

Interview with Shoichiro Asada, Executive Director of Japan Space Forum

# Space as a New Business Frontier — a Japanese Space Development Pioneer's View

By Japan SPOTLIGHT

Japanese space engineers have been working on space development for a long time and have contributed greatly to reducing the technology gap between Japan and the United States. Shoichiro Asada, executive director of Japan Space Forum and a former senior executive engineer of Mitsubishi Heavy Industries, Ltd., is one of those distinguished rocket engineers in Japan. He talked to *Japan SPOTLIGHT* about the history of space development in Japan, the implications of space for our daily lives, and the current status and future of Japanese space business development.

(Interviewed on May 9, 2018)

## Introduction

**JS:** Could you briefly introduce your professional history as an engineer who has been involved in a number of crucial space development projects in Japan?

**Asada:** I gained a Master's degree in 1981 from the Institute of Space and Astronautical Science at the University of Tokyo, the predecessor to the Japan Aerospace Exploration Agency (JAXA), and joined Mitsubishi Heavy Industries, and then started working on development of a liquid fuel rocket. In Japanese rocket technology, there are two kinds of rocket: a liquid fuel one and a solid fuel one. Dr. Hideo Itokawa, regarded as the father of Japanese rocket and space development, worked on the trial launch of a Pencil rocket in 1955. This was a solid fuel one under the jurisdiction of the Ministry of Education, and it was later taken over by JAXA. On the other hand, the National Space Development Agency of Japan (NASDA) under the jurisdiction of the Science and Technology Agency of the Japanese government, and Mitsubishi Heavy Industries developed the N-I rocket using liquid fuel by importing technology from the US for launching an artificial satellite with a commercial purpose. I was then mainly in charge of the design of the structure and also the mechanical design involving vibration analysis, thermal analysis and separation analysis of the N-I and N-II, H-I, H-II rockets.

It was exactly in 1981 when I joined Mitsubishi Heavy Industries that the US achieved the inaugural launch of the Space Shuttle. I recall that I thought then it would be extremely difficult to catch up with US rocket technology, having seen Japan still working on developing the



*Shoichiro Asada*

old-fashioned N-I rocket. However, the US rocket development project was stopped then. Japan, on the other hand, continued to make progress and finally succeeded in launching the H-II rocket in 1994, the first rocket wholly made in Japan. Furthermore, in 1989, we started a project called "HOPE" (H-II Orbiting Plane), an attempt to produce a space shuttle on a Japanese version returning from space and reentering Earth's atmosphere. I worked on this project in charge of system design. It was a very interesting project, as the experimental spacecraft was the first such vehicle in Japan assumed to reenter the atmosphere. However, around 10 years after the start of the project it was stopped in 2001. It was probably a little too premature to start such a project, since there was no International Space Station (ISS) yet.

When I came back to rocket development from this project, a big turning point in Japanese rocket development occurred. This was the privatization of a rocket launch project under the administration of Prime Minister Junichiro Koizumi in 2003. I was involved in this turning point as a businessman of Mitsubishi Heavy Industries, which in 2007 was successful in launching the H-IIA rocket as a privatized project. At that moment, Mitsubishi Heavy Industries was transformed from a company engaged in development and manufacturing of rockets into one engaged in transportation services in charge of launching artificial satellites into orbit. My mission was also changed from rocket development to sales of satellite launch services, and in 2007 I became director of space business at Mitsubishi Heavy Industries, and in 2011 general manager of space systems, responsible for all the space-related business. I tentatively

left the space business when I became executive vice president of Mitsubishi Heavy Industries America, Inc. in 2015. Meanwhile, I was continuously working on rocket development as chairman of the Japanese Rocket Society from 2014 to 2016, the oldest Japanese association for space development. Since June 2017, I have been executive director of Japan Space Forum.

### **JS: Could you explain what Japan Space Forum's mission and main business activities are?**

**Asada:** Japan Space Forum's principal mission is "to bridge end-users and providers of space development". Among those end-users, there are a variety of people ranging from space development experts to the general public. Specifically, we support university researchers hoping to do a space experiment, run an observatory facility for space debris and organize an international conference for space experts, conduct research on overseas aerospace information, and engage in experimental education programs and the designing and producing of space-related goods. We are thus working on many issues. We have also been working for 20 years as the secretariat of a "satellite design contest" for students.

### **JS: Does bridging end-users and providers of space development mean connecting the world of satellites with scientists interested in space as a venue for all kinds of scientific experiments?**

**Asada:** No. What we would like to do most is to enlighten the ordinary public with basic knowledge on space activity. We are much more eager to deepen the understanding of the general public about space than connect space with a wide range of academic researchers.

## **Implications of Space for Human Beings Today**

### **JS: With continuing scientific and technological development, how important do you think space will become for human beings in the future?**

**Asada:** Whenever I tell people I am working on space, many respond to me by saying, "What a fantastic job you have! Your job must be full of dreams." I am always saying to them, "That is not correct. Space has a much more real impact on your routine life."

Even at this moment, without space activities our routine lives would not function. This reality does seem to be strangely unknown to the public. For example, the time system in our contemporary age is controlled by the Global Positioning System (GPS). The time on your mobile phone is automatically adjusted by GPS. The time management of all the prices of the stocks, bonds and exchanges in the world is done by GPS. In other words, if GPS is wrong, the world economy would be in a panic. You are constantly checking what time it is by a mobile phone, but you are not conscious of the time being controlled by space. Space activity is indispensable for weather forecasts as well. By surveillance from space, we can now manage to have precise weather forecasts. Telecommunication and satellite

broadcasts are other examples. Satellites are also used in other domains which are not directly related to your routine life. For example, surveillance for illegal deforestation in the Amazon area or farming administration is such a domain. In Latin America, North America or Australia where they have vast areas for farming, they can utilize the information from satellites to know about harvest times or the time for fertilizing. It is also used for disaster mitigation in droughts or floods and for measuring greenhouse gases.

On the other hand, there are some activities in progress for realizing humans' dreams, such as observation or exploration of other planets. Discovering how Earth came into existence by such activities could be useful for the survival of the human race. From this perspective as well, I believe space activity will be a crucial infrastructure for human life.

### **JS: What do you think about Big Data to be provided from space?**

**Asada:** Space could provide a wide range of Big Data. There are interesting examples. In space, there is no concept of national territory. Strictly speaking, there is no rigorous rule to determine a nation's territory in the sky, but in terms of general customs, a national territory in the sky is defined as being in a domain no higher than 100 kilometers. Artificial satellites are working above this height and they would be able to see the whole Earth. For example, we can measure a country's oil reserves by getting data on the height of oil tanks. An American company measures all nations' oil reserves by analyzing photos of oil tanks all over the world taken by those satellites and they use this data for oil price forecasting. Also, this company measures the changing number of the automobiles in a parking lot of a supermarket by using photos taken by satellites. They analyze this data and evaluate the business situation accordingly to see whether the supermarket business is getting better or worse, and provide investors with their report. Innumerable amounts of data from space have never been used so far, but now many people are starting to explore effective usage of such Big Data by data processing.

### **JS: If you do this too spontaneously it could infringe an individual's privacy or threaten national security. Are there any efforts beginning to create rules to address such concerns?**

**Asada:** At this moment, there are no rules on the use of data obtained from space. However, data from highly resolved images is used only for military purposes and is not available to the public. A benefit of space is that it is no nation's territory. There is only one single rule in space, and that is that it must not be occupied by anybody. This has been agreed by many countries.

### **JS: Do you think some rules need to be adopted?**

**Asada:** Yes, we need to make rules. Without any rules, there would be extreme difficulties, as we have a significant congestion problem in space.



## Japanese Contribution to Space Development

### JS: How do you assess Japan's contribution to space development?

**Asada:** First, Japan is the only Asian country participating in the ISS. This is, I believe, an enormous contribution. There have been some Japanese astronauts active at the ISS. Nobushige Kanai is now staying there and it was decided that Akihiko Hoshide will be the second Japanese captain of the ISS in 2020, following Koichi Wakata. Thus, though Japan has no manned spacecraft, it has acquired a certain reputation in the activities of the ISS. Japan has also been sharing the workload in surveillance of the global environment along with the US and Europe, and has engaged in surveillance on CO2 emissions and forests. A Japanese observatory satellite is working on measuring CO2. Exploration attempts will be started for the Moon and Mars, and Japan will join these activities as well.

### JS: What do you think of the capacity of Japanese space development-related industries and their economic impact upon other industries?

**Asada:** There is an index of space industrial competitiveness measured by the number of launched satellites, quality and capacity of a produced rocket, and the number of space engineers, as well as the spacecraft-producing companies. According to this index, the Japanese space industry follows the US, Europe, Russia and China. There is little technology gap with the US and Europe in hardware such as rocket and satellite technology, but in terms of money and human resources for space development Japan is far behind. For example, China has spent enormous amounts of money and human resources on space development, and we cannot be their competitor. The number of Japanese rocket engineers is at maximum around 1,500, while the number of employees for only one single space development company in China is more than 100,000. The Japanese space equipment industry's total business sales including producers and users are around 8 trillion yen, corresponding to those of the shipbuilding industry in Japan and about one-tenth of the Japanese wholesale industry.

**JS:** In light of the impact of space upon daily life as you mentioned, we guess the size of the market of the space industry in Japan should be much greater. Is this smaller size caused by insufficient understanding among the Japanese public about the role of space in their daily lives?

**Asada:** Yes. In Japan there are not many companies skillfully using data from the images taken in space. Services using this data, such as Google Map, are not popular in Japan. In the US there are many ventures producing such services for users, but in Japan this is not the case. This is a challenge for us in the future.

### JS: What other challenges for Japanese space business do you see in the future?

**Asada:** The scale of the space industry worldwide, excluding the user business, is around 37 trillion yen, of which Japanese business accounts for only 2.7 trillion yen, less than 10% of the total. Thus Japanese space business cannot play a leading role in the world. The main client of Japanese space business is the Japanese government and its scale corresponds to the size of the government budget for space activities. We would need to acquire more overseas clients.

### JS: This means we need many more existing companies or ventures to enter the space industry?

**Asada:** Yes, indeed. Prime Minister Shinzo Abe said the government would input an additional 100 billion yen over the next five years into new space business and implement an international human resources exchange on the occasion of the announcement of the third Grand Prix of Space Development and Utilization. So far, space business has been considered one with a high entry barrier due mainly to its high costs, but in the US today some venture businesses have started to get into the space industry, which seems to be changing this preconception. In Japan as well, there are some ventures emerging that are working on development of small satellites.

## The Future of Space Ventures

### JS: Space business looks very attractive, but can we see more young people starting it?

**Asada:** Yes, it looks attractive but it is different from IT business. Its initial costs would be enormous. You need billions of yen rather than millions to start up a space business. In Japan today, a space start-up company, ispace, working on a project for natural resources development on the Moon, succeeded in procuring 10 billion yen in capital to proceed with the project. The investors include the Innovation Network Corporation of Japan, Development Bank of Japan, TBS Holdings, Dentsu Inc. and KDDI. So we have just started to see an example of a space venture today in Japan.

Looking at examples outside Japan, a US company, Rocket Lab, working on a small rocket development, was successful in acquiring \$148 million in total. Jeffrey Bezos, CEO of Amazon.com, sells \$1

billion of his own company's stocks and invests the money every year in a space development venture business founded by himself. Elon Musk, the co-founder of PayPal who runs electric car producer Tesla, set up a space development venture called SpaceX by using capital obtained by selling PayPal shares. There are now new space ventures emerging one after another in the steps of these two distinguished business leaders.

### JS: Besides space, are there any other notable Japanese space ventures?

**Asada:** Yes, there are unique ventures in Japan as well. Astroscale, a venture company trying to decrease space debris for the first time in the world, was founded by a Japanese. Their R&D office is in Japan and their headquarters is in Singapore. Mitsunobu Okada, its CEO, used to work for the Japanese Ministry of Finance. He told me, "I decided to do this business because I was told that nobody had ever tried and it would be impossible to find the relevant technology for retrieving space debris." He has also been promoting space debris elimination activities and they have been instrumental in starting serious discussions on possible rule making for space debris. There are other unique space ventures emerging in Japan, such as Infostellar Inc., which provides an antenna-sharing service for receiving data from satellites, and ALE Co. Ltd, which provides entertainment by creating artificial shooting stars with special grains released from a satellite.

### JS: How about large Japanese enterprises? Are they ready to make important decisions on investment in space development business?

**Asada:** Sales of space-related business to total sales of Mitsubishi Heavy Industries amount to only 1-1.5%. In the case of Mitsubishi Electric they are around 2% and in the case of NEC less than 1%. Thus space business is not a key to a company's whole destiny, and we cannot expect a decisive scale investment. I have always said that space development would be a show window display business. Though sales do not matter, if we are successful the impact on business would be significant. This is the same even for large US companies such as Lockheed or Boeing. Where they differ from Japan is in their active support for space ventures by establishing funds for support. In Japan, there are not so many companies supporting space ventures. The exception is Softbank led by Masayoshi Son. He invested \$1 billion in the US venture OneWeb developing telecommunications technology using electromagnetic waves from a satellite.

## International Cooperation for Space Development

### JS: We suppose that international cooperation is key to achieving space development. How do you think international cooperation and competition can be developed?

**Asada:** Deep space exploration must be initiated by national governments under international collaboration, since private business cannot pay the costs. But space business will be exposed to international competition. Another big issue emerging currently in space is space debris. At sea, there are rules for avoiding collisions between ships under navigation. But in space there are no rules for that and nobody can judge which spacecraft would be responsible for a collision. Rule-making for space traffic management will be necessary. Furthermore, there are no rules to determine who should be in charge of cleaning up the massive amounts of space debris. With a collision of satellites, there would be a lot of debris and that debris could increase with further collisions, and space would then not be able to be utilized well anymore. In order to prevent this, we will definitely need international collaboration. Although this issue of space debris has not been discussed much so far, since there would be conflicts of interest among nations and also enormous costs in cleaning it up (almost corresponding to the cost of launching an artificial satellite), it is now gradually being discussed among nations.

Another issue for international collaboration is space resources development. All nations have agreed to the rule that nobody can monopolize space. But there is no clear consensus about ownership of natural resources on the Moon or Mars. Such rule making would provide Japan with a good opportunity to take an initiative in space development and thus we advocate for Japanese leadership on this.

## New Project by Japan Space Forum

### JS: Could you tell us about your future projects for Japan Space Forum?

**Asada:** What I have been desiring to do for a long time is to found a bank of human resources for space business. Many space engineers including myself, who have worked hard on space development, are now retired. I would like to make a venue for matching up retired engineers and young people interested in space business. I would like to add a space information center to this venue to respond to the need for consultations on space business. So it would be a think tank where you could find detailed information about space.

I would also like people interested in collecting maritime information to utilize the information from space, since it is difficult to get it at sea, though Japan is an oceanic country. I also believe that we should be well prepared for the occasion in the near future when the ISS is privatized. **JS**

Shoichiro Asada has been executive director of Japan Space Forum since June 2017. He is a former senior executive engineer of Mitsubishi Heavy Industries, Ltd.