilities of ground control stations to enable timely and accurate operation execution for PMD and CAM.

## 4. **Evaluating the Environmental Impacts of Orbital Maneuvers**



In conjunction with the execution of orbital maneuvers, UNISEC-Japan is committed to advancing comprehensive assessments of both the short-term and long-term impacts that these activities may have on outer space. The outcomes of these evaluations will inform the development of operational guidelines and best practices for sustainable space utilization. By understanding the consequences of orbital maneuvers, UNISEC-Japan can refine our future projection and risk assessment models, thereby reinforcing the foundation established in Initiative 1.


UNISEC-Japan will share the outcomes of these four initiatives through its international activities, contributing to capacity-building within the small satellite community.

## **Conclusion**

Through these concerted efforts, UNISEC-Japan aims to contribute to the global advancement of “space safety engineering” for ensuring the long-term sustainability of outer space activities. Moreover, we aspire to ensure that the technologies, methodologies, and educational programs developed through these initiatives will benefit small satellite missions and emerging space actors worldwide, fostering a culture of responsibility among the next generation of space engineers.

## **Additional References**

- The aforementioned issues that UNISEC members should consider are also described in [ISO 20991 of the International Organization for Standardization \(ISO\)](#)  as minimum requirements that must be complied with in space missions.
- In addition, [A Handbook for Post-Mission Disposal of Satellites Less Than 100 kg](#) , published by the International Academy of Astronautics (IAA) in May 2019, provides practical guidance and serves as a useful reference for small-satellite operators and developers.

- Furthermore, for educational and technical training related to post-mission disposal and sustainable satellite operations, valuable materials are available through the KiboCUBE Academy:
  - [KiboCUBE Academy 2023 Lecture Slides \(UNOOSA Official PDF\)](#) 
  - [KiboCUBE Academy 2023 Lecture Video \(YouTube\)](#) 