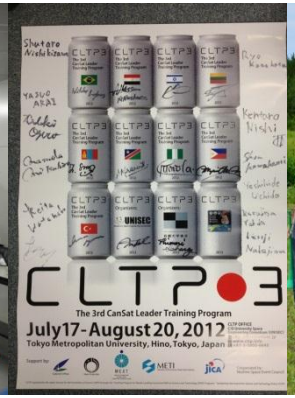


CanSat Leader Training Program (CLTP) Report

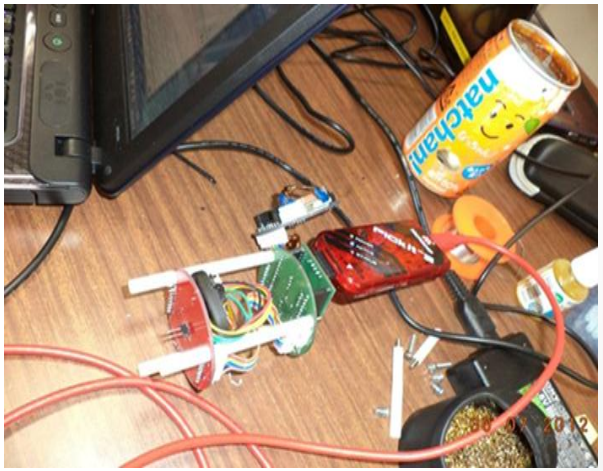
October 12, 2012
UN/Japan Nano-Satellite Symposium

Hironori Sahara
Department of Aerospace Engineering
Tokyo Metropolitan University

Emiko Ando
UNIversity Space Engineering Consortium

What is CanSat?

In November 1988 at the University Space Systems Symposium (USSS) held in Hawaii, Prof. Bob Twiggs (Stanford University Space Development Laboratory) proposed "CanSat" concept.



The CanSat provides an affordable way to acquire the students with the basic knowledge to many challenges in building a satellite. Students will be able to design and build a small electronic payload that can fit inside a soda can. The CanSat is launched into high altitude by rockets, balloons and/or aircrafts; and experiments are performed during descent by parachute, simulating the satellite operations in space. Post launch and recovery data acquisition will allow the students to analyze the cause of success and/or failure.

Cansat Leader
CLTP
Training Program

What is CLTP?

- Established in 2010 to contribute to capacity building in space technology and improve teaching methods based space engineering education
- CLTP provides a training course to experience whole cycle of CanSat development that involves
  - Design , Fabrication, and Launch by a model rocket or a captive balloon
  - Lectures on space engineering and nano-satellite development
- The participants will be expected to make a textbook in their own language for preparing education in their home countries.
- CLTP opened for <u>Academic researchers and educators belong to the University or Research Institute from outside Japan</u>, who wish to learn the hands –on space engineering education methods using CanSat.

History

CLTP1

Date: February 14 -March 20, 2011
Venue: Wakayama University, Japan
Organized by:

Attendee:12 participants from 10 countries (Algeria, Australia, Egypt, Guatemala, Mexico, Nigeria, Peru, Sri Lanka, Turkey, Vietnam)

CLTP2

Date ： November 14-December 14, 2011
Venue ： Department of Aerospace Engineering, Nihon University, Chiba, Japan
Organized by:

Attendee:10 participants from 10 countries (Ghana, Indonesia, Malaysia, Mongolia, Nigeria, Peru, Singapore, Thailand, Turkey, and Vietnam).

YouTube

English (5m30s) | Japanese (5m30s)

CLTP3

Date: July 17 - August 20, 2012
Location: Tokyo Metropolitan University, Hino, Tokyo, Japan
Organizers:

TOKYO METROPOLITAN UNIVERSITY
首都大学東京

UNISEC
University Space Engineering Consortium

Supported by:

- Cabinet Office
- Ministry of Foreign Affairs of Japan
- Ministry of Education, Culture, Sports, Science and Technology
- Ministry of Economy, Trade and Industry
- Japan International Cooperation Agency

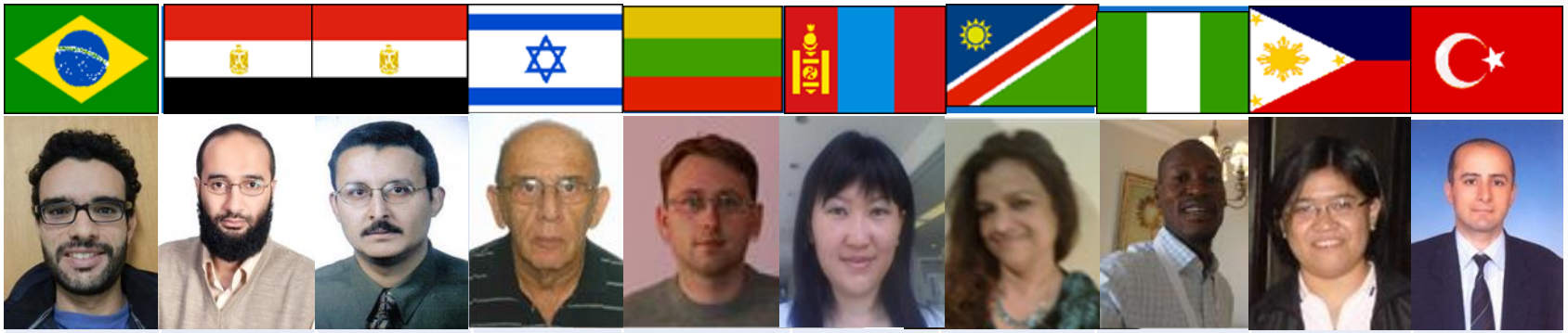
Cooperated by:

Noshiro Space Event Council

CanSat Launch Experiment have been conducted on the occasion of 8th Noshiro Space Event.

CLTP3 Attendee:

10 participants from 9 countries (Brazil, Egypt, Israel, Lithuania, Mongolia, Namibia, Nigeria, The Philippines and Turkey). They formed 3 teams.



Wilder Bezerra Lopes	Ahmed Elfiky	Ayman Kassem	Michael Luft	Raimondas Pomarnacki	Suvdant-setseg Balt	Smita Francis	Taiwo Raphael Tejumola	Ma. Rosario Concep-cion Ortiz Ang	Cuma Yarim
Univ of Sao Paulo	Cairo Univ	Cairo Univ	Herzliya Space Lab	Vilnius Gediminas Technical Univ	Keio Univ	Polytech-nic of Namibia	National Space Research and Develop ment Agency (NASRDA)	University of the Philippines	Istanbul Technical Univ

Sahara Laboratory
Tokyo Metropolitan University

Tokyo Metropolitan University
Department of Aerospace Engineering

CLTP3 Support Members LIST

Hironori SAHARA (Associate Professor) [Supervisor]

Winston Churchill says "Success consists of going from failure to failure without loss of enthusiasm." It is very applicable to what we engineers do.

Masachika A. KIJIMA (Assistant Professor) [Assistant]

This is gonna be an event to remember!!

Yasuo ARAI (1st year of M.E.) [Support Member]

I'm honored to have a chance to participate in CLTP3.
Let's make CLTP3 better together!(^o^)

Ryo KAWAHATA (1st year of M.E.) [Support Member]

We cannot teach a man anything; we can only help him to find it within himself.

Shutaro NISHIKIZAWA (1st year of M.E.) [Support Member]

Hello. I'd like to see you soon and develop the CanSat together!
Let's have a good time in CLTP3!

Mitsuhiro MASUDA (1st year of M.E.) [Support Member]

I'll do my best effort and enjoy such a wonderful event. CLTP3!

Keita WATANABE (1st year of M.E.) [Support Member]

Hi. I'm looking forward to seeing you, all the CLTP3 participants.
Let's enjoy developing the CanSat!

Takehiro OHIRA (Senior Student) [Support Member]

I hope we all make skill up together through making CanSat.
Let's talk a lot with us. I'd like to see you soon!!

Hideki OGURO (Senior Student) [Support Member]

Hello. I'm really happy to have a chance of making CanSat together.
Let us have a good time in Japan. I can't wait for CLTP3!!

Sho KAWAKAMI (Senior Student) [Support Member]

The more I learn, the more I realize I don't know.
The more I realize I don't know, the more I want to learn.

Kenji NAKAJIMA (Senior Student) [Support Member]

I'm glad to participate in CLTP3 and meet you. Let us enjoy learning about CanSat and making it. I hope you'll have a good time!!

Kentaro NISHI (Senior Student) [Support Member]

I'm looking forward to seeing you.
Let's have good days in CLTP3!

Ryosuke ISHII (2nd year of M.E.) [Adviser]

I'm glad to have a chance to see you, and to study aerospace technology with you. Let's enjoy the life in Japan.

Yoshihide UCHIDA (2nd year of M.E.) [Adviser]

I'm looking forward to meeting you all!
Let's enjoy CLTP3!!

Kazuhisa YOODA (2nd year of M.E.) [Adviser]

I would appreciate it if you enjoy both CanSat development and everyday in Japan. I expect you feel close to educational space engineering with us.

Yusuke WAKABAYASHI (2nd year of M.E.) [Adviser]

Hi, welcome to our Tokyo Metropolitan university.
Let's enjoy everything!

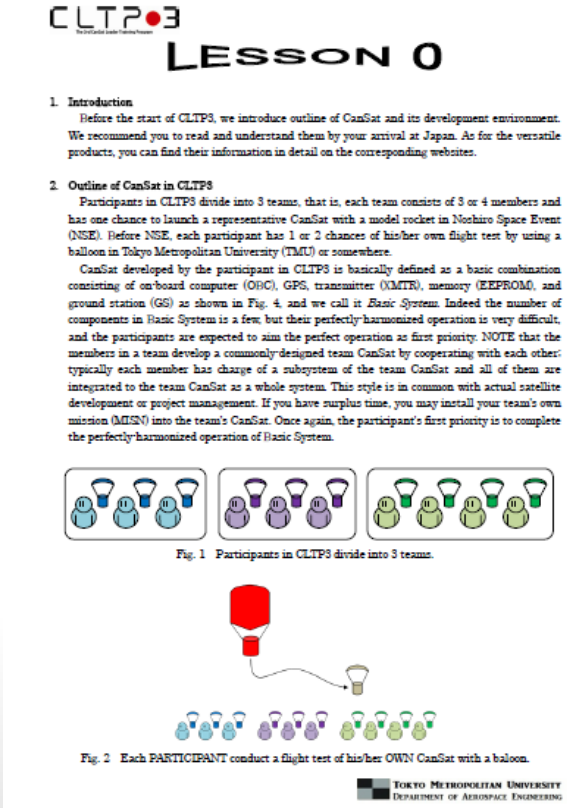
Special Lecture for International Understanding for TMU students conducted by UNISEC (May 11)

Schedule of CLTP3-Overview

Period	Contents
Before CLTP3	◆ Distribution text namely **"Lesson 0"** which introduced the Outline of CanSat, its development of environment, basic electronics and tools for CanSat development ◆ CLTP3 Briefing (Jul.16)
First Week Jul 17-21	◆ Inauguration Ceremony(Jul.17) ◆ CLTP Basic Course – Lecture Series #1-5
Second Week Jul 22-28	◆ Akihabara Tour and the 10th UNISEC General Assembly (Jul. 22) ◆ CLTP Basic Course – Lecture Series #6-10 ◆ Group work on fabrication of an electric circuit system and discussion about CanSat mission
Third Week Jul 29-Aug 4	◆ Fabrication and testing of FM of CanSat ◆ Documents making
Fourth Week Aug 5-11	◆ Field Test of CanSat by Balloon (Aug.10) ◆ Post launch meeting
Fifth Week Aug 12-20	◆ Field Test of CanSat by Model rocket on the occasion of the 8th Noshiro Space Event held in Akita, Japan

Schedule of CLTP3-Before CLTP3

Period	Contents
Before CLTP3	Text distribution namely **"Lesson 0"** which introduced the Outline of CanSat, its development of environment, basic electronics and tools for CanSat development



CLTP3

LESSON 0

1. Introduction

Before the start of CLTP3, we introduce outline of CanSat and its development environment. We recommend you to read and understand them by your arrival at Japan. As for the versatile products, you can find their information in detail on the corresponding websites.

2. Outline of CanSat in CLTP3

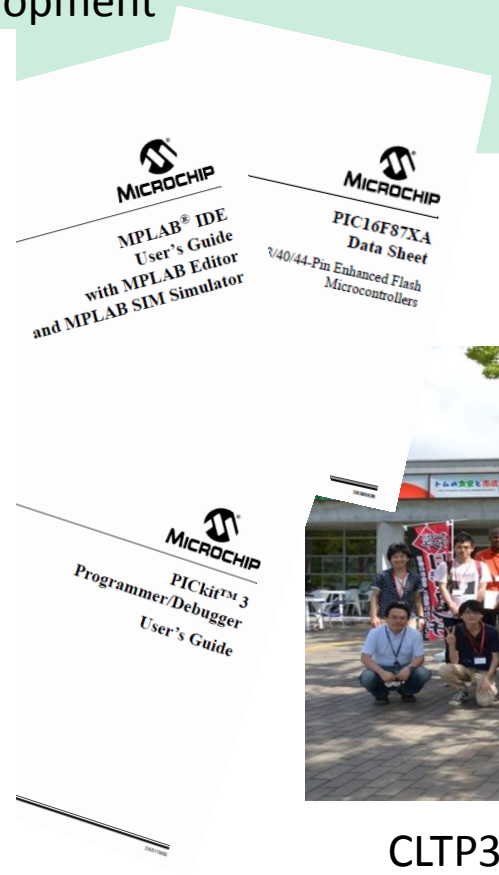
Participants in CLTP3 divide into 3 teams, that is, each team consists of 3 or 4 members and has one chance to launch a representative CanSat with a model rocket in Noshiro Space Event (NSE). Before NSE, each participant has 1 or 2 chances of his/her own flight test by using a balloon in Tokyo Metropolitan University (TMU) or somewhere.

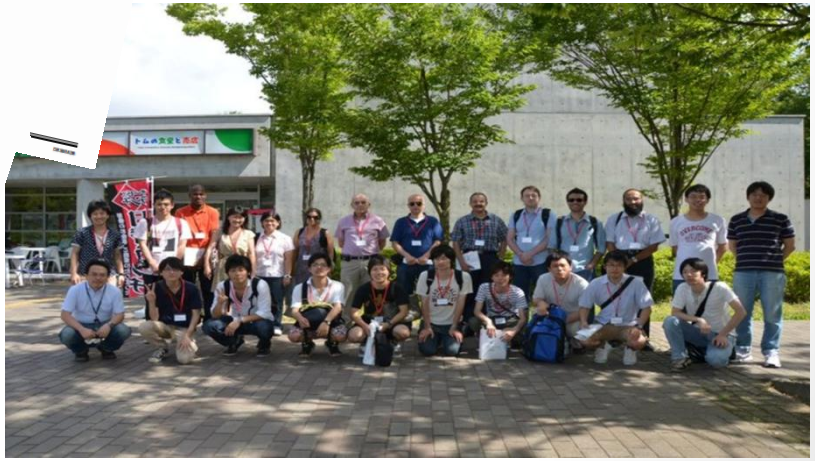
CanSat developed by the participant in CLTP3 is basically defined as a basic combination consisting of on-board computer (OBC), GPS, transmitter (XMTR), memory (EEPROM), and ground station (GS) as shown in Fig. 4, and we call it *Basic System*. Indeed the number of components in Basic System is a few, but their perfectly-harmonized operation is very difficult, and the participants are expected to aim the perfect operation as first priority. NOTE that the members in a team develop a commonly-designed team CanSat by cooperating with each other: typically each member has charge of a subsystem of the team CanSat and all of them are integrated to the team CanSat as a whole system. This style is in common with actual satellite development or project management. If you have surplus time, you may install your team's own mission (MISN) into the team's CanSat. Once again, the participant's first priority is to complete the perfectly-harmonized operation of Basic System.

Fig. 1 Participants in CLTP3 divide into 3 teams.

Fig. 2 Each PARTICIPANT conduct a flight test of his/her OWN CanSat with a baloon.

Tokyo Metropolitan University
Department of Aerospace Engineering

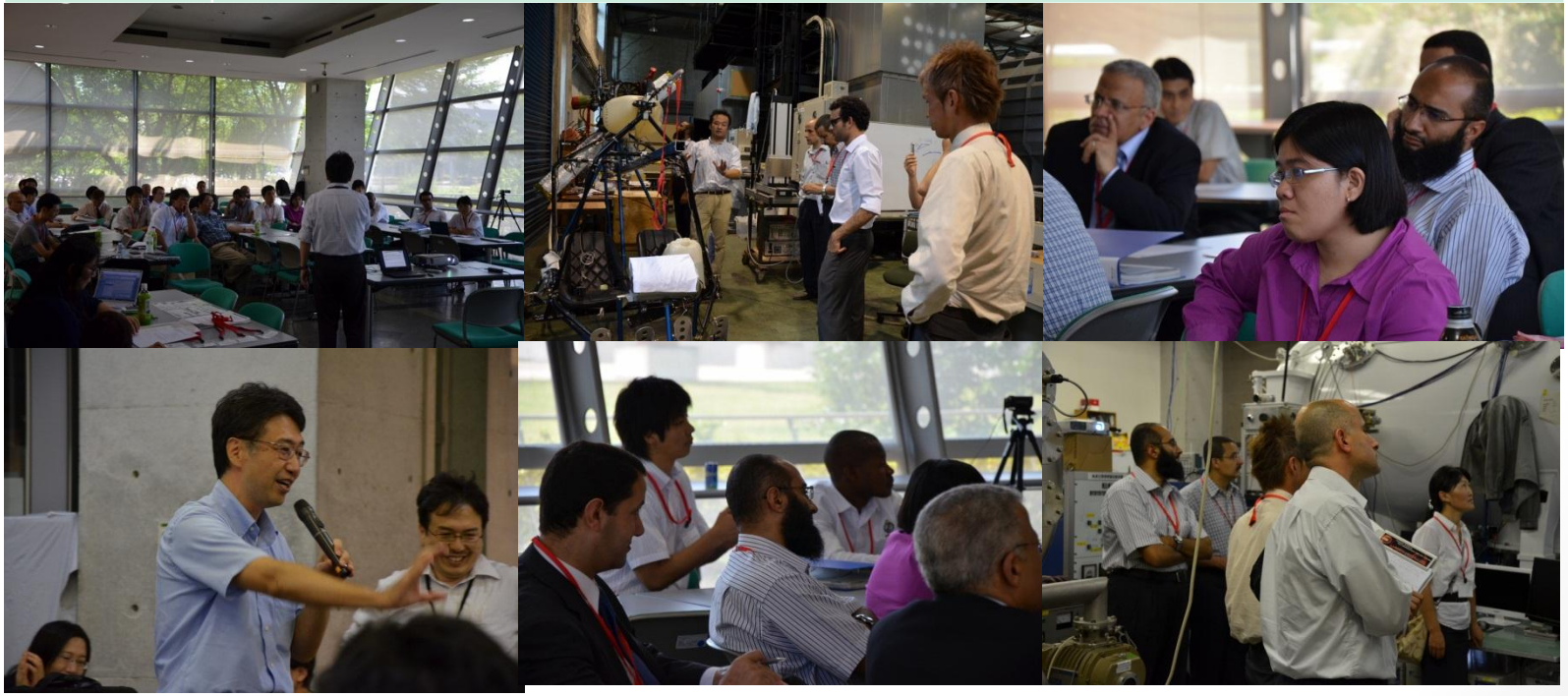




CLTP3 Briefing at TMU (Jul 16)

Schedule of CLTP3-First Week

Period	Contents
First Week Jul 17-21	◆ Inauguration Ceremony (Jul.17)



Schedule of CLTP3-First Week

Period	Contents
First Week Jul 17-21	◆ CLTP Basic Course – Lecture Series #1-5 (Jul.17-20) 1.Introduction to and Overview of CANSAT 2.CANSAT System and Subsystems and Preparation before CANSAT Development Shinichi Nakasuka, The University of Tokyo Tuesday July 17 9:00~12:00 3.Mission Subsystem Hironori Sahara, Tokyo Metropolitan University Wednesday July 18 9:00～10:30 4. Structure and Accessary Devices Hiraku Sakamoto, Tokyo Institute of Technology Thursday July 19 9:00～10:30 5.How to Organize the Project and Design Reviews Seiko Shirasaka of KEIO University Friday July 20 9:00～10:30

Schedule of CLTP3-Second Week

Period	Contents
Second Week Jul 22-28	◆ Akihabara Tour and the 10th UNISEC General Assembly (Jul. 22)

◆ CLTP Basic Course – Lecture Series #6-10 (Jul.23-27)

6.RF Communication Subsystem and Ground Station System

Seiji Kuroki, Professor Emeritus, Soka University

Monday July 23 13:00～14:30

7.Sensors and Actuators

Masahiko Yamazaki, Nihon University

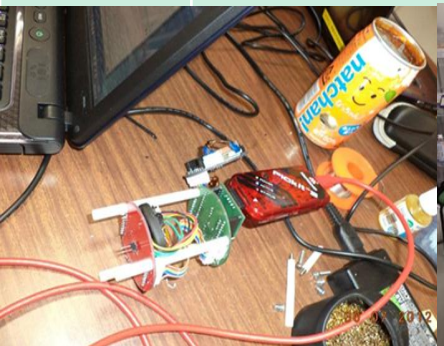
Tuesday July 24 9:00～10:30

Schedule of CLTP3-Second Week

Period	Contents
Second Week Jul 22-28	8.Command and Data Handling (C & DH) subsystem and Power System Shinichi Kimura, Tokyo University of Science Wednesday July 25 9:00～10:30 9. Ground Test and How to Feedback Yasuyuki Miyazaki, Nihon University Thursday July 26 9:00～10:30 10.Ground- Field Test and Safety Standards Hiroshi Hirayama, Kyushu University Friday July 27 9:00～10:30

Schedule of CLTP3-Second Week

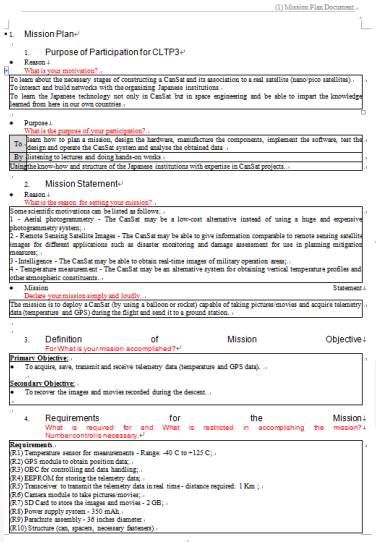
Period	Contents
Second Week Jul 22-28	◆ Group work on fabrication of an electric circuit system and discussion about CanSat mission **Tasks to participants by Dr. Sahara are …** - Communication with XBee on PC, Let's try to communicate with each other via Xbee - GPS experiment on PC, Let's see your path with positioning. - XBee adapter fabrication - TOP board fabrication - GPS connector change to the one of EH style - Harness between TOP and MDL fabrication - Then, completion of PIC board needing soldering of surface-mount package. Then, your CanSat will be completed as for



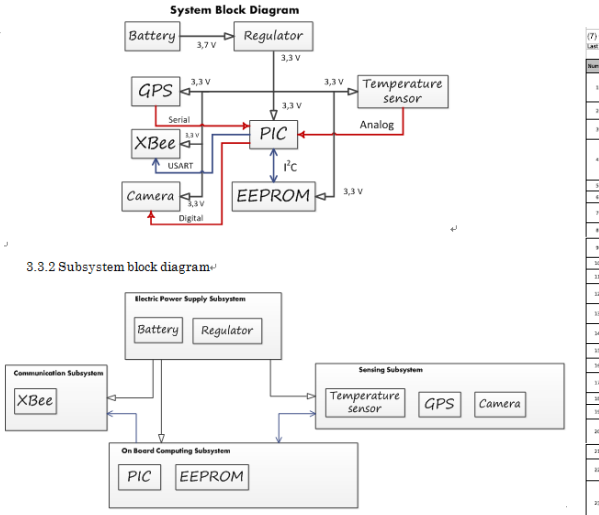
Schedule of CLTP3-Third Week

Period	Contents
Third Week Jul 29-Aug 4	◆ Fabrication and testing of FM of CanSat ◆ Documents making by team in order to share an awareness of the development of a system and confirm soundness of the system

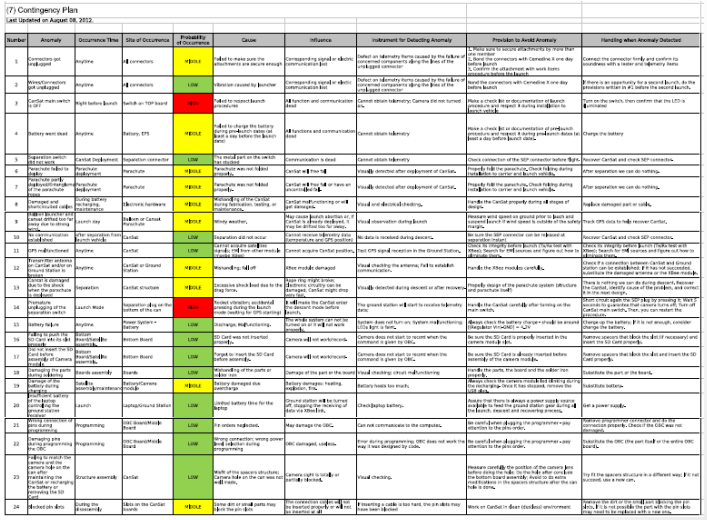
Documents created by CLTP3 participants



Mission Plan



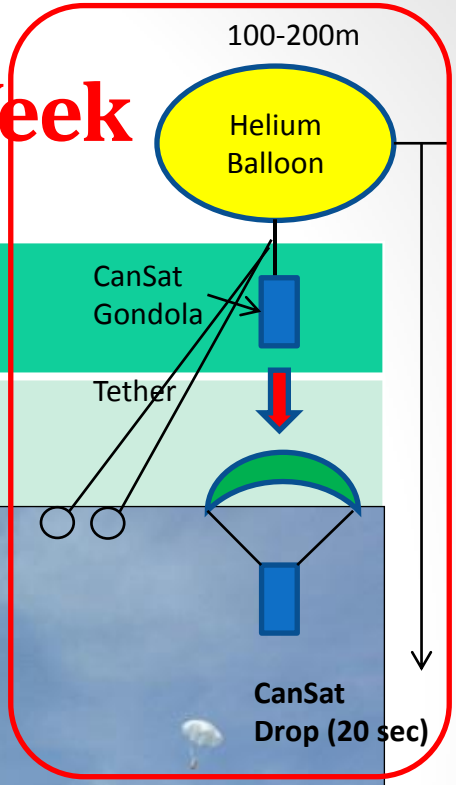
Contingency Plan

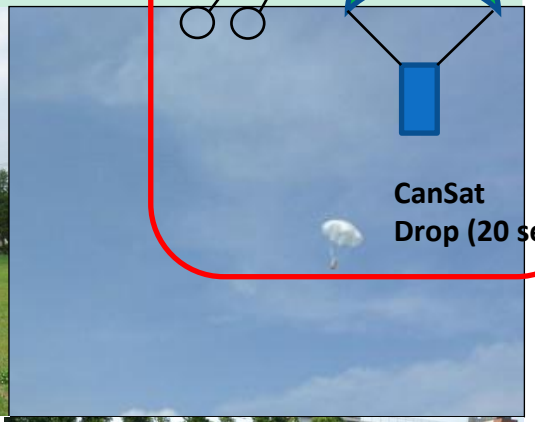


System Specification

Schedule of CLTP3-Fourth Week

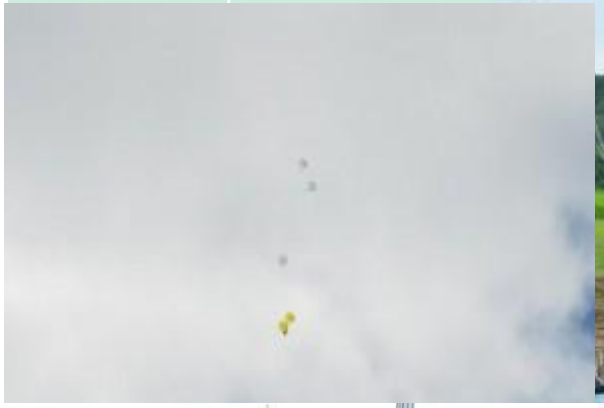
Period	Contents
Fourth Week	◆ Field Test of CanSat by Balloon (Aug.10) ◆ Post launch meeting

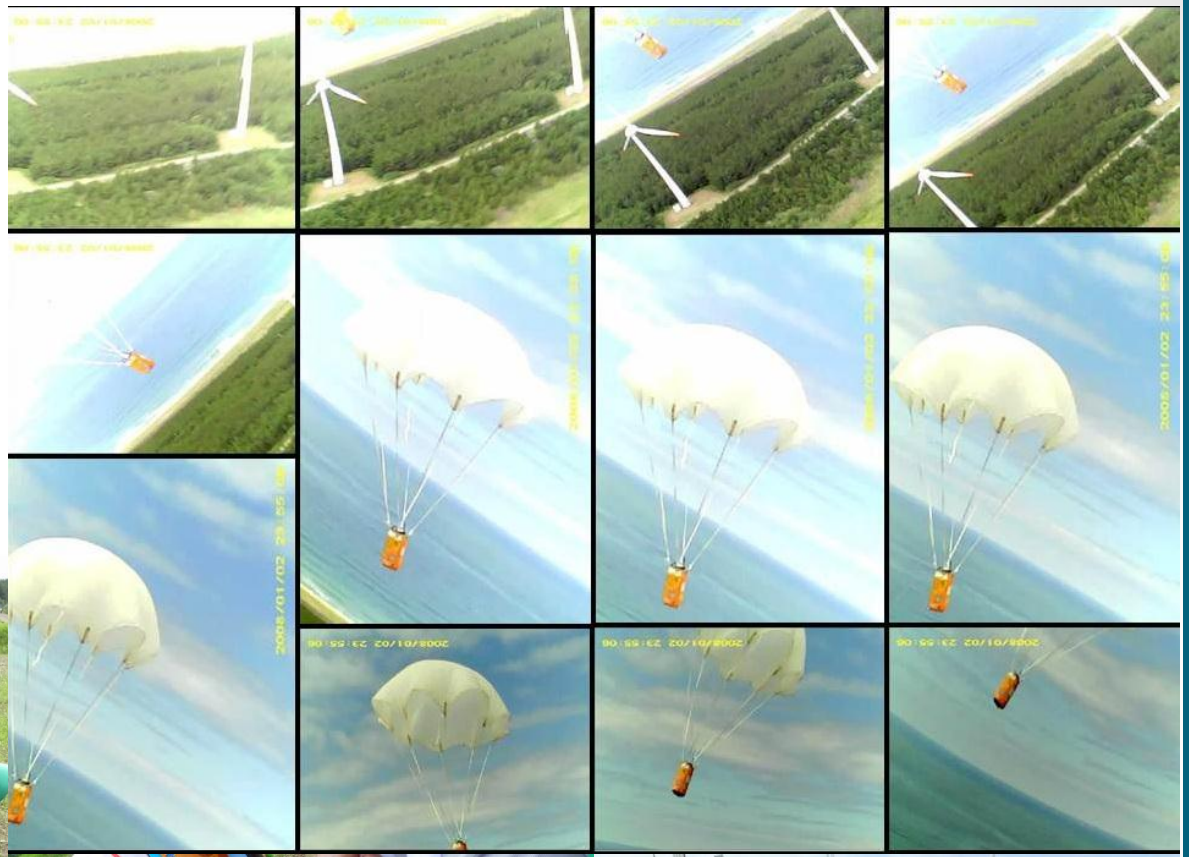




Schedule of CLTP3-Fifth Week

Period	Contents
Fifth Week Aug 12-20	◆ Field Test of CanSat by Model rocket on the occasion of the 8th Noshiro Space Event held in Akita, Japan





Japanese Culture Program – Tea Ceremony
kindly organized by citizen volunteers

Awarding Ceremony
on the occasion of The 8th Noshiro Space Event

Certificate of Completion

Certificate of Completion

CLTP3

The 3rd CanSat Leader Training Program

This Certificate is awarded to

Cuma Yarim

has successfully completed the course of the 3rd CanSat Leader Training Program (CLTP3)

Tokyo Metropolitan University, Hino, Tokyo, Japan

17th July to 20th August 2012

Harunori Nagata
President of UNISEC and Professor,
Division of Mechanical and Space Engineering
Graduate School of Engineering
Hokkaido University

Hironori Sahara
CLTP3 Supervisor and Associate Professor,
Department of Aerospace Engineering
Tokyo Metropolitan University

UNISEC

首都大学東京

Shinichi Nakasuka
Program Director of CLTP and Professor,
School of Engineering Department of Aeronautics and Astronautics,
University of Tokyo

Comments on CLTP3 and Vision for future by participants

Brazil

The following topics give an overview of the future activities I am willing to implement:
1 – Organize workshops in my university to spread the knowledge about the CanSat program;
2 – Attract students (grad and undergrad) from several engineering course (mostly electrical and mechanical) to start teams focused on develop their own CanSats from scratch;
3 – Set up an internal competition in the engineering school of USP;
4 – Gather people to form teams to the international competitions.

Egypt

I plan to contribute to CanSat Training Programs (CTP's) in my country.
I hope I and my students could develop new ideas for the CanSat.

I hope this program grow further to making Cube-sat.
This could be the second level for successful participants of Can-Sat.

Israel

I hope I will be able to run such a program in Israel.

Lithuania

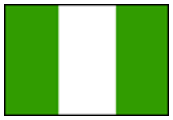
Establish some sort of UNISEC in Lithuania and propagate space engineering for students who's studying electronic and electrical Engineering;
Making CanSat and Open class competitions in Lithuania and participate in foreign country competitions; and
Extend Avionic study program implementing space engineering subjects

Mongolia

I want to learn more features to develop my Cansat and also to educate more number of capacities from my country to support national space education development program, studies, practical activities and scientific research centers. Final vision to be launched Mongolian satellite if possible in near future. And also to develop capacity of the Mongolian university students in satellite technology by conducting similar training and mentor students to participate in local, national and international projects.

Namibia

I am looking forward to promoting and capacity building Space engineering, and Space technology applications in Namibia. Encourage my students to participate in international competitions and setting up UNISEC _NAMIBIA.



Nigeria

To add more features to my Cansat and participate in the Nigerian homemade satellite to be launched in Nigeria by 2030.
To develop capacity of the Nigerian University students in satellite technology by conducting similar training in Nigeria and mentor the students to participate in international projects.

The Philippines

My vision is to use CanSat as a starting point to build the capacity of the Philippines in space engineering especially micro/nano satellite development.

Turkey

I am planning to extend the information and experience I gained in the program both to our students and in the near future to the highschool science teachers and students in order to increase the awareness on space technology in the public

Activities of alumni after completing CLTP

These are the Alumni's **activities** after returning to their home countries.

Activity Progress Report from Egypt (May 2012)

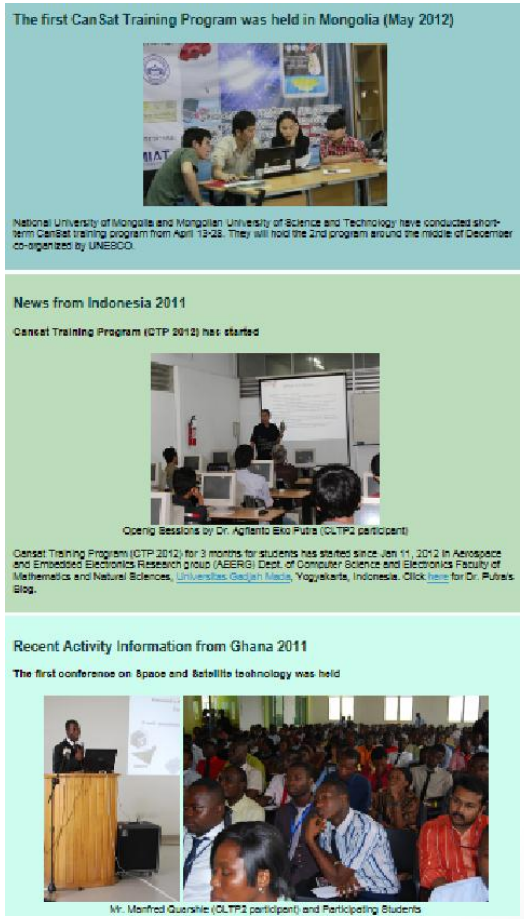
CanSat Training Seminar and lectures have been held by Cairo University, Egypt as below.

CTP1: First CanSat Training Program July 20 – 1 August 1, 2011

EED: Egyptian Engineering Day, First Place Award for the Best Mechanical Engineering Project, September 6-8, 2011

CTP2: Second CanSat Training Program Jan 25– February 5, 2012

Through Dr. Khalil's efforts, the CTP2 students (2nd CanSat Training Program in Egypt) won the first place of famous student competition during a research conference in Egypt organized by the American University in Cairo and titled "Entrepreneurship and Innovation: Shaping the Future of Egypt". The paper title was "National e -commerce Rescue from Internet-cut off crisis using Nano-satellite Constellation".



The first CanSat Training Program was held in Mongolia (May 2012)

National University of Mongolia and Mongolian University of Science and Technology have conducted short-term CanSat training program from April 13-28. They will hold the 2nd program around the middle of December co-organized by UNESCO.

News from Indonesia 2011

Cansat Training Program (CTP 2012) has started

Opening Sessions by Dr. Agfianto Eko Putra (CLTP2 participant)

Cansat Training Program (CTP 2012) for 3 months for students has started since Jan 11, 2012 in Aerospace and Embedded Electronics Research group (AEERG) Dept. of Computer Science and Electronics Faculty of Mathematics and Natural Sciences, Universitas Gadjah Mada, Yogyakarta, Indonesia. Click here for Dr. Putra's Blog.

Recent Activity Information from Ghana 2011

The first conference on Space and Satellite technology was held

Mr. Manfred Quarshie (CLTP2 participant) and Participating Students

http://www.cltp.info/activities.html

CLTP4 First Announcement

Further Information including ***Participation Fees and Application Submission details*** will be available on the 2nd announcement to be made soon.

Thank you very much!

Please follow and join us!

https://twitter.com/#!/CLTP_Office

http://www.facebook.com/pages/CLTP/333187893370245

http://www.youtube.com/user/CLTPOFFICE

Cansat Leader Training Program
www.cltp.info

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(Please replace [at] to @)