

Provide Safety, Security, and Comfort



Achieving a safe and comfortable society through satellite technology

GPS, satellite broadcasts, weather reports... The day-to-day convenience we enjoy as part of modern life is in large part the result of satellite technology. At Mitsubishi Electric, we have been engaging in the satellite business since the 1960s, and have developed not only the satellite systems themselves, but also the on-ground systems technologies that support the satellite-based systems using big data. We provide new and additional social value by utilizing the synergies we bring as an all-round electrical manufacturer.

Quasi-zenith satellites transmit highly accurate positioning information that can be used to resolve social infrastructure problems safely and efficiently

"Michibiki" quasi-zenith satellite

The Quasi-Zenith Satellite System is a program undertaken by Japan's National Space Policy Secretariat. Currently, construction is under way on satellites 2 to 4 and the provision of their on-ground systems. Under the supervision of the Cabinet Office, Mitsubishi Electric is responsible for the manufacture of satellites 2 to 4 based on the successful outcomes we achieved in the system design and manufacturing work for the first of the quasi-zenith satellites, known as "Michibiki", which was launched in September 2010 by the Japan Aerospace Exploration Agency (JAXA). Satellites 2 to 4 are scheduled to go into orbit in 2017, with fully active services to be provided as of FY2019. Once the system transitions to a four quasi-zenith satellite system, it will provide full-time coverage in the skies above

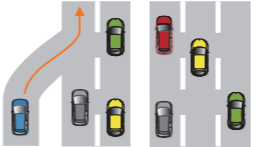
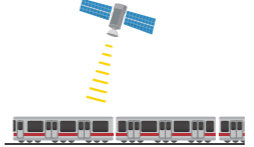
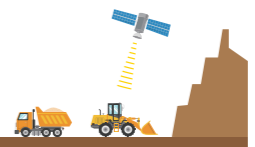
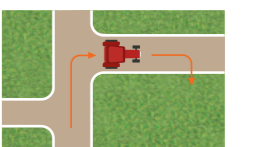
and around Japan (quasi-zenith), enabling more accurate positioning information than the measurements provided by the US GPS satellites alone. Mitsubishi Electric is also responsible for manufacturing the services that will provide high-precision positioning information, and the use of those services will allow accuracy in the order of mere centimeters.

The applications for this sort of highly accurate positioning information cannot be overestimated, and the potential uses will undoubtedly broaden further. It could offer new value to society through a wide variety of means, including by providing ways to lessen risk and improve efficiency in workplaces and eliminate or reduce risks of natural hazards. It is key to the Japanese Government's declared aim of having functioning autonomous (self-driving) vehicles in time for the 2020 Olympic Games in Tokyo, as well as an improved rail transport system. Furthermore, it can help address the growing problem of the aging population in Japan's farming sector by enabling increases in the scale and levels of automation in the agricultural machinery that is transforming the industry.



"Michibiki" quasi-zenith satellite

New technologies and potential created by quasi-zenith satellites

Safe-driving support/ Automated driving field	Railway field	IT-assisted construction field	IT agriculture field
Monitors merging and lane position at the centimeter-level. Makes highly accurate automated driving systems a possibility.	Ability to locate train positions with centimeter-level high accuracy, doing so in real-time. More precise train operation services are realized.	Enables the operation of various civil engineering machines to be controlled at the centimeter-level. Contributes to the safety and accuracy of hazardous construction work.	Controlling agricultural equipment with centimeter-level high accuracy. This makes highly efficient unmanned/automated operation possible.
			

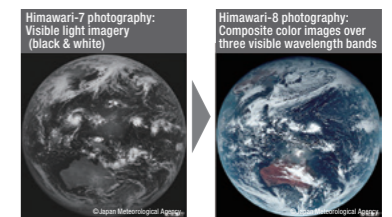
Himawari-8 and -9 geostationary meteorological satellites

Important infrastructure for people's lives

The Himawari-8 satellite launched in 2014 is a new-generation meteorological satellite capable of providing high-resolution color observational images in a short time frame. Because it supplies more detailed meteorological data than previous satellites, it is also capable of observing localized weather phenomena such as sudden downpours, as well as worldwide changes in the climate such as global warming and desertification. Because it can assist in reducing the amount of harm caused by natural disasters such as typhoons, floods, and volcanic activity, meteorological data is crucial information that has an actual impact on people's lives. To achieve this, satellites require high levels of precision, as do the ground systems used to analyze the data from satellites.

The Himawari-8 has started operation, and its data has been used for daily weather forecasting since July 2015. The color and smoothness of the cloud imagery in the weather forecasts has been widely praised.

The service also contributes more widely by extending to the Asia and Oceania areas, with efforts already underway to extend the service even further in the future.



Provision of color images

VOICE

The importance of communication bringing together a range of experts



Program Manager, Himawari Satellites
Geostationary Satellite Systems Department
Kamakura Works

Hiroshi Nishiyama

When we saw the world's first-ever high-resolution color images of the world transmitted from Himawari-8, there were gasps of astonishment at how unexpectedly beautiful they were.

In terms of the satellite itself, once it has been launched we can no longer maintain it, so the question is what level of quality can we craft that will provide a firm guarantee in the harsh conditions of space... The challenge for the project overall is how to find a common approach for all the many professionals involved, such as the company manufacturing the ground facilities, the operations company, and the people analyzing the meteorological images.

Various problems arise in a massive project like this, and I think the key to success is taking the time to carefully address each problem fully until it has been resolved.

Disaster prevention sector



Japan Meteorological Agency

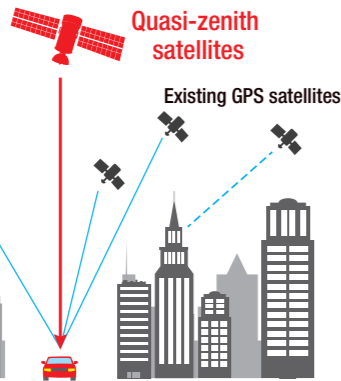
TV Internet Radio

Faster, more accurate information

Himawari-8 and -9 Contributing to Accurate Meteorological Measurement

Existing GPS satellites

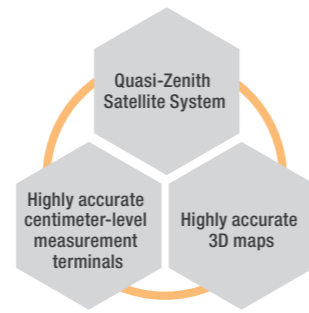
Measurement can be by four or more satellites, but the number of satellites visible to the GPS varies due to buildings, mountains, and other obstructions



The Quasi-Zenith Satellite System

Quasi-zenith satellites

With a system of four satellites, one satellite will be positioned almost directly overhead, allowing uninterrupted rooftop signal reception from the satellite



Highly accurate positioning information

VOICE

We are exploring the potential of quasi-zenith satellites



Project Group Manager
Application Business Development
Project Group
GNSS Promotion and Utilization Department
Space System Division

Yukikazu Kanoya

Since 2003, I have been involved in positioning information technology utilizing satellites, and starting in 2014 I have also been engaged in promoting the application of information from quasi-zenith satellites.

There is increasing potential for the use of quasi-zenith satellite technology. Up to now, there have been limits to the number of users of existing satellites, but many more users can access quasi-zenith satellites. We are conducting campaigns to provide a wide range of people with information on this new and relatively unknown technology, as well as programs that allow various corporate and research bodies to conduct demonstration tests using the Michibiki satellite. While this is not easy, we are acutely aware that this technology can make a significant contribution to making people's lives safer, more secure, and more comfortable. We are committed to establishing services by 2018, so each day we are seeking out new ways to use this technology.