

QZSS Latest Status

Quasi-Zenith Satellite System,
Japanese Regional Navigation Satellite System

WG-S of the 17th ICG

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Contents



1. Four-satellite Constellation Service
2. Toward seven-satellite constellation
3. Plan for the 11-satellite constellation

1. Four-Satellite Constellation Service



- The four-satellite constellation has been under operation to provide following services since 2018:

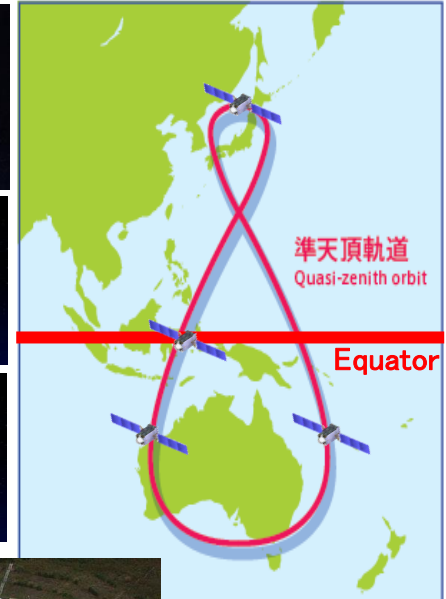
- GPS Complementary Service (PNT* service) * Position, Navigation and Timing
- GNSS Augmentation Service, i.e. SLAS, CLAS and SBAS
- Messaging Service

- The constellation consists of one GEO satellite, QZS-3, 127E Longitude and three QZO satellites (IGSO*)

* Inclined Geosynchronous Orbit

- There are two master control centers, located in Hitachi-Ota and Kobe, seven TT&C stations, and over 30 monitor stations around the world with the cooperation of countries.

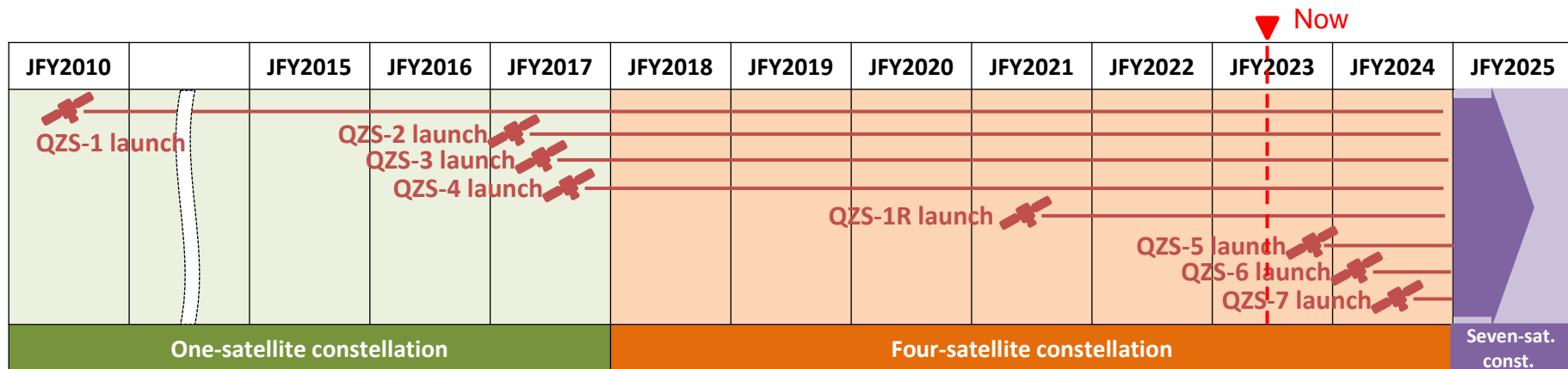
- QZS-1 was terminated on 15th September this year.



2. Toward Seven-satellite constellation (1/3)



- The launches of additional three satellites are still scheduled for JFY2023 to JFY2024 on the formal plan as follows:



- Once the constellation is initiated, users will be:
 - capable of finding their position using just only QZSS, and
 - able to utilize QZNMA service, MADOCA-PPP service and extended EWSSs.
- Next slides show the status of development both new satellites and ground system.

QZNMA: QZSS Navigation Message Authentication
 MADOCA-PPP: Multi-GNSS Advanced Orbit and Clock Augmentation - Precise Point Positioning
 EWSS: Emergency Warning Satellite Service

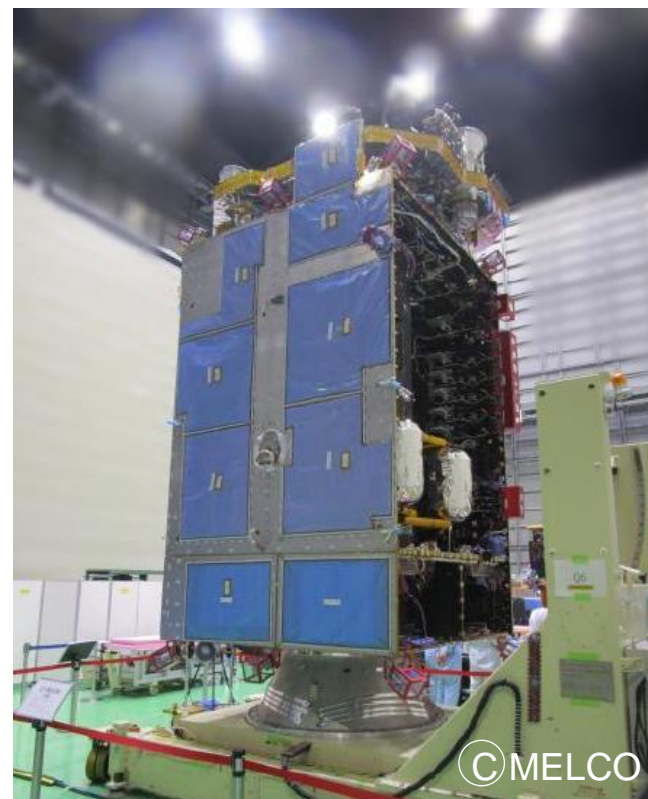
2. Toward Seven-satellite constellation (2/3)



- Three new satellites are now on developing:
 - QZS-5 and QZS-6 are under system testing
 - QZS-7 is under assembling at system level



During the vibration test (X-axis) for QZS-5



Preparation for the mechanical environment test for QZS-6

2. Toward Seven-satellite constellation (3/3)



- The ground system, at Hitachi-Ota and Kobe for the seven-satellite constellation, has been completed by the end of August, 2023:
- Two-thirds of the newly stations, Tanegashima-island and Miyakojima-island, have been completed by the end of June, 2023.

* One-third of the newly station, Amamiyoshima-island, will be completed by the end of March, 2025.

* A radio-license is required to use those stations.



The state of the acceptance test at Hitachi-Ota



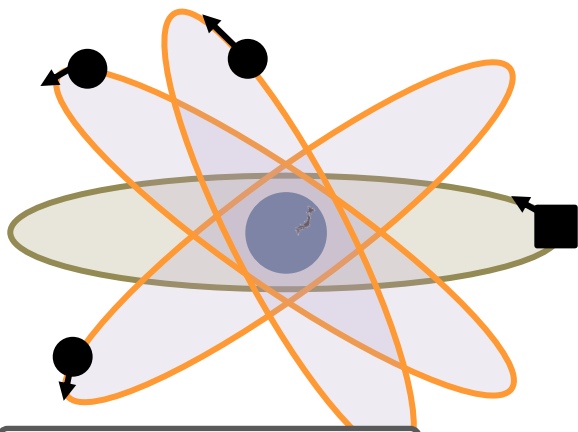
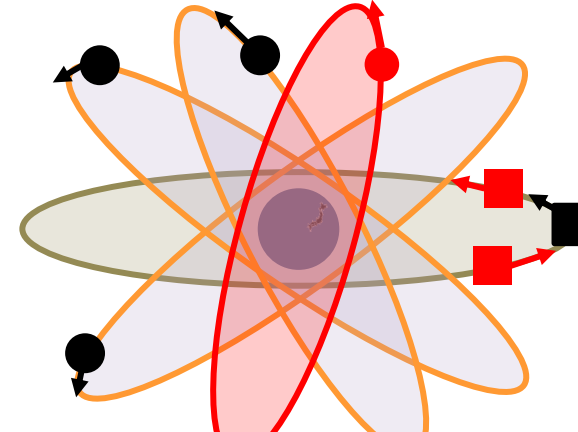
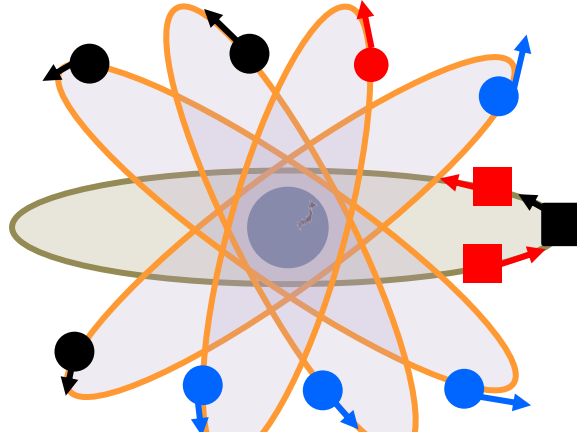
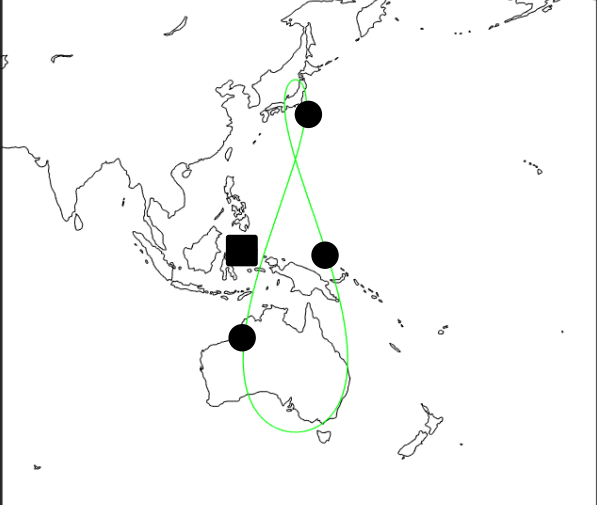
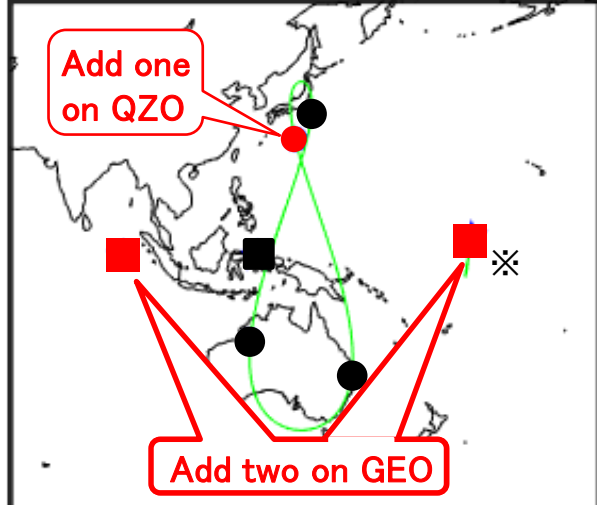
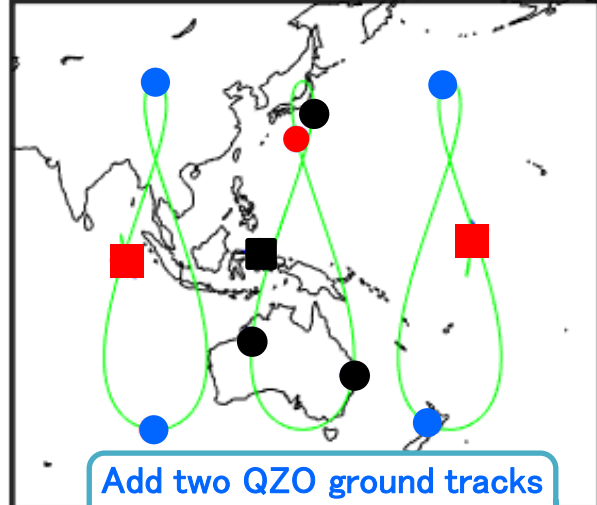
The new TT&C station at Tanegashima-island
(Photo taken during construction)



The new TT&C station at Miyakojima-island

3. Plan for the 11-satellite constellation



Four-satellite const. (current status)	Seven-satellite const. (current plan)	11-satellite const. (future plan)
<p>orbit planes: 4 (QZO: 3, GEO: 1)</p>  <p>1 satellite on each plane</p> <p>●: QZO satellite, ■: GEO satellite</p>	<p>orbit planes: 5 (QZO: 4, GEO: 1)</p>  <p>1 satellite on each QZO plane, 3 satellites on GEO plane</p>	<p>orbit planes: 5 (QZO: 4, GEO: 1)</p>  <p>2 satellites on each QZO plane, 3 satellites on GEO plane</p>
 <p>National Space Policy Secretariat</p>	<p>Add one on QZO</p>  <p>Add two on GEO</p> <p>※QZS-7 will be in a Quasi-Geostationary Orbit.</p>	 <p>Add two QZO ground tracks to the east and west</p>

For more information, please visit our web site
<http://qzss.go.jp/en/>

Thank you for your attention!