Education and Training Activities -
APSCO Student Small Satellite Project

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Asia-Pacific Space Cooperation Organization
www.apsco.int
APSCO: Multi-Lateral Cooperation in the Asia-Pacific Region

- Vast Geographical Area
- Large Population
- Mostly Developing Countries
- Prone to Natural Disasters
- Exploiting Space Needs High Technology, Risk and Investment
Education and Training Programs of APSCO

- Full Scholarship Support (215 Masters & 63 Doctors)
- Top Aerospace schools in China: Beihang, NPU & HIT

- Space Education Curricula Development
- Student Small Satellite (SSS) program

Degree Education

- Space Science Schools
- Space Innovation Contest
- APSCO Microsatellite Contest

Talent Cultivation

- On-line, On-site, Centralized Trainings
- More than 1,500 trainees from 32 Asia-Pacific and 5 African countries

Training
APSCO Student Small Satellite (SSS) Project

APSCO SSS Project Consists of a 1 Microsat (SSS-1) and two Cubesats (SSS-2A and 2B)
A basic activity of APSCO, it was kicked-off in December, 2016.
Launch service will be provided by CNSA.
Member States: Bangladesh, China, Mongolia, Iran, Pakistan, Peru, Thailand and Turkey.
Beihang University was identified as the Leading University.
SSS-1 Configuration

- Main/Sub-sat, Collable Mast
- GaAs Solar Array + Li-ion Bat
- ARM Processor with CAN Bus
- Passive + Active (MTQ, RW)
- Passive (MLI) + Active (Heater)
- S-band TRX + UHF/VHF TRX

Platform
- Structure
- EPS
- OBDH
- ADCS
- Thermal Control
- Communication

Payload
- Inter-Sat Transceiver
- Remote Sensing Camera
- ADS-B Receiver
- Radiation Dosimeter
SSS-2A Configuration

Diagram showing the configuration of SSS-2A with labeled components:
- UHF antenna
- UHF Model
- Gamalink
- OBC
- EPS
- Battery
- Hub
- Interstage
- S-band transmitter
- Camera
- Momentum wheel
- Star Tracker
- Mems-Prop
- GPS antenna with GPS/BD2 GNSS
- GPS antenna with Gamalink
- Monopole
- Star tracker
- S-band Patch
- UHF Antenna

+X
-Z
SSS-2B Configuration

- GPS Antenna
- Y Solar Panel
- Structure
- Propulsion
  - Magnetometer
  - UHF/VHF Modem
  - S-Band Modem
  - S-Band Antenna - Nadir
  - Attitude Determination and Control Subsystem (ADCS)
  - Beacon Antenna
  - -X Solar Panel
  - Battery
  - +Y Solar Panel
- On Board Computer
- UHF/VHF Antenna Mechanism
- Camera
- S-Band Antenna - Zenith
- Sensor
- Dosimeter
- +X Solar Panel
- Nadir ADCS Lens
- Electrical Power Subsystem
Educational Programs of SSS Project

**Multilayer training program**

- **Selection of Student Teams**
  - Designation of the Universities joining this program
  - Nomination of student teams by universities
  - Each MS can nominate a student team including 2-10 students

- **Training Material Sharing**
  - System level training materials by Leading University
  - Subsystem level training materials by subsystem developers
  - All students get a copy of training materials

- **Training Opportunities**
  - Microsatellite Technology MASTA 2017 and 2018 (Master Degree)
  - 4 students and 1 faculty member per MS join each summer camp (2017-2018-2019)
  - Subsystem developers provide hands-on training for students
  - Satellite Integrators provide hands-on training on AIT for students

- **Training Costs**
  - APSCO will cover travel and accommodation costs for MS students
  - China will fully support the MASTA students through government scholarships
  - Other MS are encouraged to provide similar opportunities
MASTA Program: Team Pilot Project

- Training the students to put the knowledge and skills into practice.
- Encouraged to be carried out in Team to provide a chance to complete a task with teammates for developing the teamwork spirits.
- Conduct experiments to verify their ideas with the facilities of BUAA-Sat project.
Summer Camp Main Goals

To help students practice satellite development process

To develop team-work spirit among students and MSs

To familiarize students with small satellite design

To review the progress of the project in each MS

To practice international work environment

Summer Camp Programs
## Summer Camp Programs

The following are Summer Camp main Modules:

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The Summer Camp Sequence

1st Summer Camp - 2017
Design and team-work
APSCO & Beihang University

2nd Summer Camp - 2018
Manufacturing and test
APSCO & Middle-East Technical University

3rd Summer Camp - 2019
AIT and operations
APSCO & Shanghai Jiaotong University
First Summer Camp: August 14 - September 2, 2017
Beihang University, Beijing, China

The training covered over 13 topics and was given to nearly 40 students from Member States of APSCO.

1) System Systems Engineering
2) ECSS and CubeSat Mission Design and Engineering Implementation
3) Cube System Design and Verification
4) Structural Design and Analysis of Small Satellite
5) Small Satellite Technical Process
6) Small Satellite Test (Thermal Vacuum, Thermal Balance, Vibration, Magnetic, EMC) and AIT Technology
7) Small Satellite EPS System Design and Test
8) Attitude and Orbit Determination & Control Subsystem of Satellite
9) OBDH & On-board Software
10) Space Program and TT&C network
11) Chinese Launch Vehicle Technology
12) Electrical Power Subsystem Design and Implementation
13) Research & Development of S-band Segment
Second Summer Camp: July 23-August 10, 2018, Middle East Technical University, Ankara, Turkey

This activity concentrated on the micro/nano satellite subsystems (EPS, Tracking & Communications, ADCS, Structure & Mechanism, Thermal Control, etc.), and provided the valuable opportunity of hands-on training.
Third Summer Camp: July 15-August 2, 2019
Shanghai Jiao Tong University (SJTU), Shanghai, China

The third Summer Camp concentrated on the CubeSat assembly, integration, and testing and focused on the ADCS hands-on training.
University Cooperation Framework

✓ Educational Hands-on Projects

- To train students for satellite engineering through hands-on practical training until the flight model is made;

- Universities will be able to
  ✓ Develop their own space education system;
  ✓ Build their own capability to develop small satellites;
  ✓ Build their own payload/subsystem integrated on the satellite(s);
  ✓ Build their own capability to operate satellites and/or process image/data.
Ongoing and Future Activities

- **Second Phase of Student Small Satellite Project**
- **A series of Cubesat Competitions, first one with NPU in November 2019**
- **A series of on-site trainings with model Cubesats and developmental kits**
- **A series of free launch opportunities for the winners provided by CNSA and/or private sector launchers (under negotiation)**
Active Involvement in international space affairs
Peaceful use of outer space
Sharing knowledge and experiences
Collaborative gains with its Member States
Open worldwide to international space communities

THANK YOU