

Promoting LTS through Education and Responsible Nano/Micro Satellite Operations

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Mission and Role of UNISEC

- **UNISEC: “University Space Engineering Consortium”**

- **UNISEC-Global:**

- An international non-profit organization connecting university researchers, students, and space professionals across about 30 countries and regions (about **210 university members**).
- **Mission:** To promote practical space engineering education, capacity building, and responsible nano/micro satellite development.

- **UNISEC-Japan:**

- The founding chapter of the UNISEC-Global, that implements these objectives at the national level and shares the outcomes internationally

- **Common Goal:**

- To integrate the principles of safety, sustainability, and international cooperation into university-level space activities.
- To support the implementation of the COPUOS LTS Guidelines.

Vision for LTS - The UNISEC-Global Tokyo Declaration 2025

(<https://unisec-global.org/>)

Establishing the Philosophical Foundation of UNISEC-Global

- **Adoption:** Adopted at the 11th UNISEC-Global Meeting in Tokyo, November 2025.
- **Core Declaration:**
 - Commitment to harnessing nano/micro satellites in a manner that promotes spaceflight safety, LTS, and the protection of Earth's orbital and natural environment.
- **Aspiration:**
 - To create a collaborative world where all countries can take part in sustainable space development, utilization, and exploration.
 - A collective vision of academia and emerging space actors working together.

Implementing the Vision(1/2)

The UNISEC-Japan Statement

https://unisec.jp/library/text/lts/UNISEC_LTS_statement_EN.pdf

Key Initiatives and Principles

- Tokyo Declaration 2025 & Commitment:** Articulates a collective vision for academia and emerging space actors to advance safe and sustainable space use, pledging to protect the orbital environment for future generations.
- Legal Compliance & Guidelines:** Commits to full compliance with Japan's Space Activities Act, the UN Space Debris Mitigation Guidelines (Guidelines 3 & 6), and the LTS Guidelines (B.1 & B.8).

Implementing the Vision(2/2)

The UNISEC-Japan Statement (https://unisec.jp/library/text/lts/UNISEC_LTS_statement_EN.pdf)

•**Advancing "Space Safety Engineering"**: Promotes **four strategic initiatives** to operationalize these principles:

- 1.Future Projections & Risk Assessment:** Developing models to assess the cumulative impact of university nano/micro satellite missions.
- 2.Promoting PMD & CAM:** Advancing and standardizing technologies for Post-Mission Disposal (PMD) and Collision Avoidance Maneuvers (CAM) for nano/micro satellite.
- 3.Enhanced Positioning & Ground Control:** Strengthening satellite control precision and ground station capabilities for timely operations.
- 4.Environmental Impact Assessment:** Evaluating the short- and long-term consequences of orbital maneuvers to refine our future projection and risk assessment models, thereby reinforcing the foundation established in Initiative 1.

Example of Four strategic initiatives(1/2)

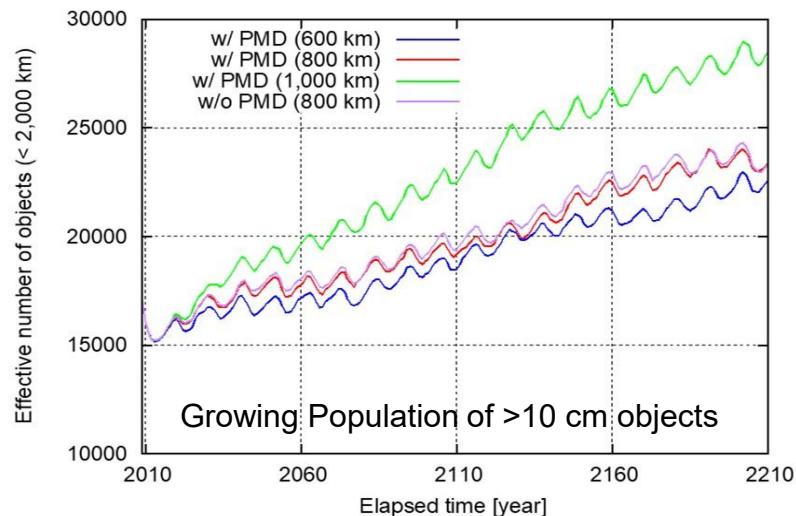
1.Assessment: Developing models to assess the cumulative impact of university nano/micro satellite missions

○ Main Assessment Tool for Initiative 1

NEODEEM: Near-Earth Orbit Debris Environment Evolution Model (©JAXA/KU)

- Developers: JAXA and **Kyushu University**
(led by Prof. Toshiya Hanada)

Analysis example



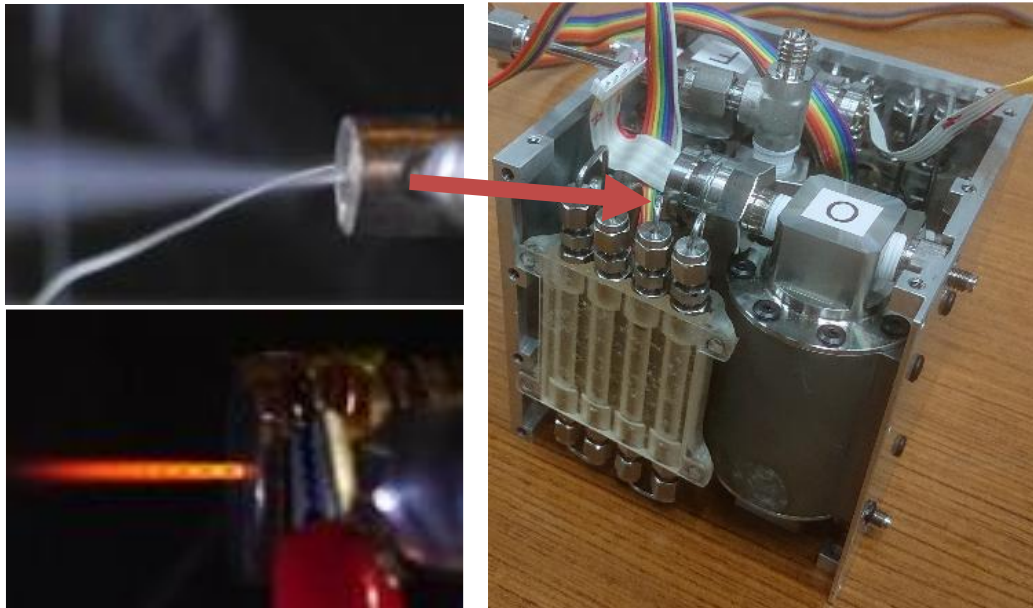
Goals of Initiative 1:

- Further advance future projections of space object population in the LEO region.
- Promote safe and secure activities by satellites associated with UNISEC, including:
 - 1) Post-mission disposal
 - 2) Collision avoidance maneuvers
 - 3) Improving satellite positioning accuracy
 - 4) Enhancing ground control capabilities and other activities,

Promoting a comprehensive assessment of their short-term and long-term impacts on outer space activities.

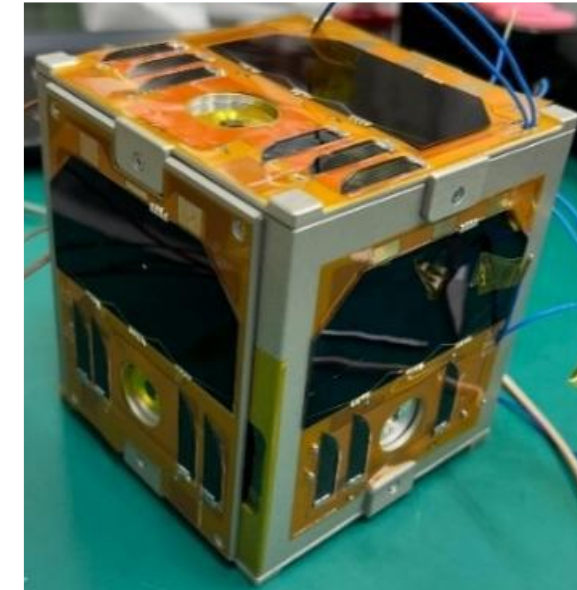
Example of Four strategic initiatives(2/2)

2.Promoting PMD & CAM: Advancing and standardizing technologies for Post-Mission Disposal (PMD) and Collision Avoidance Maneuvers (CAM) for nano/micro satellite.



1U propulsion module equipped with a multi-mode thruster

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& Space Systems
Laboratory, Tokyo
Metropolitan University

TSUKUTO, a 1U (10cmx10cmx10cm)satellite planning the in-orbit demonstration for 'PMD algorithm' for post-mission disposal (PMD) with propulsion system, requiring minimal satellite functionality.

Integration and Global Impact

Contributions of UNISEC-Global to LTS is Bridging the Gap between Policy and Practice

Global Programs:

- Utilizing the Mission Idea Contest (MIC), CanSat/CubeSat Leader Training Program (CLTP), and KiboCUBE Academy for Capacity Buildings.
- Sharing best practices consistent with LTS Guidelines (B.1, B.2, B.8, D.1).

Role of University Missions:

- Act as "practical testbeds" for responsible operations.
- Foster the next generation of engineers capable of applying LTS principles.

Recommendations to the LTS Working Group

1. **Recognize Education**: Recognize education and youth engagement as key enablers in implementing LTS Guidelines.
2. **Include University Missions**: Encourage inclusion of university-level missions in LTS-related capacity-building and data-sharing initiatives.
3. **Facilitate Cooperation**: Cooperate with non-governmental educational networks like UNISEC to promote hands-on learning.
4. **Support Standardization**: Support knowledge exchange and standardization in PMD, collision avoidance, and risk assessment for nano/micro satellites

Conclusion - Commitment to the Future

- **A Model for Responsibility:** Coupling global vision (**The UNISEC-Global Tokyo Declaration 2025**) with national technical practice (The UNISEC-Japan Statement) offers a model for cultivating a culture of responsibility.
- **Collaboration:** UNISEC reaffirms its willingness to collaborate with the LTS-WG and the international community for the benefit of all humankind.

- **Thank you for your kind attention !**