UNISEC-Global Challenge - for Sustainable University Space Activities

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UNISEC-Global

Vienna, Austria, June 19, 2019.
United Nation Committee on the Peaceful Uses of Outer Space (UNCOPUOS)
Outline

• UNISEC-Global “VISION 2030-ALL”
• UNISEC-Global Approach
• CanSat Activities
  – CLTP
  – ARLISS
  – New educational tools – HEPTA-Sat
• Eco-system model for University Space Project/program
• Conclusion
• Upcoming Events in 2019
Vision 2030-ALL

“By the end of 2030, let’s create a world where university students can participate in practical space projects in all countries.”

Key principle of the 2030 Agenda for Sustainable Development:
No one will be left behind.

17 Local Chapters, 50 Points of Contact
UNISEC-Global’s Approach

Training Program
HEPTA-Sat Training
CanSat Leader Training Program

Forum, Conferences, Technical competitions
UNISEC-Global Meeting, Mission Idea Contest, Nano-satellite Symposium, CanSat Competition

Vision 2030-ALL

Debris Awareness and Solutions
Debris Mitigation Competition
IAA Study Report: A Handbook for Post-Mission Disposal of Satellites less than 100kg

Support Global Space Projects initiated by member universities
CanSat Leader Training Program (CLTP)

Objective: CLTP is a training program for professors/instructors to learn how to conduct CanSat (or HEEPTA-Sat) training by experience. Participants are expected to teach their students after training. It has contributed to capacity building in basic space engineering and technology.

Launched: October 2010 (1st CLTP was held in 2011)
Offered: Annually
Graduated: 81 participants from 37 countries

CLTP10 will be held in August 19-30, at Nihon University, Japan
## UNISEC - CanSat Training /Competition in 2019

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Venue</th>
<th>Participants</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>CanSat Training Program</td>
<td>Feb 3-5</td>
<td>Cairo, Egypt</td>
<td>30</td>
<td>Domestic</td>
</tr>
<tr>
<td>Tanegashima Rocket Contest (incl.CanSat)</td>
<td>March 6-9</td>
<td>Kagoshima, Japan</td>
<td>315</td>
<td>Domestic</td>
</tr>
<tr>
<td>Thailand CANSAT-Rocket Competition 2019</td>
<td>July</td>
<td>Thailand</td>
<td>200-300</td>
<td>Domestic</td>
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<tr>
<td>CanSat Competition in Noshiro Space Event</td>
<td>Aug 15-17</td>
<td>Akita, Japan</td>
<td>200</td>
<td>Domestic</td>
</tr>
<tr>
<td>21st ARLISS</td>
<td>Sep 9-12</td>
<td>Nevada, USA</td>
<td>200</td>
<td>International</td>
</tr>
<tr>
<td>CanSat Short Course</td>
<td>Sep 23-28</td>
<td>Bekaa, Lebanon</td>
<td>96</td>
<td>Domestic</td>
</tr>
<tr>
<td>1st CRIC 2019</td>
<td>Oct 4-6</td>
<td>Serbia</td>
<td>200</td>
<td>International</td>
</tr>
<tr>
<td>5th national CANSAT contest (Mexico)</td>
<td>Oct 10-11</td>
<td>Tijuana, B.C. Mexico</td>
<td>150</td>
<td>Domestic</td>
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<tr>
<td>CanSat workshop</td>
<td>Oct</td>
<td>Córdoba Argentina</td>
<td>30</td>
<td>Domestic</td>
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<tr>
<td>CanSat Training</td>
<td>Nov 8-10</td>
<td>Istanbul, Turkey</td>
<td>100</td>
<td>Domestic</td>
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Birth of CanSat at USSS 1998

“Let’s make a satellite out of this Coke-can !!”

Prof. Bob Twiggs, Stanford University
A CanSat launch event at BlackRock desert, NV, US

- organized by AEROPAC (An amateur rocket group in US) and UNISEC
- 1 stage solid motor to 4,000m
- Three 350ml sized cans or one large can (<H240mm, dia.140mm)
- Cost $400 /flight
ARLISS Rocket

- AEROPAC Amateur Rocket group
- 1 stage solid motor
- Lift 1.8 kg to 4 km
- Three 350ml sized cans or one “Large sized can”
- Black Rock Desert (Nevada, USA)
2001 ~ Comeback Competition

Competition

Call Back Your CANSAT!!

ARLISS2001 PROJECT
CanSat evolution – various types

“Paraglider” type

“Plane” type

“Rover” type
Educational Significances of CanSat/Micro/Nano/Pico-Satellite Projects

- **Practical Training of Whole Cycle of Space Project**
  - Mission conceptualization, satellite design, fabrication, ground test, modification, launch and operation
  - Know what is important and what is not.

- **Importance for Engineering Education**
  - Synthesis (not Analysis) of a really working system
  - Feedbacks from the real world to evaluate design, test, etc.
  - Learning from failures (while project cost is small)

- **Education of Project Management**
  - Four Managements: “Time, human resource, cost and risk”
  - Team work, conflict resolution, discussion, documentation
  - International cooperation, negotiation, mutual understanding

- Also contributions to other technology areas!
Significance of CanSat Program

• Very Short Period Required for One Whole Project
  – 5-6 months for mission conceptualization, satellite design, fabrication, ground test, modification, launch, operation
  – Launch date is fixed in ARLISS: no delay is allowed

• Very Low Life Cycle Cost for One Project
  – $500 - 1,000 budget for one team (typically)
  – Rocket launch requires $400/flight, etc.

• Small, but Still Can be “a Satellite”
  – All the satellite functions + mission can be packed

• Can be Retrieved after Experiment
  – Analysis of the causes of failures is easy

• No worries of debris
Training Programs: Educational Kits

HEPTA-Sat
(CLTP8-, HEPTA-Sat Training Workshops)
Developed by: UNISEC-Japan

i-CanSat
(CLTP3-7, CTP)
New Tool: HEPTA-Sat
International Knowledge and Technology Transfer for CubeSat Development

(Hands-on Education Program for Technical Advancement)

Southern Hemisphere Space Studies Program 2019
Collaboration with International Space University (ISU)
What is HEPTA-Sat Training Program?

1) Understanding basic satellite system architecture.
2) Experiencing the pico-satellite development process in a short time.
3) Acquiring the basic knowledge of space engineering.

Step 1: Lecture
Step 2: Hardware Assembly
Step 3: Hardware & Software Integration
Step 4: Mission Design
Step 5: Field test
Step 6: Review & Presentation

Congratulations!
Eco-system Model of University Space Projects/Program

Small Investment/Resources

Do what you can do.

Good education at Universities

- Strong and sustainable motivation
- Excellent education tools

More Investment resources

Do better/more activities.

Ring Eco-system

Well educated and motivated students

New space business, New projects, government awareness

Driving Forces in the Space Field

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Conclusion

• UNISEC-Global aims to realize a world where university students can participate in practical space projects in all countries.

• Building an eco-system of space education would be beneficial to academy, industry and government

• Initial small investment/resources will trigger “Ring Eco-system.”

• Strong and sustainable motivation will drive this Ring Eco-system continually to grow larger and better.

• Excellent space education tools are essential to keep such strong motivation. CanSat/ARLISS and Hepta-sat organized by UNISEC-GLOBAL can make such contributions.

• Again, initial small investment is key to trigger the movement
Upcoming Events in 2019

• **10th CanSat Leader Training Program (CLTP10)**  
  (August 19-30, 2019), Nihon University, Chiba, Japan.

• **21st ARLISS**  
  (Sep 9-12), Black Rock Desert, Nevada, USA

• **7th UNISEC-Global Meeting**  
  (Nov 30-Dec 3, 2019),  
  The University of Tokyo, Tokyo, Japan

• **6th Mission Idea Contest**  
  (Dec 2) Abstract Due : August 8  
  • For Archiving Sustainable Development with Human Spaceflight

Associated Event  
  HEPTA-Sat Training Short Course (Dec 4-5, 2019) Tokyo  
  Lean Satellite Workshop (Dec 4-5, 2019) Tokyo  
  Global Space Job Fair in Tokyo (Dec 6, 2019) Tokyo
Thank you!

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Back-up slide
Amateur Rocket Launch and Descent by Parachute

4km altitude

15-20 min after release

ArLISS

CAN SAT deployment

launch

carrier

nosecone
20-year practical space education

- 1999 ARLISS (A Rocket Launch for International Student Satellites)
- 1999 CubeSat concept at USSS
- 2003 First CubeSats on orbit
- 2011 CanSat Leader Training Program
- 2015 HEPTA-Sat - New tool for satellite training
- 2018 20th Anniversary of ARLISS