



Transforming the future
with centimeter-level precision

Quasi-Zenith Satellite System (QZSS)

Becoming a seven-satellite constellation



 Cabinet Office

 Quasi-Zenith Satellite System Services Inc.

What is the Quasi-Zenith Satellite System (QZSS)?

QZSS is the Japanese satellite positioning system

The Quasi-Zenith Satellite System (QZSS) is the satellite positioning system built and operated by the Japanese government. QZSS, nicknamed “Michibiki,” is also referred to as the Japanese GPS. As its name suggests, QZSS satellites remain near the zenith over Japan. This means signals are not easily obstructed by mountains or buildings, resulting in more stable positioning. The Centimeter Level Augmentation Service (CLAS) and other services are used in a wide range of fields like autonomous driving, smart agriculture, logistics, sports, and disaster prevention. QZSS has been maintained and operated as important social infrastructure since services were started as a four-satellite constellation in November 2018. Development efforts are now underway to build a seven-satellite constellation and provide even better services.



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QZSS features



Figure eight-shaped orbit



Quasi-zenith (high elevation angle)

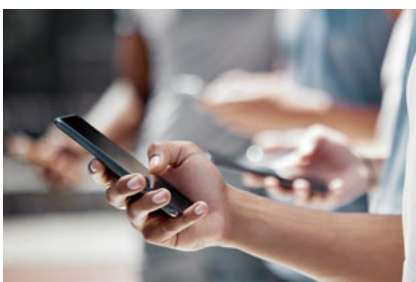


Message functions

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Satellite Positioning, Navigation and Timing Service (PNT)

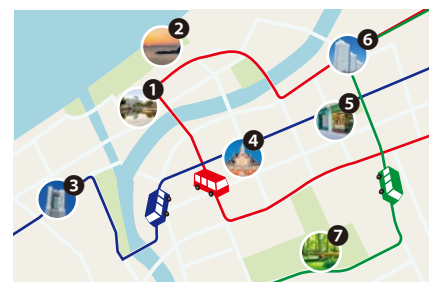
This service transmits positioning signals that are interoperable with GPS. It can be difficult to receive sufficient positioning signals in places like Japan with many urban and mountainous areas. QZSS enables stable positioning with satellites that remain above Japan for long periods of time and transmit the same type of signals as GPS, which helps compensate for insufficient positioning signals.



Smartphones



Car navigation systems



Positioning information services

Augmentation Services

Sending augmentation information to further improve positioning accuracy

CLAS

Centimeter Level Augmentation Service

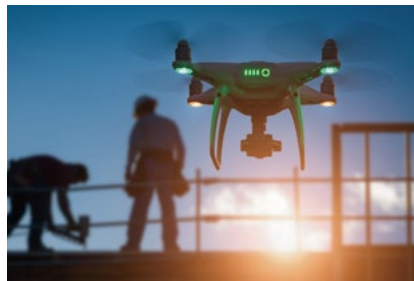


Centimeter-level precision helps upgrade many industries

CLAS enables highly precise positioning of the centimeter level. It is used in autonomous driving—including cars, agricultural equipment, construction machinery, and drones—and other fields that require more accurate positioning information.



Automated driving



Drones

Main specifications

Horizontal accuracy	Static: $\leq 6\text{cm}$ (95%)
Vertical accuracy	Static: $\leq 12\text{cm}$ (95%)
Service area	Japan and its coastal areas



Agriculture



Plowing

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Construction machinery

SBAS

SBAS Transmission Service



Countries around the world operate the Satellite-based Augmentation System (SBAS) to provide aircraft with information about positioning error and satellite information reliability. Japan's Michibiki Satellite-based Augmentation Service (MSAS) transmits information via QZSS as the Japanese SBAS, and is operated by the Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism.



SLAS

Sub-meter Level Augmentation Service



Enhancing lifestyles with accurate positioning of the meter level, even on small, low-cost receivers

SLAS can be used for accurate positioning of the meter level, even on the small, low-cost receivers that have come into more widespread use. It is frequently utilized on portable devices like dash cams, golf watches, and tracking devices.



Smart watches



Dash cams

Main specifications

Horizontal accuracy	Static: $\leq 1\text{m}$ (95%)
Vertical accuracy	Static: $\leq 2\text{m}$ (95%)
Service area	Japan and its coastal areas

Scheduled to start in FY2024

MADDOCA-PPP

Multi-GNSS Advanced Orbit and Clock Augmentation - Precise Point Positioning



Highly accurate positioning in the Asia-Oceania region

The MADDOCA-PPP highly precise positioning augmentation service will be available everywhere that QZSS signals can be received, both land and ocean areas. It is ideal in applications for which accurate positioning has been difficult to achieve, such as the marine transportation and fishing industries. This service will be launched in FY2024 (a trial service is currently available).



On the ocean



Outside Japan

Main specifications

Horizontal accuracy	$\leq 30\text{cm}^*$
Vertical accuracy	$\leq 50\text{cm}^*$
Service area	Asia (including Japan) and the Oceania region

* At 1,800 seconds after signal is received

Message Services

Services for sending and collecting information during disasters and emergencies

Services for Southeast Asia and the Oceania region are scheduled to start in FY2025

DC Report

Satellite Report for Disaster and Crisis Management



Sending important emergency and disaster messages via QZSS

DC Report transmits disaster and crisis management information from government agencies and other organizations. It currently sends disaster information and hazardous weather information from the Japan Meteorological Agency (tsunami warnings, earthquake warnings, flood warnings, volcanic eruption information, etc.). In the future it will also transmit J-Alert (missile launch information) and L-Alert (evacuation instructions and other information) messages, as well as disaster information for Southeast Asia and the Oceania region.



Q-ANPI

QZSS Safety Confirmation Service



Helps provide prompt aid and relief to evacuation shelters and confirm individual safety

QZSS can be used to send messages when ground communications networks are cut off during a disaster, including evacuation shelter information and requests for supplies. This makes it possible to provide prompt aid and relief to isolated evacuation shelters. Close relatives and other people can also search for information regarding the safety of individuals on the official QZSS website, which contributes to safety and peace of mind.



Other Services

Scheduled to start in FY2024

QZNMA

QZSS Navigation Message Authentication service



Improves signal security for safer positioning

QZNMA helps protect against GNSS spoofing, a method of interfering with satellite positioning. This service enables secure positioning using only authentic positioning satellite signals.



QZSS Services and Capabilities

Services

Service	Overview	Signals	Start date	Area
Satellite Positioning, Navigation and Timing Service (PNT)	Transmits positioning signals that are interoperable with GPS, so it can be used in an integrated way with GPS.	L1C/A, L1C/B, L1C, L2C, L5	November 2018	Asia (including Japan) and the Oceania region
Centimeter Level Augmentation Service (CLAS)	Sends highly precise augmentation information to achieve positioning accuracy with an error range of several centimeters.	L6D	November 2018	Japan and its coastal areas
Sub-meter Level Augmentation Service (SLAS)	Sends sub-meter level augmentation information to achieve positioning accuracy with an error range of around one meter.	L1S	November 2018	Japan and its coastal areas
Multi-GNSS Advanced Orbit and Clock Augmentation - Precise Point Positioning (MADOCA-PPP)	Enables highly accurate positioning in the Asia-Oceania region.	L6E	Planned for FY2024 (trial service started September 2022)	Asia (including Japan) and the Oceania region
SBAS Transmission Service	Provides positioning satellite error correction and malfunction information to aircraft, etc.	L1Sb	April 2020	—
Satellite Report for Disaster and Crisis Management (DC Report)	Sends disaster information and weather information from the Japan Meteorological Agency, including tsunami warnings, earthquake warnings, flood warnings, and volcanic eruption information.	L1S	November 2018	Japan and its coastal areas
	Augments DC Report functions to transmit J-Alert (missile launch information) and L-Alert (evacuation instructions and other information) messages.	L1S	Planned for FY2024	Japan and its coastal areas
	Augments DC Report functions to transmit disaster information for Southeast Asia and the Oceania region.	L1S	Planned for FY2025	Southeast Asia and the Oceania region
QZSS Safety Confirmation Service (Q-ANPI)	Can be used by evacuation shelters and disaster prevention organizations in Japan to send and receive information during disasters, etc. Can also be used to confirm the safety of individuals.	S Band	November 2018	Japan
Signal authentication service (QZNA)	Authenticates information included in positioning signals to help protect against signal spoofing.	L1C/A, L1C/B, L1C, L5, L6E	Planned for FY2024	Asia (including Japan) and the Oceania region
Positioning Technology Verification Service	Verifies new, high-precision positioning technologies. Currently used to verify practical, next-generation SBAS services.	L5S	November 2018	—

Quasi-Zenith Satellite System (QZSS)

QZSS website
<https://qzss.go.jp/en/>



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