

NEC Tackles the Global Business of Space Solutions

In recent years, interest in the space business has seen a dramatic shift from “development” to “utilization.” As the leading company in Japan’s development of space, NEC is continuing to innovate the technologies and products that it has developed over years, and is providing an array of space utilization solutions with the aim of advancing our vision of “an information society friendly to humans and the earth.” This article will introduce how NEC intends to tackle the business of space in the future, and will provide the reader with an overview of the related technologies and products.

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1 Introduction

About 10 years have passed since NEC first began designing our iconic space business product “HAYABUSA.” During that time, NEC has continued to refine and innovate the space-related technologies that define “HAYABUSA” and play an active role as a leading company supporting Japan’s space program. In recent years, the environment surrounding the space business has undergone significant changes, transitioning from an era of “space development” to the age of “space utilization.” The space business of NEC also is in process of reinventing itself, transforming from a satellite manufacturer into a global “space solution” provider.

In order to provide the reader with an overall picture of NEC’s space business, the first half of this special issue will introduce NEC’s vision which will serve as our compass for space business, and the roadmap that will guide to its achievement as well as our approach to execution of the roadmap. In the latter half, the reader will be introduced to the various space-related products and platform technologies that will provide the foundation for our pursuit of the vision.

2 NEC’s Approach to Space Business

As one of Japan’s leading companies in the Japan’s exploration and development of space, NEC has provided a broad range of space-related products over its history. **Fig. 1** shows an overview of those products.

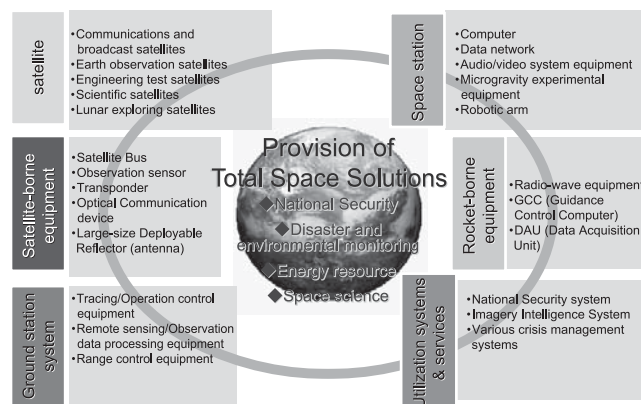


Fig. 1 NEC's space business.

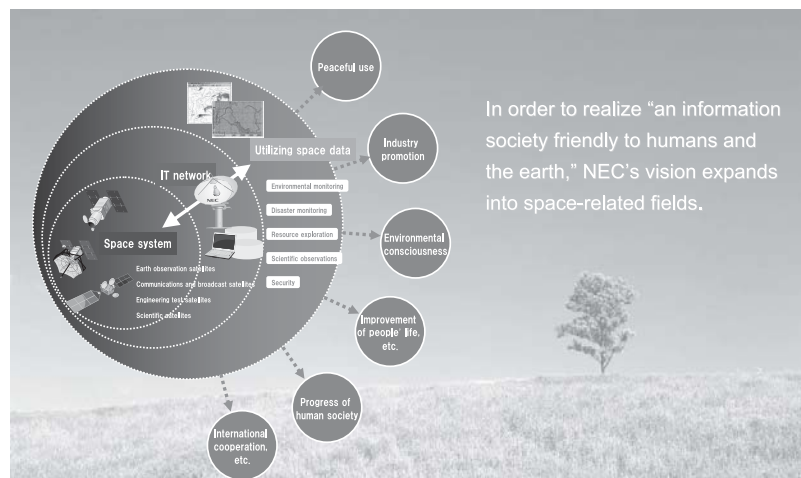


Fig. 2 Space solutions provided by NEC.

With this wide diversity of products and technological capabilities as our base, NEC's space business intends to transform itself into an enterprise that provides "space solutions." In detail, this means the proposal and provision of earth observation/surveying systems, communications systems and other social infrastructure systems to developing countries in Asia and Africa, integrating NEC's strengths in IT and network technologies with space systems (satellites and ground stations systems) to create cutting-edge tools and the solutions necessary to realize "an information society friendly to humans and the earth." Fig. 2 illustrates this concept.

Also NEC is developing a new type of satellite that allows delivery at a lower cost and in a shorter time. In order to promote the utilization of space, it is essential that satellites not only be "high performance and easy to use" but also be more economical to lighten the burden of ownership and operation. For example, just as in the case of personal computers and automobiles, the approach of offering a standard model and a catalog of optional satellite-borne devices from which the user can choose will be necessary for swift response to the demands of diverse customers.

In addition, NEC is currently pursuing the miniaturization and standardization of satellites as a means to achieve satellites that are lower priced and easier to use while providing the same or improved functionality and performance compared with conventional satellites.

Supplying the market with small-scale earth observation satellites that deliver multi-functionality and high performance at highly competitive prices and in a shorter delivery time is expected to further heighten space utilization needs. Miniaturization and standardization, which is the approach necessary for

ASNARO (Advanced Satellite with New system ARchitecture for Observation) Project

Project objectives:

- Realize satellite developmental technologies through new development, manufacturing, operational methodologies and systems that will enable development of a low-cost satellite bus that can be fabricated in a short time.
- Realize an earth observation satellite with sub-meter class resolution within 3 years.

- ① Establish an advanced space system development methodology
 - New space systems realized in a short period of time at low cost.
- ② Develop a standard bus for small-scale satellites
 - Realize high-performance standard bus system in the 300 kg-weight class for the global market
- ③ Develop high-performance satellite-mounted mission equipment and devices
 - Develop optical sensors with sub-meter-class ground resolution (global top class resolution)

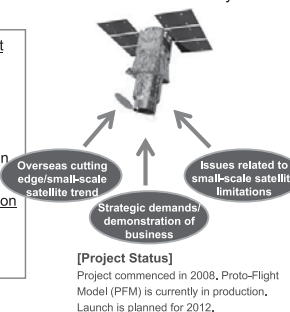


Fig. 3 ASNARO Project using small-scale satellites.

making this a reality, is also introduced in this special issue.

Fig. 3 shows the ASNARO Project currently under development.

3 Space Business-related Products and Technology

3.1 Rich Diversity of Satellites and Related Technologies

NEC's space-related products cover a very broad spectrum from satellites and ground systems necessary for their tracking and control, and processing the data that they gather to space station-related equipment and devices as well as guidance

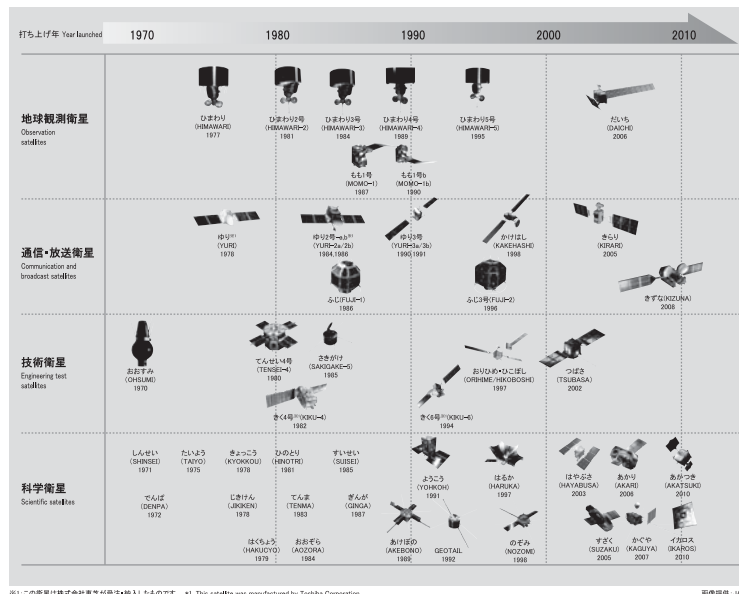


Fig. 4 NEC achievements in satellite development and manufacturing.

control computers for the rockets that carry them into space.

In the field of satellites, for over 40 years since the launch of Japan's first satellite "OHSUMI" in 1970, NEC has borne the responsibility for the development and manufacture of various types of satellites (See Fig. 4).

The various technologies involved in the development of these satellites together with our IT and network technologies will be the source of the technological power that will support the future of NEC's space business.

This special issue will introduce the reader to various examples of satellites including "KAGUYA," which made a huge contribution to exploring the moon, and "DAICHI," which was launched in 2006 and continues to supply valuable information for national land management and situational status observation when a disaster strikes. This issue will also put the spotlight on "HAYABUSA" which has received worldwide attention.

3.2 Wide Variety of Mission Devices and Observation Sensors

As the industry makes the shift from "Space Development" to "Space Utilization" and we ask what role will be played by space systems and satellites, increasing importance will be placed on mission equipment/devices and observation sensors. As shown in Fig. 5, NEC has been involved in the development of a wide variety of optical and radio wave sensors. Data gathered by these sensors (satellite imaging) is already playing an active role in monitoring the situation when a disaster

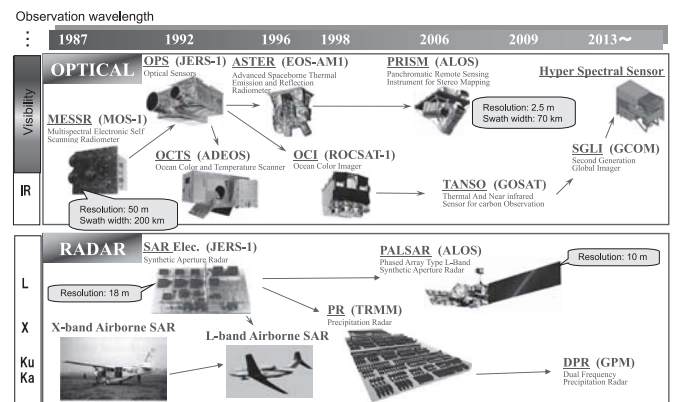


Fig. 5 NEC achievements in earth observation sensor development.

occurs and in various environmental observational fields. NEC also provides the TANSO sensor to measure the concentration of CO₂, which is considered one of the main contributing factors to global warming.

In addition to supplying various products in the field of communications including our pioneering communications relay equipment that has been installed in over 150 satellites from around the world to date, NEC possesses an array of cutting-edge technologies including large-scale deployable satellite-mounted antenna technology and communications equipments that uses optical technology.

In this special issue, we would like to introduce the various

types of mission equipment and observation sensors borne on these satellites as well as the components, materials and technologies that serve as their foundation.

Our employees engaged in the space business are also united in their efforts to innovate our manufacturing. The construction of efficient manufacturing lines that deliver mission-critical quality is one of the sources of the power that will drive NEC's penetration of global markets. While the limited space in these pages does not permit a thorough description of this aspect of NEC's space business, this special issue will touch on part of these activities.

4 Conclusions

As described above, NEC supplies a wide variety of products as one of the leading companies in Japan's development of space products.

In recent years, global interest in space utilization solutions is rising, and NEC's space business intends to answer those needs with global space solutions built on the platform of advanced technologies that we have honed to cutting edge over the long history of our involvement in space development. And through these solutions, we shall contribute to building a better society where people all around the world can live in safety and security.

We sincerely hope that this special issue will leave the reader with a better understanding of our approach to reaching this goal and the technologies that will serve as a platform to carry our business into the future.

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Space Solutions for a Better Society

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The Business of Space: Our Vision and Roadmap

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Progress with the implementation of NEC's Roadmap

Fusion of Space Technologies and IT/Network Technologies

Strategies aimed at the Entry of Space Systems Business Enterprise to the Global Market

Promotion of Service Oriented Businesses for Space Utilization

Development of the ASNARO, an Advanced Space System

Technologies/Products supporting roadmap implementation (Satellites/Space station)

Development of the Japanese Experiment Module (JEM), KIBO for the International Space Station

Development of the Venus Climate Orbiter PLANET-C (AKATSUKI)

Development of Small Solar Power Sail Demonstrator IKAROS

Development of the KAGUYA (SELENE), a Lunar Orbital Spacecraft

Development of the Earth Observation Satellite "DAICHI" (ALOS)

Development of the Wideband InterNetworking Satellite WINDS (KIZUNA)

Small SAR Satellite Technology Promotes Dissemination of a Comprehensive Space Utilization System

Technologies/Products supporting roadmap implementation (Satellite ground system)

Ground Systems Supporting Satellite Operations

Data Processing System for Advance of Earth Observation Data

Technologies/Products supporting roadmap implementation (Satellite Bus)

NEXTAR Standard Platform for Quick Startup of Remote Sensing Operations

Standard Components of Satellite-borne Equipment

Technologies/Products supporting roadmap implementation (Communication)

Communications Technologies Supporting Satellite Communications

Satellite Transponder Equipment in Active Worldwide Use

Technologies/Products supporting roadmap implementation (Observation sensors)

Optical Sensor Technology Supporting the Greenhouse Gases Observing Satellite (GOSAT, or IBUKI)

Radio Frequency Sensor Technology for Global Rain and Cloud Observation

SAR Image Processing Technologies are Improving Remote Sensing Data

An Industrial Waste Monitoring System Based On the Use of Satellite Images

Technologies/Products supporting roadmap implementation (Fundamental technologies)

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Guidance Control Computer for Launch Vehicle

Asteroid probe MUSES-C (HAYABUSA)

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