



International Civil Aviation Organization

**TWENTIETH MEETING OF THE COMMUNICATIONS/NAVIGATION
AND SURVEILLANCE SUB-GROUP (CNS SG/20) OF APANPIRG**

Bangkok, Thailand, 11 – 15 July 2016

Agenda Item 5: Navigation

5.2 Updates on national PBN implementation plan and PBN implementation issues

MSAS STATUS AND FUTURE PLAN

(Presented by Japan)

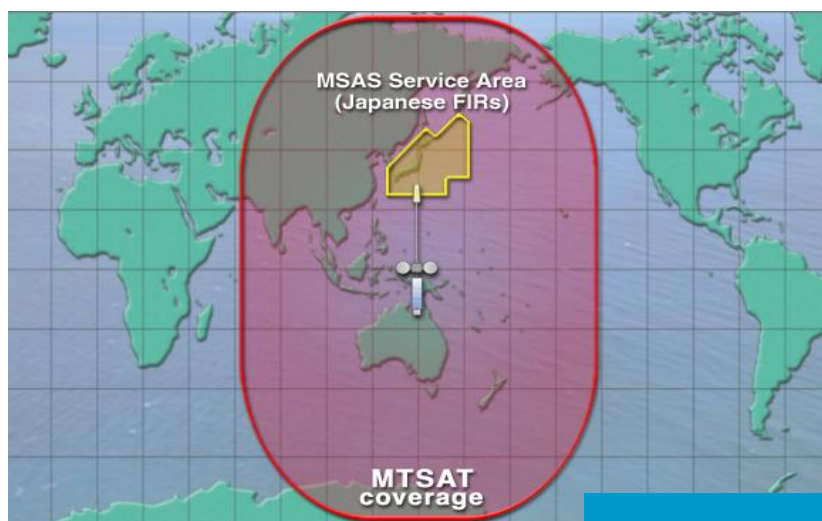
SUMMARY

This paper presents current Japanese SBAS (MSAS: MTSAT Satellite-based Augmentation System) configuration and its future plan.

1. INTRODUCTION

MTSAT-1R and MTSAT-2 were launched by H-IIA rockets, respectively on February 26, 2005 and February 18, 2006. JCAB has started Japanese SBAS (called MSAS) operation with these satellites since September 27, 2007, at the completion of various tests and verifications.

Currently, MSAS provides the NPA service in the Japanese FIR (Fukuoka FIR) by broadcasting PRN code 129 and 137 (without providing vertical guidance).

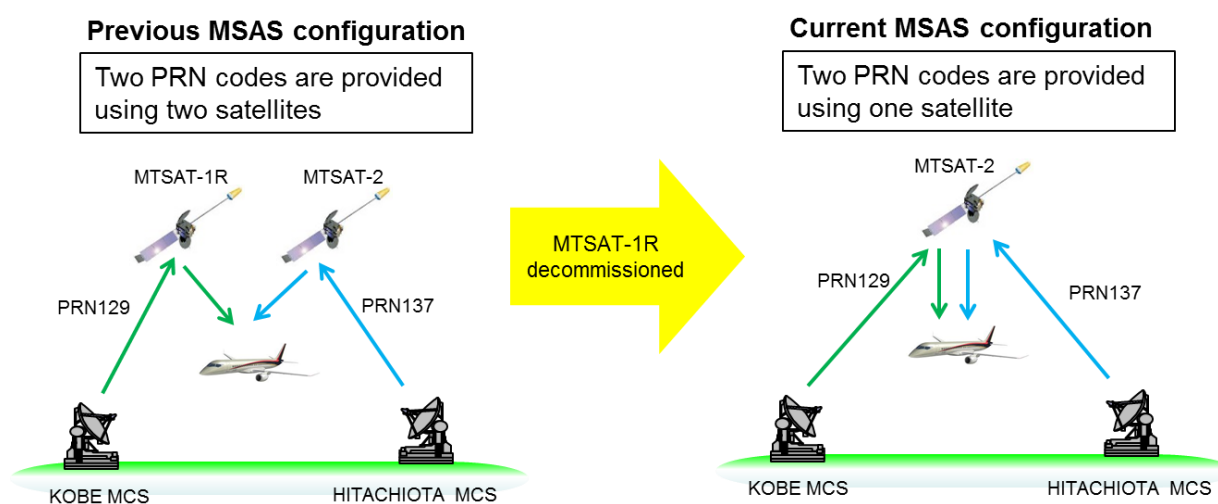


【Figure-1 MSAS Foot print and Service area】

2. DISCUSSION

2.1 MTSAT-1R Retirement

MTSAT-1R was decommissioned in December, 2015 due to the depletion of propellant. For the purpose of maximizing availability and continuity of service after the retirement of one of two MTSATs, Dual PRN operation, which provides two SBAS PRN signals through single satellite, had been initiated. To avoid SBAS service interruption, one of MSAS signal (PRN137) is uplinked from Hitachiota master control station (MCS) and the other MSAS signal (PRN129) is uplinked from Kobe MCS to MTSAT-2. This configuration downlinks two different PRN code signals simultaneously to the SBAS users.



【Figure-2 Previous and Current MSAS Configuration】

2.2 Provision of the Next Stage MSAS

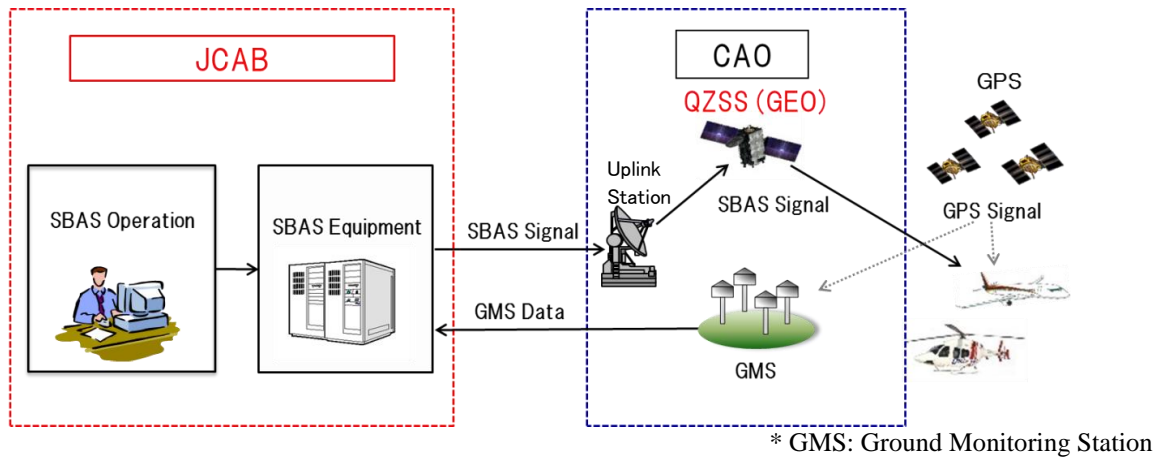
Decommission of MTSAT-2 will be planned in 2020. At that stage current MSAS service using MTSAT will be terminated.

During the pre-termination period of MTSAT MSAS, Cabinet Office (CAO) of Japan will be developing and deploying Quasi-Zenith Satellite System (QZSS). QZSS will start operation in 2018 with one geostationary orbit satellite (GEO), and three geosynchronous inclined orbit satellites (IGSO).

Taking the QZSS development schedule into account, JCAB will develop next stage SBAS of Japan and will conduct functional tests and performance evaluations with QZSS (GEO) satellite from 2018, and the next stage SBAS will start operation in 2020.

The ground segment of next Japanese SBAS has 13 GMSs in Japan. This SBAS equipment has been installed at Hitachiota. The uplink station has been set up at Miyakojima, Tanegashima and Hitachiota.

SBAS service for Fukuoka FIR (Japanese Flight Information Region) will be continued after 2020 accordingly.



【Figure-3 Next Japanese SBAS Configuration (After FY2020)】

Japanese Government decided that QZSS configuration will be upgraded by increasing the number of satellites from four to seven targeting year of 2023. Considering this configuration change, JCAB is investigating the following SBAS upgrade plan to the next stage.

- Implementation of SBAS system with redundant SBAS satellites
- Improve SBAS capability to include LP/LPV service

ICAO has started development of DFMC (Dual Frequency Multi Constellation) SBAS SARPs. This standardization will enable multiple uses of augmented GPS, GLONASS, Galileo and BeiDou for aviation and it will result in an improvement of GNSS performance. Based on this trend, QZSS will have a capability of the L5 signal transmission. Demonstration experiment of DFMC SBAS is planned as R&D activities from 2018 by the Electronic Navigation Research Institute (ENRI) in that not only ICAO standard GNSS core constellations but also QZSS will be augmented.

Japan will also consider providing DFMC SBAS service by the future Japanese SBAS system using QZSS.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate.
