

UNISEC-Global The 2nd Virtual Meeting

October 10, 2020 22:00-24:00
(Standard Japan time GMT +9)



The following report prepared by UNISEC-Global Secretariat
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Japan



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1) Welcome and Opening remarks by Rei KAWASHIMA, UNISEC-Global



Rei KAWASHIMA,
UNISEC-Global

Highlights:

- Why can't humans go back to the moon or on deep space missions?
- New Local Chapter acknowledgment

2) Introduction to the 7th Mission Idea Contest (MIC7) - Deep Space Mission Challenge NAKASUKA Shinichi, the University of Tokyo

Importance of Satellite Design and Mission Idea Contest



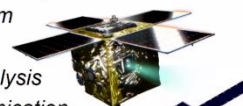
We are waiting for innovative and interesting idea of mission and spacecraft design !!

Join us !



Difference from LEO missions

- 1) Design of the Trajectory
 - 1-1) Three body or multi-body problem
 - 1-2) Sphere of influence and patched conics
 - 1-3) Swing-by Mechanism
- 2) Design of the Explorer
 - 2-1) Radiation effect analysis
 - 2-2) Long range communication
 - 2-3) Optical navigation
 - 2-4) Long lifetime
 - 2-5) Autonomy.
- 3) Ground station and operation
 - 3-1) Operation scenario



Presentation highlights:

- Began 2010, Winner mission ideas, ISS
- Deep space science and exploration mission
- Problem solving importance Design | Functions: Inverse problems
- Problem solving skill training, motivation, teamwork (Satellites are mission success problem solving) Goal -> scenario -> orbit -> spacecraft: Requires multiple disciplines
- Rationale: LEO field established already, deep space missions provide frontier spirit and require additional technological innovation providing opportunities for learning. Small satellites are viable for DS missions.

Q&A Session

Q1: Christian Chavez: Dear Dr. Nakasuka, thanks for the motivating talk. Question: It is possible to propose a mission mainly based on trajectory analysis only? To what extent should be cover the AOCS, EPS and other subsystems?

A1: Can split system designs into sub-teams

Q2: Thameur Chebbi: Dr. Nakasuka, following your interesting presentation, I would like to know what are the must have nanosatellite technology that should be equipped with for a deep space mission?

A2: Accommodate inner thrusters, communication system should be long wave system

Q3: Marco Romero: Thanks a lot Dr. Nakasuka the body to be visited is a decision factor? following that the toll used or the mechanism used for the trajectory analysis or the System Design is also considered on the evaluation? Or only the accuracy of the data used and output produced?

A3: The body to be visited is not a decision factor, but the scientific value for visiting this body is to be evaluated. If you have special design and analysis tool which are your own original things, please show that in the contest. If that is very interesting and useful, it will give additional points to your works.

3) Mission Design for Deep Space Nano/Micro Spacecraft Utilizing Lunar Orbital Platform-Gateway Opportunities by UNISEC Alumni, OZAKI Naoya, JAXA/ISAS

Mission Design for Deep Space Nano/Micro Spacecraft Utilizing Lunar Orbital Platform-Gateway Opportunities
 Naoya Ozaki
 Institute of Space and Astronautical Science,
 Japan Aerospace Exploration Agency

Ozaki Naoya

2020/10/10

LOP-G Related Launch Opportunities

Starting from NASA's Artemis-1, we can expect **more than 10 CubeSats** are launched to deep space every year (Launch for LOP-G Construction, Resupply, etc...)

Exploration Firsts

NASA Updates Lunar Gateway Plans, NASA Spaceflight.com
<https://www.nasa.gov/spaceship/2018/09/nasa-lunar-gateway/>

4) To Interplanetary Space (Mars, etc)

Exploiting solar gravity (tidal forces) can **increase the Vinf** with respect to the moon!!

DESTINY+ Trajectory (Ozaki, et al., 2019)

Geometry of Lagrange Points

Sun-Earth line fixed rotation

Satellites Born From UNISEC Activities

<http://unisec.jp/unisec/satellites.html> (Info. in 2019, accessed on July 11, 2020)

Presentation highlights:

- Lunar orbital platform Gateway (utilize for DS mission objectives) Artemis One mission > 10 cubesats to deeps space each year
- UNISEC has helped develop many satellites we can achieve deep space missions
- Halo orbit can be found around a Lagrange with different energies. Gateway will be in L2 Halo orbit

- Halo orbit is unstable but easily reachable and escapable. Halo orbits are preferable for communications. NRHO energy orbit never experiences eclipse.
- Utilise Lunar swing-by. Can select stable trajectory on manifold orbits to transfer to L1/L2. Landing on Lunar surface requires large delta V (approx 2.5 km/s) and can be calculated via 2-body problem and orbital-invariance-energy conservation law
- Can transfer via solar-tidal force to reduce delta v (approx 10 m/s).
- Gateway metro map shows how to transfer to different orbits (to be made available).

Q&A Session

Q1: Thameur Chebbi: Mr. Ozaki, comparing LOP-G and HTO, what are the main advantages of the latter one, if we consider both for a deep space mission in terms of costs and time?

Q2: Stella: What was the major reason for choosing the Halo orbit for the Gateway station?

A2: The accessibility of the Halo orbit requires a small delta-v and the communications are easy. Can also cover the side of the moon not visible from the Earth.

4) Garvey McIntosh, NASA Attaché based at the U.S. Embassy in Tokyo.

Garvey was invited by UNISEC-Global to participate in the 2nd Virtual Meeting and made some comments. At the moment, Garvey is responsible for the coordination of NASA's programs with Japan.

Direct comment from Garvey McIntosh:



“Artemis Program’s goal is to send first woman and next man to the Moon by 2024 year which is the main focus of NASA right now. We are looking forward for partnerships with universities, entities, private companies, and obviously governments.”

5) Breakout discussion and sharing. Moderator: MAEDA George, Kyutech



MAEDA George: *As moderator, I plan to create ten breakout rooms. You will be assigned to one of them on a random basis by the ZOOM software. Please discuss the agenda (on the next page) with your room mates. Select one person to be the room representative.*

Breakout session Agenda:

1. How do we move forward with University Deep Space exploration missions using micro/nano satellites?
2. How can emerging nations get involved?
3. Or is it too early for this discussion?
4. Other things that ought to be considered as a global community?

Highlights:

- Entire meeting is divided into 10 breakout rooms (about 4-5 people in each room);
- Participants discuss the above agenda for 3 min;
- Representative of each room makes 1 min summary to the entire meeting.

Summary of breakout session discussion:

Room 1	It is a good idea and good opportunity. The moment is right.
Room 2	Utilise existing supply and collaborative projects international to bolster capability of emerging nations.
Room 3	Right time. UNISEC is the right platform to start the discussion as emerging nations don't have the access. This course will be motivating for university students. Build capacity.
Room 4	Happy for the plan but hesitant as collaboration of nations needs to be improved. Many universities are not part of the program.

Room 5	Collaboration and competitions. Communications and limited launch capability and complexities of systems. Developing countries may be outside of the scope (balancing budgets) getting them involved in LEO first is more important.
Room 6	Emerging nations can participate with ground stations for projects and they can also help develop software and include collaboration of universities. Networking from UNISEC is important.
Room 7	Communication is the largest issue.
Room 8	Emerging nations should develop operational capabilities and help develop these missions with nanosatellites may motivate young engineers.
Room 9	Difficult for emerging nations to contribute substantially for deep space missions. More expertise, facilities and collaboration is required. This will also bolster these nations capabilities.
Room 10	Developing countries can also participate via collaborations. Increase education benefits for emerging nations. Astronauts to support missions to develop launch capabilities.

6) Space program initiative in Lebanon. Current situation and future of Lebanese Universities. Presenter: Amin Haj-Ali, Ph.D. Dean, School of Engineering Lebanese International University Member of the Lebanese Space National Committee UNISEC-Global Lebanon POC



SPACE PROGRAM INITIATIVE IN LEBANON

CURRENT SITUATION AND FUTURE PLANS OF

Amin Haj-Ali, Ph.D.
Dean, School of Engineering
Lebanese International University
Member of the Lebanese Space National Committee
UNISEC-Global Lebanon POC
amin.hajali@liu.edu.lb

Amin Haj-Ali

Highlights:

- Lebanon has a UN centre located in Jordan. Space activities date back to the 1960's (1962 Cedar III rocket. National centre of remote sensing (did not own satellites and relied on external sources).

- Objectives: Develop capacity building; Establish Space Program Governance (LNSC)
- Future plan: Run online courses in space and nano-satellite technologies; Develop specialized entry level multidisciplinary online courses (for Lebanese universities). Develop joint Master's degree program.

7) Acknowledgement of new Local Chapter and new members KAWASHIMA Rei

Welcome! New Local Chapter


UNISEC-Thailand

- King Mongkut's University Bangkok
 - Responsible Professor: Dr.P
 - Student Representative: Mr.
- Khon Kaen university
 - Responsible Professor: Dr.Numpon Mahayotsanun
 - Student Representative: Mr.Pavaret Preedawiphat
- Prince of Songkla University
 - Responsible Professor: Dr. Vasan Jantarachote
 - Student Representative: Ms. Saowapa Meerabeab

New university members

- UNISEC-Philippines


- 1. University of Southern Mindanao**
Responsible Professor: Engr. Maricel Dayaday
Student Representative: Eric Dominic Manginsay
- 2. De La Salle University**
Responsible Professor: Dr. Cesar Llorente
Student Representative: Armie Pakzad
- 3. Adamson University**
Responsible Professor: Engr.Evelyn Quiambao- Raguindin
Student Representative: Nathaniel Noveno



8) Final comment by UNISEC Alumni OZAKI Naoya, JAXA/ISAS

OZAKI Naoya: *New experience hearing that Gateway is too early for emerging nations. The Gateway opportunity is important for future missions and its availability is limited. Launching deep space missions will be much easier with Gateway.*

9) Closing remarks and announcements by KAWASHIMA Rei, UNISEC-Global





"A.I.Solutions"
Moataz Abdelazim

New corporate members


- Silver Corporate member
 - a.i. solutions
 - CubeSpace

Note: Corporate membership details will be available on the website soon.
(Invitation letters can be sent upon request.)





Cristian Chavez



Highlights:

- Start of UNISEC-Global Corporate Membership;
- Silver Corporate member “**A.I. Solutions**”

Point of Contact for “A.I. Solutions”: Moataz Abdelazim

Website: <https://ai-solutions.com/freelyer/freelyer-university/>

E-mail: Moataz.abdelazim@ai-solutions.com

- Silver Corporate member “Cube Space”;
- Celebration of Cristian Chavez birthday! Happy Birthday!

10) Participant Statistics

113 registered participants from **32** countries participated in the 2nd Virtual UNISEC-Global Meeting.

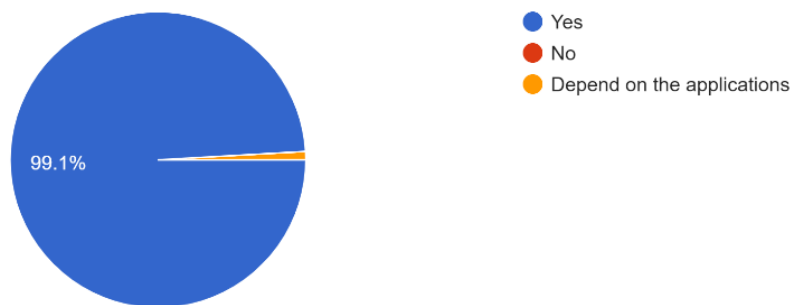
- | | |
|----------------|---------------------|
| 1) Angola | 17) Japan |
| 2) Argentina | 18) Kazakhstan |
| 3) Australia | 19) Lebanon |
| 4) Bangalore | 20) Mexico |
| 5) Bangladesh | 21) Myanmar |
| 6) Brazil | 22) Nepal |
| 7) Bulgaria | 23) Panama |
| 8) Cambodia | 24) Philippines |
| 9) Chili | 25) Southern Africa |
| 10) Costa Rica | 26) Switzerland |
| 11) Egypt | 27) Taiwan |
| 12) France | 28) Thailand |
| 13) Germany | 29) Tunisia |
| 14) Honduras | 30) Turkey |
| 15) India | 31) USA |
| 16) Indonesia | 32) Zimbabwe |

Status	Number
CLTP Graduate	9
UNISEC members	50
UNISEC Alumni	2
UNISEC Staff	4
Point of contact	11
MIC	6
Interested/invited guests	7
Others	24

11) Participant Questionnaire

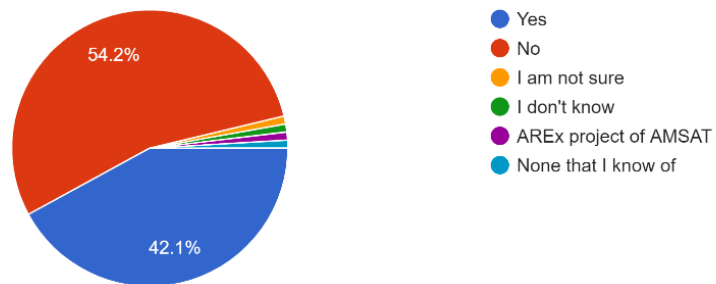
A) Are you interested in Deep Space Exploration/exploitation?

110 responses



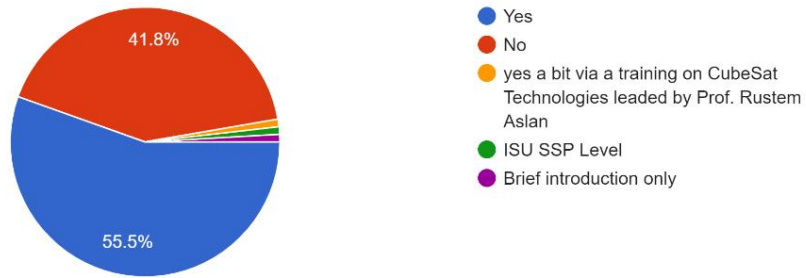
B) Are there any projects related to deep space exploration/exploitation in your region?

107 responses



C) Have you ever studied orbital mechanics?

110 responses



Your position (Please select "other" for several positions.)

112 responses

