

International Symposium on Space Technology and Science (ISTS) 2009

Abstract

International Space Technology and Science Symposium in Japan has started way back since 1959 and historically been held once every two years to present, discuss, and tackle the problems of respective periods from academic and engineering aspects. This year, the 27th ISTS celebrated the 50th anniversary and was dedicated to review the space activities in the last 50 years and to view those in the next 50 years. It was attended by various space engineers, scientists, policy maker, business leaders, as well as university and high school students to learn from each other the development and achievements in space technology. Many topics were presented; a few eye-catching such as small satellites, formation flight control, space elevator and space tourism. Nanotechnology's important role is recognized especially in the development of space elevator, for example carbon nanotubes are considered to be the most applicable material for the elevator ribbon. Nanotechnology also contributes significantly in the fabrication of components assembled for the small satellites.

ISTS 2009, held on 5 – 12 July 2009 in Tsukuba City, Japan and sponsored by the Japan Aerospace Exploration Agency (JAXA), was the 27th symposium to encourage the specialists of space engineering, space science, space medical and space law to exchange information and promote space related activities through presentation, exhibition, and panel discussion. At the same time, ISTS 2009 celebrated its 50th anniversary since the first symposium held in 1959 in Tokyo Japan and therefore was themed with "Toward the Next 50 Years".

The symposium drew over 470 technical papers and it covered not only the technical presentations, but also special programs and events such as panel discussion on innovating ISTS towards the future and 50th anniversary keynote speech, reception and award presentation. It also exhibited the latest results of space-related R&D and business activities from 17 prominent Japanese organizations/companies/universities working on space technology and science. In addition, a technical tour was also arranged for visitors to find out more in details the activities and facilities available in JAXA.

Various space-related topics were presented over the five-day symposium such as surface exploration, international space station, earth observation, lunar exploration, electric propulsion system, thruster and detonation engines, small satellites, mission design, attitude maneuver and orbit control,

formation flight, satellite communication and broadcasting, materials characterization, space debris, liquid solid and hybrid rockets, space tourism, space elevator, and many other interesting topics. It also covered panel discussions on space solar power systems, international cooperation in Asia Pacific region and space contribution to the Earth's sustainability.

Being a beginner in space technology and science, I found myself learning very much about the advancement of technology being developed, applied and achieved for space applications. One in particular is space elevator, which is another form of space transportation enabling safer and lower cost system than chemical rockets that are currently in the mainstream. It was mentioned that once upon a time (pre-2000), space elevator was science fiction simply because there was no known ribbon materials that were strong enough to build it as its concept outlines the hanging of a ribbon in space and reaching down to Earth, while a vehicle that climbs up or down is attached to the ribbon. However, the discovery of carbon nanotubes in the 90's changed the destiny of space elevator, as it potentially provides the necessary strength and weight required in space elevator concept.

On slightly different approach, the Japanese are now developing their own space vehicle, referred as space train. It differs with the space elevator concept mainly on the power delivery methods and climbing mechanism. Space train concept involves the use of cable, made of carbon nanotubes with high strength and high conductivity, as powered rail equipped with counter lightning features. It also involves the use of solar power as much as possible as it will be the primary energy source from the altitude of 10-100 km upwards. It was estimated that the weight of the whole system will only be about 20-40 tonnes and Earth Track Corporation – Japan, spin-off company that is developing the space train, estimated that it will be ready for commercialization in 2030.

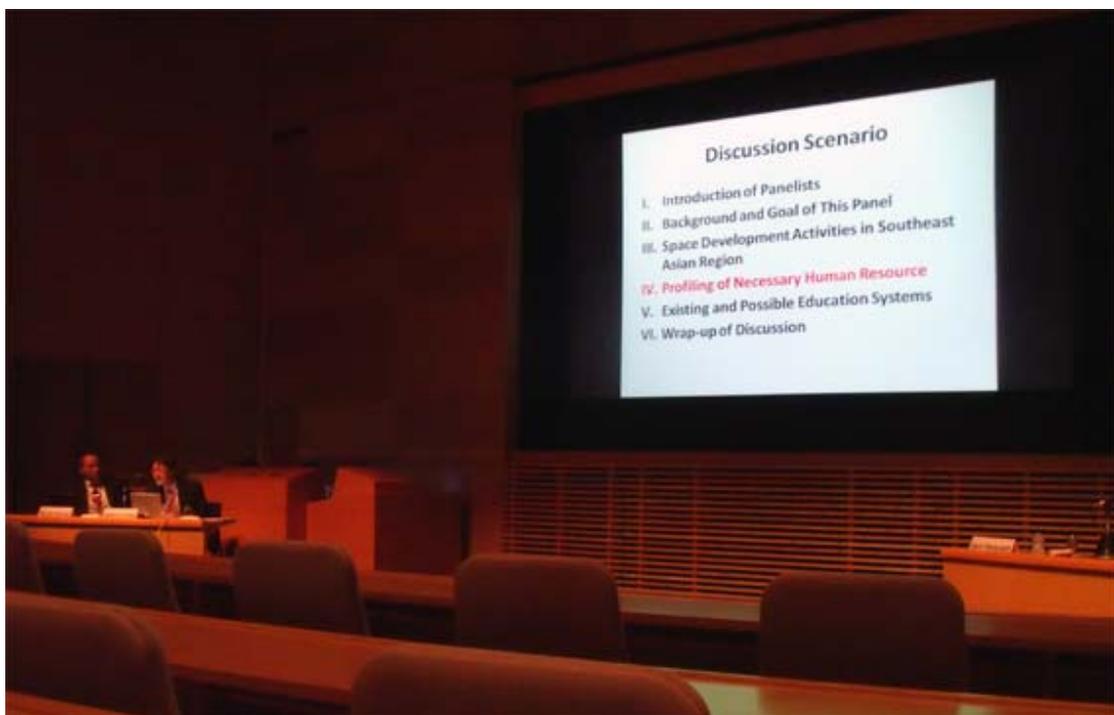
It was also interesting to learn the enthusiasm from Asian countries in space technology development, for example Indonesia acknowledged and recognized the importance of education on basic space technology. The experience of small satellite development is also recognized to be very useful and efficient to foster young space engineers. In the same way, Vietnam is also striving to self-educate aerospace engineers, self-manufacture hardware and software, and to master the manufacture technology of ground station, small satellite technology. Small satellites including micro/nanosatellites, of which components fabricated by micro/nanotechnology, seem to be in the trend now for the near future form of satellites, since similar capability but at lower cost can be expected.

Lastly, space tourism is another emerging trend that was discussed in one full session. In conclusion, Asian countries have shown their enthusiasm in developing space technology, especially small

satellites, and space education for manpower development. Nanotechnology plays its role in enabling the fabrication of micro/nanosatellites as well as the development of space vehicles, including space elevator and space train.



The National Space Program Presentation



Panel discussion on International Cooperation in Asia Pacific Region



Rocket Display by the Mitsubishi Heavy Industries, Ltd.