Welcome to 15th Virtual UNISEC-Global Meeting

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The 7th Mission Idea Contest

For Deep Space Science and Exploration

- A restart announcement for MIC7 was done on 23rd Oct 2020
- Online lectures on the topic were presented during Feb 2021
- Abstracts were due 21st July 2021
  - ✓ 20 teams submitted abstracts from 12 countries
  - ✓ 10 finalists and 1 semi-finalist from 8 countries were selected
- Finalist papers were received by 30th Sept 2021
  - ✓ Final presentation was done on 13th Nov 2021
  - ✓ A finalist withdrew and plus the semi-finalist 10 papers were presented and reviewed by 5 reviewers through Q&A

Mission Idea Contest：History

- Mission Idea Contest was launched in 2010 to encourage innovative exploitation of micro/nano-satellites to provide useful capabilities and services.
- Mission idea and satellite design for 50kg class micro-satellites or smaller satellites and their constellation were proposed and evaluated.
- Four books and one proceedings were published as **IAA book series.**

MIC3 finalists and reviewers, Nov 19, 2014, Kitakyushu, Japan

MIC4 finalists and reviewers, Oct. 21, 2016, Verna, Bulgaria

IAA book series (MIC1-4)

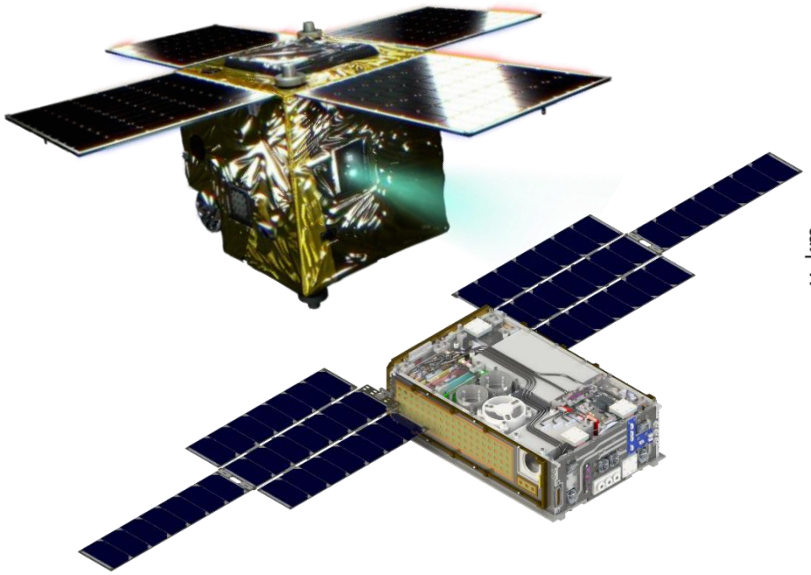
MIC Winners' Mission Ideas

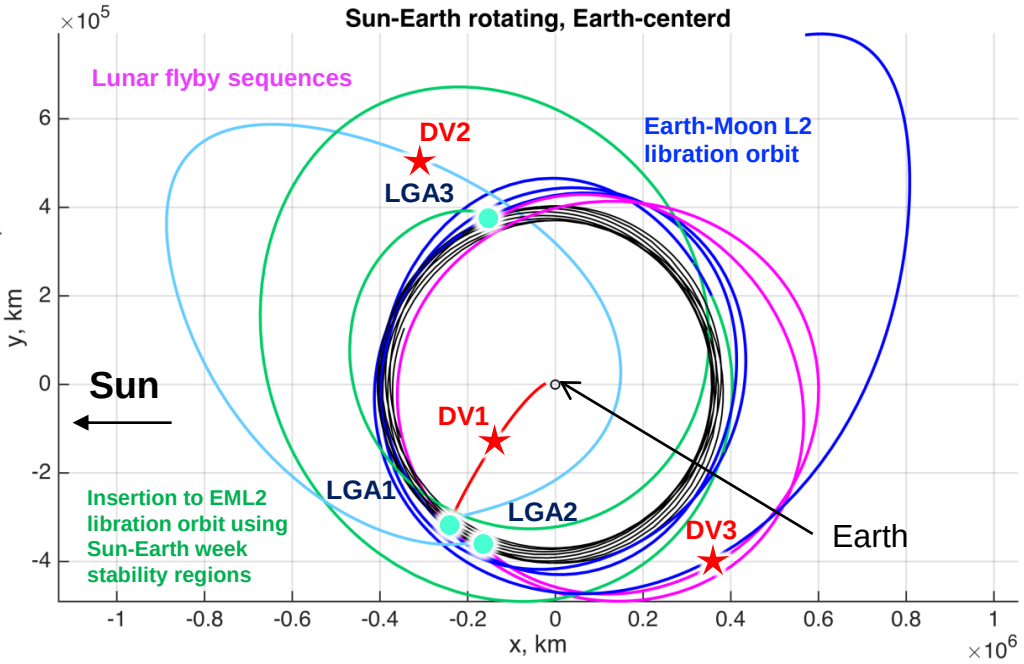
	Proposed idea	Country
MIC 1 (2011) (constellation)	Integrated Meteorological / Precise Positioning Mission Utilizing Nano-Satellite Constellation	Japan (professional)
MIC 2 (2012) (Satellite Design)	SOLARA/SARA:Solar Observing Low-frequency Array for Radio Astronomy/ Separated Antennas Reconfigurable Array	USA (student)
MIC 2 (2012) (Business model)	Underground and surface water detection and monitoring using a microsatellite	South Africa (student)
MIC 3 (2013)	Clouds Height Mission	Germany, Italy, Slovenia (professional)
MIC 4 (2016)	CubeSat constellation for monitoring and detection of bushfires in Australia	Australia (student)
MIC 5 (2018)	Smallsat Ionosphere Exploration at Several Times and Altitudes,	Taiwan, USA, India (student)
MIC 6 (2019) (ISS-IceCube)	MUSA: An ISS Experiment for research of a dual culture for Panama Disease	Costa Rica (student)
MIC6 (2019) (ISS-iSEEP)	Spectrum Monitoring from Space with i-SEEP (SMoSiS)	Philippines (professional)

Now it's time to go to "Deep Space"

- **Requirement:** Propose deep space science and exploration mission with micro/nano satellites
- **Constraints:** Realistic constraints are given

http://www.spacemic.net





Realistic Constraints

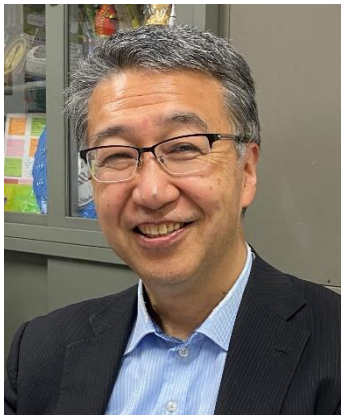
- **Propose an innovative experiment idea which contributes to deep space science and exploration.**
- **Constraints:**
  - Spacecraft envelope size is less than 1.0 m x1.0 m x1.0 m size with less than 100 kg in weight (Multiple satellites are acceptable within the envelope area).
  - cis-lunar orbit or deep space trajectory orbit with the relative velocity to the Earth (excess velocity) greater than 0 km/s and the deliverable spacecraft mass is given in a figure.
  - You can use a transponder onboard of PROCYON.
  - You can assume you can use Earth ground stations for deep space missions like DSN (Deep Space Network).
  - You can take continuous 8 hours for spacecraft operation every day.
  - The lifetime is a free parameter. But you should consider the effect of radiation for the proposed lifetime.
  - The proposed launch date should be before 2030.

Evaluation Criteria

Originality	Novel concept not yet realized or proposed, or a new implementation of an existing capability or service (25).
Impact	Impact on society / Potential to expand scientific knowledge/ Strengthen deep space mission motivation (25).
Engineering	Technical description and solutions (20).
	Operational (protocol, communication and interaction during experiment) (15).
Feasibility	Programmatic (realistic- cost, development schedule, infrastructure requirements) (15).

Note: Inclusion of a budget and a development schedule is not required for MIC7, however, the proposal should be demonstrated to be financially and temporally feasible.

MIC7 Reviewers/Jury



Shinichi Nakasuka,
Univ of Tokyo

Ryu Funase,
Univ of Tokyo

Munetaka Ueno,
Kobe University

Rainer Sandau,
IAA

Herman Steyn,
Stellenbosch University

Naoya Ozaki,
ISAS/JAXA

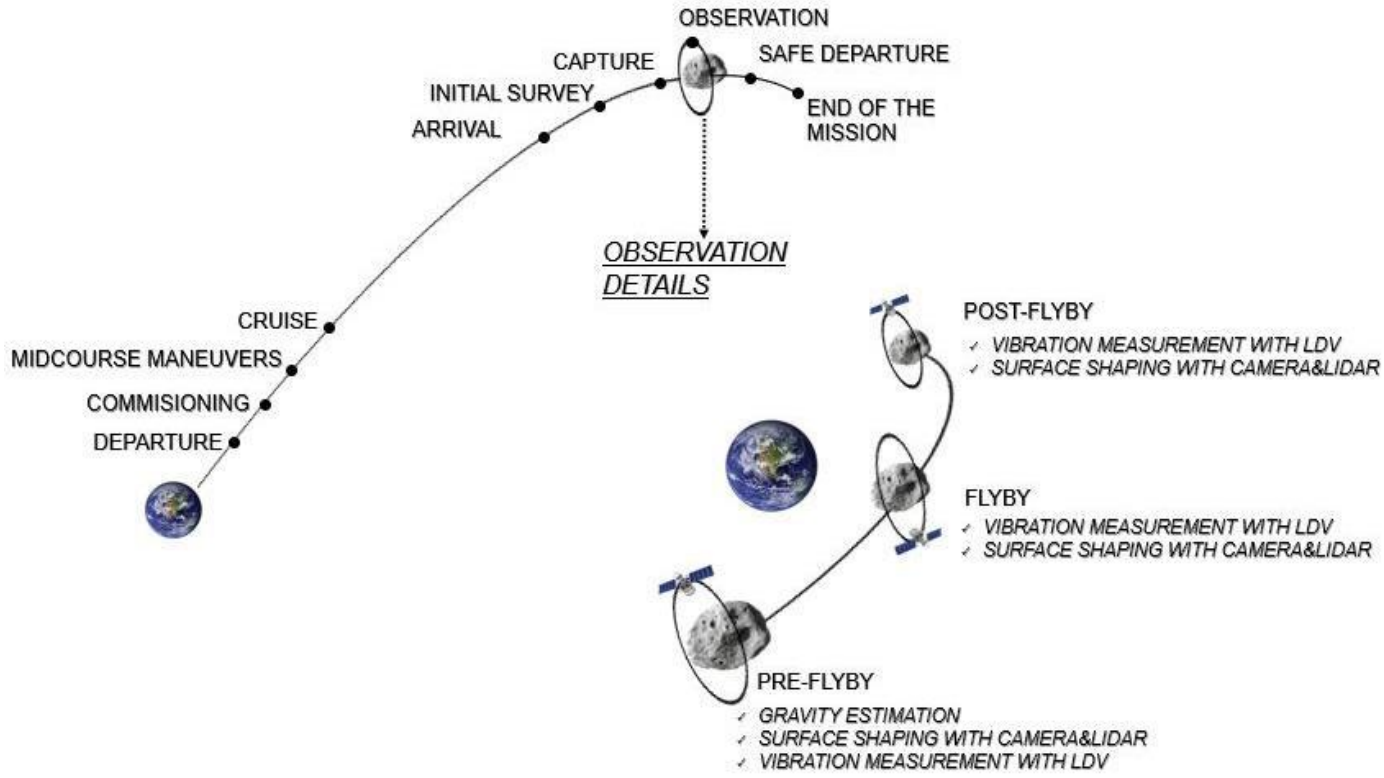
Winner 1st Place

PARS: Precursor Asteroid Remote Survey

Batu Candan, Cansu Yildirim, Derya Sarmisak, Mehmet Esit, Sahin Ulas Koprucu, Sefa Cengiz, Semra Sultan Uzun, Sirin Yakupoglu

Middle East Technical University, Istanbul Technical University and Yildiz Technical University
Ankara / Istanbul, TURKEY

Research about Apophis asteroid (close approach to earth on 13th April 2029) using Laser Doppler Vibrometry, LIDAR and HiRes camera



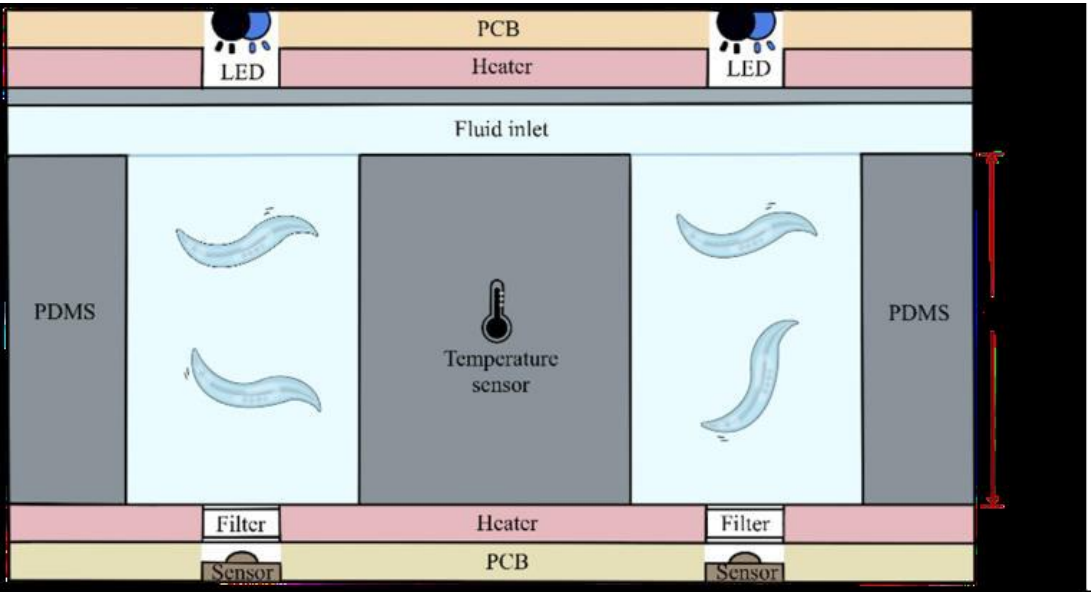
	DATE/DURATION
DEPARTURE	20.04.2028
ARRIVAL	08.03.2029
INITIAL SURVEY	30 DAYS
CAPTURE	07.04.2029
PRE-FLYBY OBSERVATION	5 DAYS
FLYBY OBSERVATION	3 DAYS
POST-FLYBY OBSERVATION	5 DAYS

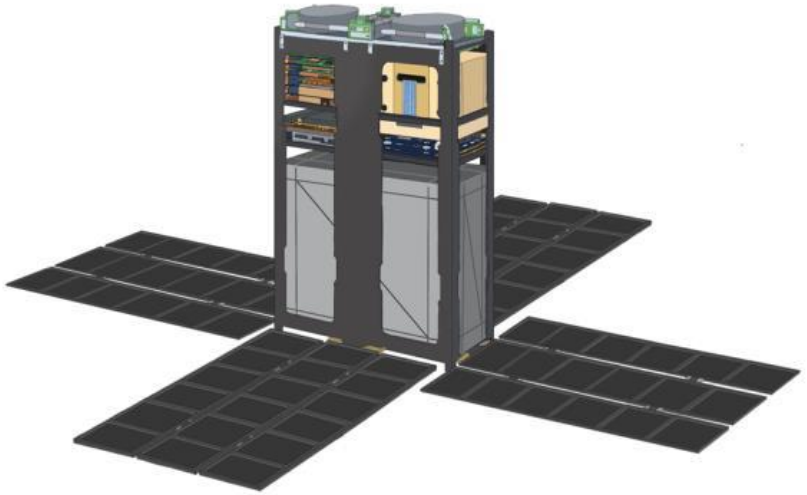
Winner 2nd Place

MINERVA: A CubeSat for demonstrating DNA damage mitigation against space radiation in *C.elegans* by using genetic modification

Sumeth Klomchitcharoen, Tanchanok Tangwattanasirikun, Sean Gallup, Noparin Smerwong, Peetimon Arunwiriyahkit, Pisitchai Tachavises, Jin Tangkijngamwong, Pichamon Phatthanaanukun, Benjamard Jirapanyalerd, Siripak Chattanupakorn, Visarut Rungpongvanich, Norawit Nangsue, Krai Meemon, Patompon Wongtrakoongate, Suradej Hongeng, Yodchanan Wongsawat
Mahidol University, Nakhon Pathom, THAILAND

An experiment to transform a creature with radiation intolerance into a transgenic organism that is radiation-tolerant when exposed to Galactic Cosmic Rays. *Caenorhabditis elegans* (*C. elegans*) is utilized as a model organism to study its biological effect on the Minerva mission in a Near-Rectilinear Halo Orbit





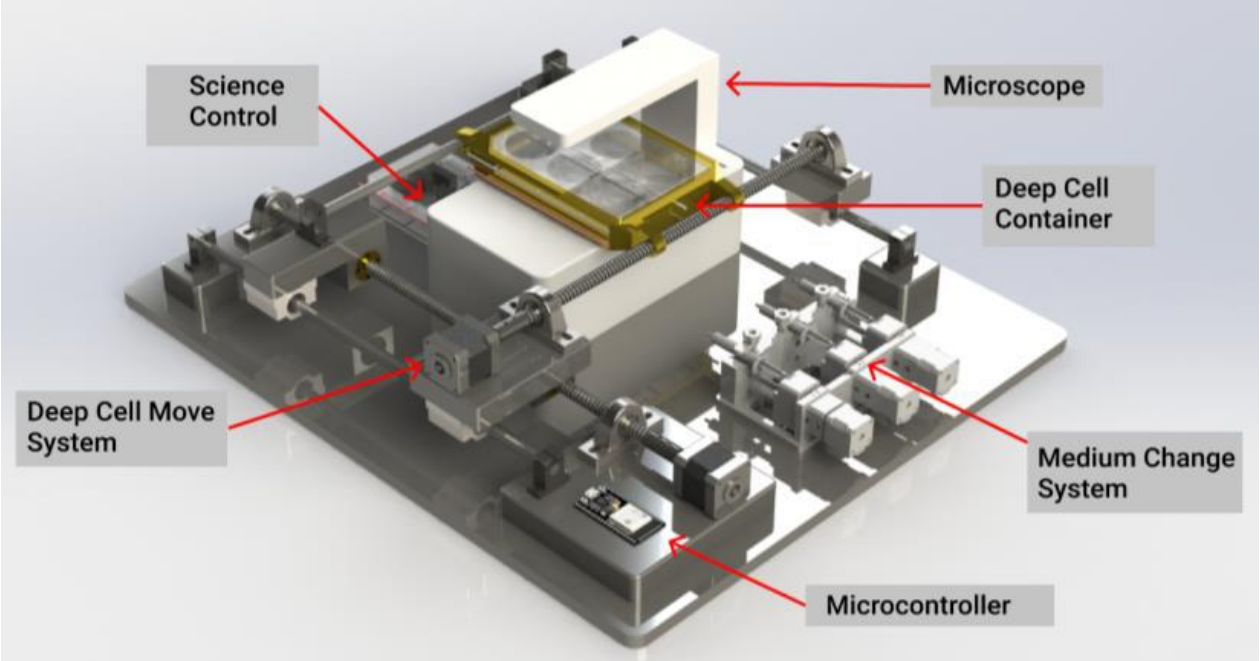
Student Prize 1

Disrupting Herpes virus investigation in lunar orbit: A system for animal cell analysis

André Arias Ovares, Andrés Cubero Salas, Ariadna Hernández Montoya, Carlos Montoya Marín, Daniel ChacónMora, Fabián Fernández Aguilar, Karol Cerdas Mejías, Kenneth Chacón Fernández, Kevin Sánchez Ramírez, Marco Corrales Barrantes, María Francini Mora Chacón

University of Costa Rica and Costa Rican Institute of Technology, COSTA RICA

This paper investigates the latent reactivation of a specific Herpes virus called Epstein Barr virus into an animal cell line taken to lunar orbit. The results can prevent the virus in the international astronautical community for their future space travels in deep space and can help with the investigation for the treatment of this disease on Earth by finding the virus reactivation by any particular parameter during a 6-week travel in a lunar orbit environment.



Student Prize 2

SCORE: Observation and exploration of a long period comet using micro-satellites

Vincenzo Porrino, Annarita Argirò, Marcello Chiariello, Alessia Contaldi, Antonio Cristiano, Luca D'Albenzio, Barbara De Leonardis, Carmen Di Mauro, Francisco Javier Fernàndez Fernàndez, Mirca Gargiulo, Riccardo Guida, Claudio Rosario Ibello, Gaetano Montano, Lorenzo Zennamo, Giorgio Isoletta, Alessia Nocerino, Alfredo Renga

University of Napels Federico II, ITALY

The paper represents an overview of the SCORE project (Scientific mission for Comet Observation, Research and Exploration), a space mission using a micro-satellite with a wet mass of 100 kg, aimed at performing a flyby with a Long Period Comet. The spacecraft is deployed in cis-lunar space by another mission (e.g. Lunar Gateway) and will wait on a parking Near Rectilinear Halo Orbit until a suitable target is detected.