

Japan Aerospace Exploration Agency

Since its formation in 2003, JAXA has grown quickly into a major player in the worldwide space community. Senior Vice-President **Kiyoshi Higuchi** discusses international collaboration and the Agency's increasing emphasis on how its activities benefit society

What experiences prepared you to become Vice-President of the Japan Aerospace Exploration Agency (JAXA)?

I began my career as a rocket system engineer and then as a small sounding rocket manager. I was one of the initial members who prepared Japan to participate in the International Space Station (ISS) programme. I know only one initial member of the ISS, besides myself, who is still active in the space field and that is European Space Agency (ESA) Director General Jean-Jacques Dordain. I became Senior Vice-President of JAXA based on this experience, so I started out as an engineer but now perform administrative duties.

You have been involved with JAXA since its formation in 2003. Over the past 11 years, which achievement stands out to you as the most impressive?

At the beginning, JAXA faced a very severe situation with a rocket launch failure and two satellite malfunctions. The most important thing at that time was to recover from those setbacks. We focused on overcoming those challenges and avoiding any further mistakes in launch vehicle and satellite operations in our first decade.

The most impressive achievement is that JAXA has become one of the most reliable space agencies in the world, through scientific and Earth observation satellites and its work with the ISS. We have had 23 consecutive successful active rocket launches since 2004, including the very latest in May 2014.

JAXA celebrated its 10th anniversary last year with the launch of a new corporate philosophy and slogan. How were these decided upon and what is their significance?

Through concentrating on avoiding failures in the last decade we have improved our space technologies significantly. However, we have not been able to spare enough effort to apply our achievements to society. Since last year, we have shifted our focus to how we can improve people's daily lives and contribute to a prosperous society. Our corporate philosophy and slogan 'Explore to Realize' reflects both of these aspects; indicating our mission to explore and utilise the technologies acquired through exploration, as well as to contribute to society.

Recently, JAXA's plans to develop a prototype solar farm within the next 20 years have attracted international media attention. Could you describe the motivation for this endeavour?

The solar farm project is very important to expand energy supply and benefit society. Securing a safe energy supply has been one of the top priorities in Japan since the Great East Japan Earthquake in 2011. This project is still in the research phase and we have technical challenges to overcome such as accurate control of microwave transmitters for antennae and deployment technology for such a large structure. We also need to work out transportation methods and costs. By bringing together our expertise, JAXA will endeavour to overcome these challenges and realise the project for the benefit of all.

What is the importance of the Japanese experiment module 'Kibo' at the ISS? Could you discuss any other international collaborations?

It is very important for JAXA to play a key role in the space arena and contribute to the international community. JAXA's involvement with ISS has shown that we will go further in space together. We are utilising Kibo/ISS to prepare for future projects, such as missions to Mars and the Moon.

We are also working on joint programmes with ESA, including the BepiColombo mission to Mercury and the Earth observation satellite EarthCARE. JAXA is not only cooperating with Western countries but also with Asia-Pacific nations through the Asia-Pacific Regional Space Agency Forum (APRSAF).

Recently, JAXA signed a partnership agreement with the Japan International Cooperation Agency (JICA) with the aim of promoting collaboration to solve various challenges currently faced by developing countries. How will this goal be accomplished?

Space activities are valuable not only for advanced but also emerging countries. This is one of the reasons why we participate in APRSAF and are grateful to JICA for their support in further enhancing our international collaborations. Past experience has taught us that space activities can contribute to solving problems in disaster preparation, environmental issues and water management. Our latest launch in May 2014 of the 'DAICHI-2' satellite is a good example of this. DAICHI-2 has an L-band radar so it can observe the surface of the Earth even at night or through cloud. In Brazil, which has very large areas of forest and a big problem with illegal logging, observation data from the satellite can be used to monitor and prevent these criminal activities and protect the forests.

JAXA's fundamental foci

- Development of the Hayabusa-2 project and the X-ray telescope for scientific space exploration
- Development of a new innovative launch vehicle to allow more efficient and less costly space transportation
- Contribution to satellite utilisation to realise a more prosperous society
- Participation in space exploration through international cooperation

ANALYSIS

Japanese astronaut Koichi Wakata recently returned from a six-month mission to the ISS, where he served as its first Asian commander. What does this historic achievement mean to JAXA?

Astronaut Wakata's achievements proved that Japan is a major partner in international collaborations. We will be sending more top-class and dedicated Japanese astronauts to space with the Japanese mindset of harmony and 'omotenashi', meaning hospitality.

Does JAXA conduct outreach work? How do you engage students?

We have various initiatives for students from primary to university level. One programme involves teaching young people how to make, operate and launch a plastic bottle rocket. We run about 700 lectures per year for people, including school students, and also facilitate communication between the Earth and space; Japanese astronauts communicate live from ISS with young students and send them messages.

Why should governments and other funders continue to invest in bluesky research?

Though small in existence, each of us has an untiring spirit of curiosity. We cannot stop thinking and must consider fundamental and curiosity-driven research. I believe that fostering blue-sky research depends on the dignity and self-regard of a nation, which is an aggregate of human beings. To illustrate my point, I would like to share Blaise Pascal's words from *Pensées*:

"L'homme ne'est qu'un roseau, le plus faible de la nature. Mais c'est un roseau pensant. "

"Man is no more than a reed, the weakest in nature. But he is a thinking reed."

What are the biggest challenges to further space exploration or even space colonisation?

There are a lot of technological limitations but I will mention two particularly significant challenges. The first is transportation costs – current launch vehicles are very expensive; in fact, more than half of the operational cost for ISS programmes is spent on transportation, so this needs to be reduced. The second is that radiation is very severe in space; at ISS it is about 10 times greater than on the surface of the Earth. So we need protection from that for human beings to be able to stay in space.

How do you envision JAXA will have changed in 10 years' time?

JAXA will continue to be one of the most reliable partners in the international space community. I believe it will become a core technology and engineering organisation that will lead Japan and the world to prosperity through aerospace activities.

http://global.jaxa.jp/





Through time and space

International Innovation highlights the groundbreaking achievements and missions that have been accomplished by JAXA in the 11 years since its formation

The global precipitation measurement (GPM) core observatory, with the dual-frequency precipitation radar (DPR) onboard, launched to accurately determine rainfall distribution and improve capacity to predict and prepare for abnormal weather.

Japanese astronaut Koichi Wakata became the first Asian to assume the post of Commander at the International Space Station.

Global change observation mission 1st-water 'SHIZUKU' (GCOM-1W) launched with the aim to construct, use and verify systems that enable continuous global-scale observations (10-15 years) of effective geophysical parameters for the elucidation of global climate change and water circulation mechanisms. It carries the world's largest revolving space antenna.

Venus climate orbiter 'AKATSUKI' (PLANET-C) launched to elucidate the mysteries of Venus, alongside Small Solar Power Sail Demonstrator 'IKAROS' – the world's first solar-sail powered spacecraft.

Asteriod explorer 'HAYABUSA' (MUSES-C) returned to Earth.

Quasi-zenith satellite-1 'MICHIBIKI' launched to monitor Japan from above.

Wideband internetworking engineering test and demonstration satellite 'KIZUNA' (WINDS) launched to establish the world's most advanced information and telecommunications network. So far, it has successfully achieved the world's fastest communication speed at 1.2 Gbps.

Advanced land-observing satellite 'Daichi' (ALOS) launched with the goal to observe precise land coverage for the purpose of both cartography and disaster monitoring.

Launch of Japan's first infrared-ray astronomical satellite 'AKARI' (ASTRO-F). Its aim was to further understanding of the formation and evolution of galaxies. This operation led to the detection of carbon monoxide from a supernova remnant and the release of one of the world's biggest large magellanic clouds (LMC) near-infrared spectroscopic catalogues.

Solar physics satellite 'HINODE' (SOLAR-B) launched to study the impact of the Sun on the Earth, as part of a joint Japan-UK-US initiative.

Engineering test satellite VIII 'KIKU No.8' (ETS-VIII), one of the world's largest geostationary satellites weighing in at 3 tonnes and measuring 40 m, launched to facilitate mobile communications.

JAXA was formed following the merger of the Institute of Space and Astronautical Science, National Aerospace Laboratory and National Space Development Agency of Japan.

