Expand Locally and Globally

University Space Engineering Consortium

Rei Kawashima

The Beginning of My Journey

Life is like a journey. It seems that my life has been guided by something. I appreciate where I am and I look forward to seeing where I am going in the future.

I am currently involved in the University Space Engineering Consortium (UNISEC), an organization that aims at facilitating and supporting student space projects at the university level. Japanese students have started satellite projects in 1999, and have completed them in the last few years, and four satellites have already been launched into orbit successfully. It was a great pleasure to share such an impressive moment to hear the first Acquisition of Signal (AOS) with the students. My aspiration to share such a tremendous moment with many others led me to publishing two books to introduce their activities.

In a journey, things that you never thought of often happen. I had nothing to do with space development, not to mention satellite communications, when I studied Chinese literature at university. What connected me to space is a question that I was asked in an English conversation class, “Do you think that World War III will happen or not?” In the class, students had to answer the question yes or no and to give reasons. My answer was “Absolutely not.” The reason I gave was, “Human beings have learned enough through painful experiences in two world wars.” The teacher said, “You are so naïve!” The Canadian teacher who studied political science in London took a part-time job as English teacher while he did research at the University of Tokyo.

His comment made me happy because I did not realize “naïve” means “ignorant of the world.” By the end of the lesson, I came to believe that WWIII will certainly happen as he explained dangerous situations and strained relations among nations. When this idea made me feel extremely uneasy and uncomfortable, I suddenly got inspired. Although I could not give a logical explanation, the idea that “space could contribute to preventing war” came to me. As the teacher said, I was a naïve thinker. I thought that I would have to work in the space field. Since then, I have been struggling to seek a new way in my life, giving up my old life that seemed to be going well.

Although I understand that it has been historically observed that military and space were closely related to each other in many places of the world, I still believe that “having a viewpoint

of space" is necessary to create a peaceful world. I still keep this belief, whatever I am told. In my "naïve" way of thinking, war happens because people cannot consider alternative ways to get something other than fighting when they have shortsighted viewpoints. If they see things from a distance, their broad horizon might make them think in a different way. They may have a chance to rethink if war is worth such a price. If people can see the earth and themselves from space, I think that their way of thinking may change, which will lead to another change towards a better future. I am working every day on the basis of such belief.

My journey for seeking a viewpoint from space

I consider myself a lucky woman who was given many fortunate opportunities to meet wonderful people. For example, I met Dr. Mamoru Mohri before I went to Florida to watch the Space Shuttle launch in September 1992, when he flew as one of astronauts on board. I coincidently worked for a company where three Japanese astronauts, Dr. Mamoru Mohri, Dr. Chiaki Naito (Mukai), and Dr. Takao Doi, took English lessons. The section which I worked for was not very busy, and I was given a position to take care of their lessons as coordinator. I arranged classrooms, lunch, etc to support their lessons. I enjoyed talking with Dr. Mohri about Hokkaido University from which he and I had both graduated. However, giving me such a position was like casting pearls before swine because I did not pay much attention to space at that time.

I had been seeking a place where I could learn about space since I had gotten the sudden inspiration that "space is important and I have to work in space field," when I heard that the International Space University (ISU) had decided to establish a permanent campus in Strasbourg, France on a radio program on Voice of America, which I was listening to for improving my listening comprehension of English. I decided to ask for leave of absence to participate in a Summer Session Program held in Barcelona in 1994. Then, I went to France to take the Master course in 1995-1996. As I studied space development from many different points of view, though, I became aware of the problems and difficulties in the space field. After coming back to Japan, I started to learn future studies with the purpose to consider how the problems in the space field can be solved. Working voluntarily for the Millennium Project coordinated by the American Council for the United Nations University, joining the World Future Society, and participating in future-oriented workshops and conferences helped me broaden my outlook.

In 1999, I came to a turning point in my life. The Space Generation Forum organized by young people was planned as a part of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space held in Vienna. A friend of mine at ISU was involved in the organizing committee as he worked for United Nations at that time. Sister conferences were about to be organized in each country, and I voluntarily took responsibility to organize it

because he said that nobody took care of it in Japan. The theme that we chose in the sister conference was space education, and one of the participants introduced Prof. Nakasuka of the University of Tokyo (UT). It was also in 1999 when the first CanSats made by students of UT and Tokyo Institute of Technology (Titech) were launched. I intuitively thought that their activities may have the possibility to open a door to a new world in the future. After two years, I started to work for the launch of a new organization called the University Satellite Consortium (UNISAT), the predecessor of UNISEC, in 2001.

Background of UNISEC

In April 2002, two organizations "UNISAT" and "Hybrid rocket group" merged and obtained corporate status for more effective and sustainable activities. The purpose of UNISEC is to facilitate and promote practical space development activities in universities and colleges, such as small satellites and hybrid rockets. About 30 universities and colleges currently participate in the activities.

UNISEC is the acronym for University Space Engineering Consortium, but we also mean “one- second (uni-sec)” because success or failure in rocket launch and satellite deployment is clear in a mere instant. No matter how many years the preparation goes on, the result is determined in one second. Therefore success in practical space project brings the participants tremendously condensed joy and sense of achievement.

Three main objectives of UNISEC are: 1) space engineering education and human resource development, 2) technological development, and 3) outreach to bridge space development and the general public.

In education and human resource development, output should be considered in order to make decisions with integrity. Clear values will help us to make appropriate decisions because we can go back to core values if necessary. UNISEC suggests six qualities: Uniqueness, Never-give-up-spirits, Innovation, Sincerity, Energetic and Challenging minds. The acronym of these six qualities is also UNISEC.

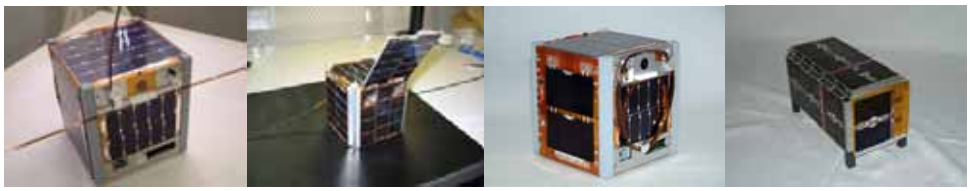
Student Satellite Projects – CanSat and CubeSat

CanSat

Let’s briefly describe student satellite projects: CanSat and CubeSat in Japan. The concept of CanSat project was introduced by Professor Twiggs of Stanford University, in the University Space Systems Symposium (USSS). He suggested a project to make coke-can sized satellites and

launch them into orbit. In the beginning, CanSats were planned to be launched into space, but it was difficult to find a launch slot for piggyback. Then, Professor Twiggs changed his approach and decided to use amateur rockets in cooperation with the Association of Experimental Rocketry of the Pacific (AEROPAC). They hold gatherings for launching hand-made rockets as a hobby in Black Rock desert in Nevada several times in a year. The rockets are launched up to 4-5 kilometers. Prof. Twiggs thought that it could be meaningful for students to launch satellites to communicate with them, and to analyze the results even though satellites would not go to space. It takes approximately 20 minutes for CanSats deployed at the altitude of 4 kilometers to come down to the ground. Students can make various experiments such as communications, GPS, sensors, etc. Although it was just an alternative solution for piggyback launches, we found it definitely meaningful and suitable for entry level training for satellite experiments. There is no way to know what happened in the case of failure in communication when satellites go to space, whereas it is possible to examine the reasons for failure in the experiments when students can recover the satellites on the ground.

In 1999, only two universities (UT and Titech) participated in the CanSat experiment, but more universities (Tohoku University, Kyushu University, Nihon University, Soka University, etc) now participate. In 2006, the experiments will be held in September. Every year, students' excitement of receiving signals from their hand-made satellite can be observed.



(CubeSat: from left to right, XI-IV of UT, CUTE-I of Titech, XI-V of UT, Cute1.7 of Titech)

CubeSat is a 10-centimeter cubic satellite. Four CubeSats made by UT and Titech were successfully launched and are in operation already. It can be said that the quality of satellites made by Japanese students is remarkable.

XI-IV made by UT and Cute-I made by Titech were launched from Plesetsk Space Center, Russia, on July 30th, 2003. I was fortunate to be with the students at UT, and I cannot forget how impressive it was to receive signals from CubeSat. XI-V (UT) was launched from Russia in October 2005, and Cute1.7 (Titech) was launched from Uchinoura, Kagoshima, Japan.

What was amazing with the student projects is their creativity and capability that makes it possible for them to achieve their mission beyond 100%. Students in Nakasuka Lab of UT got an idea, worked, and realized an earth image distribution service using images sent by CubeSat XI-IV. Subscribers receive earth images and "XI's monologue" written by students via the Internet and mobile phone.

(http://www.space.t.u-tokyo.ac.jp/ximail/index.html)

Earth image taken by XI-IV

Such a big success in university satellite projects has motivated other universities to develop their own hand-made satellites. SEEDS (CubeSat) made by students in Nihon University completed shipment, and it is waiting for launch. HITSAT (CubeSat) made by Hokkaido Institute of Technology, Hokkaido University and local private company is in the process of completing the flight model aiming for launching within this year.

Future Visions– Expand locally and globally

At the end, let us share our future perspectives on student satellite projects. I think that it will expand in two different directions. I do not emphasize direction of technical improvement, because the direction tells its own fate.

The first direction is to "expand locally." A university will function as a center of local space projects. A few universities already have declared their bids for launching local satellites, such as Taiki (Hokkaido-satellite), QTEX (Kyushu), and Kagawa Sat. As a university exists as the "lamp of learning" in the local community, it is suitable for a university to coordinate local people and companies. A new type of space development in collaboration with the local economy is expected. It is a good coincidence that JAXA announced then to provide launch opportunities for small satellites using the H2A rocket.

The second direction is to "expand globally." International Ground Station Network is about to be established. Regarding this project, the 1st International Workshop on Ground Station Network will be held in Tokyo on July 18 and 19, 2006. Through the workshop, network systems will be constructed, which will make satellite operation more effective.

I am pleased to imagine that university students all over the world will jump with deep emotion when they hear a voice from their hand-made satellites. At the unforgettable moment upon receiving a signal, one student said that he felt impressed "as if tears were coming from each cell in his whole body." I believe that facilitating young people to experience such glorious moment leads us along a narrow path to a better future.

URL of UNISEC: http://www.unisec.jp/