

Satellite Communications and I

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I had participated in the launch of the satellite in the JAXA Uchinoura space observation point last spring. The launch of the rocket went well, and the satellite obtained the orbit altitude safely. The satellite was named "SUZAKU" in several hours after the launch. Usually, satellite can not get a name if the satellite does not reach the orbit. . . like



SUZAKU launch on July 10, 2005
(JAXA offer and NASA/ GSFC Dr. Scott. F Porter taking a picture)

ASTRO-E that had burned out before reaching the orbit.

"SUZAKU" has developed as a satellite of the re-challenge of ASTRO-E. For the launch of "SUZAKU", I attended and prayed for its success. Though, satellite maker like us, does not own satellite, based on the hardship of ten years from ASTRO-E, I feel "SUZAKU" just like my child with great care and also like the comrade-in-arms. The success of "SUZAKU" had become an important treasure in my life which was realized by all dedicated peoples including ISAS teachers, engineers of another companies who had overcome sadness of losing ASTRO-E. More over, it is sincerely proud to participate in the development of this satellite. Though I am still lacking in experience of satellite development, I would like to describe some of my feeling for satellite development and .. etc.

I had been yearning to space some how since my childhood. I believed that human-race will go out to space in future and I wanted to a person a little near the space of the future. I was a student who was absorbed in the band activity and the student government of extracurricular activities. So, I was really excited when got a letter of recommendation from employment guidance teacher, for NEC which was one of the high ranked company at that time, because of its popularity in personal computer.

At the beginning of the 1990's, I joined NEC, it might be a mistake or the favor of the bubble period. I was assigned to space development division which was my 1st choice. I wondered those good start might be an omen and actually it turned out to be every day's hard and overtime work.

My first assignment was the design and the development of the on-board electronic equipment. One of the equipment which I developed was the solar battery paddle driver of radio astronomical satellite "HARUKA". By receiving the command from the ground, the equipment sends the signal turned to the left right according to a target angle, and outputs telemetry for angle information of the paddle. The interface of telemetry command was digital circuit, on the other hand the motor driver was analog circuits. For me who was a new comer, all of new terms such as part dilating, reliability analysis, design margins, temperature characteristics of parts or radiation deterioration were difficult to understand. . . . I had to fight with every kind of troubles day after day. It was failure after failure, like destruction of tantalum capacitor by installing opposite way and malfunction of PNP and NPN of the transistor by specifying oppositely. It can not tell without a tea.

The equipment was finally completed and delivered to system, and "HARUKA" was launched in the winter of 1995. It was just recent when "HARUKA" completed its mission. In my mind, I always prayed for "Please operate to the last minute without any anomalies". However it never means that I developed it irresponsibly. Once satellite has launched we can not reach it. Please be safe. It is not possible to see, to repair the satellite, so we can just pray for full completion of the mission. There are feelings that we are watching safety of the satellite based on string, i.e. 'Communication' that connects the satellite to the ground. Afterwards, I changed from the equipment development section to the satellite system development section, and be involved in the system of the satellite for scientific purposes.

"ASTRO-E" of which I took charge first was an Advanced X-ray Astrophysics Facility equipped with four telescopes and three kinds of sensors. To our regret, the satellite was not possible to become "True satellite" which was launched in February, 2000. The event of this launch on the day cannot be forgotten still. . . . Perhaps, I think that the event that cannot be forgotten through my life. It is every day of the ordeal under the tight schedule to face the day of the launch. Works in Uchinoura over the last two months were days of tension, haste, and race against time. By cutting sleeping time and devoted in the preparation and checking for the launch repeatedly, and the tension that reaches the climax on that day of the launch, and the sense of loss. The satellite which had been developed after 5 years of hard work was lost at only moment. ASTRO-E which could not get to the specified altitude due to the failure of the rocket, might be burned out by the aerodynamic heating or suffering a considerable high temperature even though it turns round the earth and it returns to the sky over Kagoshima. We had been kept waiting for the satellite to come back with the last hope. We kept sending command by aiming at visible time of the lowest orbit that can be expected.

We kept transmitting the command to establish the communication link from the satellite. 1st Acquisition of Site (AOS), 2nd AOS,we wished that if the command has received by the satellite, please send back telemetry. . . . We kept sending the commands many times many times toward the silent sky. . . .

And finally, ISAS project manager, saying that "Let's make it to ending".

People and I who has developed ASTRO-E together think the air at that time for it not to be able to forget.

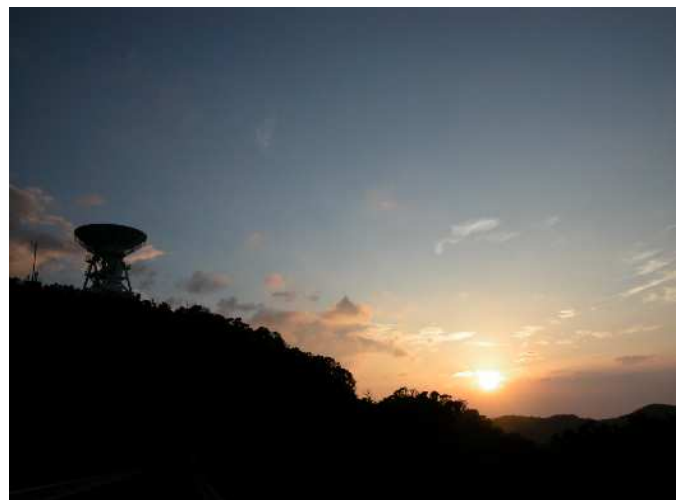
And, July 10 of last year when more than five years had passed from that accident. We successfully accomplished the launch of ASTRO-E that succeeded and strengthened the design of ASTRO-E. This success could be called revenge. Two kinds of sensors XIS of the remainder (the CCD image sensor) and HXD (X line ..unyielding.. sensor) are being observed well now though "SUZAKU"

suffered a regrettable result by losing the refrigerative of X-ray calorimeter (XRS) that should be an main mission of three observation sensors at the early stage. It is the very pleasant one that sees the operation of the satellite where the mission was safely begun after the hardship though the development of satellite.

"SUZAKU" rises from the other side of the sea. "S (band) lock-on was done.", "Uplink on", "Command lock-on.", by orientating the 34 antenna of Uchinoura station and transmitting these commands toward the sky far away. Then, telemetry inadvertently returns as if there is a satellite in the presence like being so in the other day clean room. "Ah you are fine today and are surroundings around the earth". I am feeling relieved. By setting coordinates to observe the next X rays heavenly body for observation, and registering commands for non-visible period, we transmit commands and receive telemetries several times, as if we are having conversation with the satellite. "The elevation angle is 10 °.", "Uplink off", "S (band) lock off. "The hand never reaches though we can communicate with the satellite as if it present just in front of us. Satellites are very dramatic. It is communication which ties between the important satellite and us. The



ASTRO-E2 and I (right edge)(JAXA offer)



34 antenna and morning glow in Uchinoura space observation point (JAXA offer)

communication of the satellite is the one like a thin, and also thick bonds to watch my important satellite.