Current MSAS Status and Future Plan

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- Current MSAS status
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- MSAS user segment & PBN
Current MSAS Status

- **MSAS**: Japanese SBAS in operation
  - MTSAT Satellite-based Augmentation System
  - Operational since Sept. 27, 2007
  - Continue stable operation with 1 GEO 2 PRNs

- **Service for air navigation**
  - GPS Augmentation Information for RNAV, from En-route through NPA (RNP 0.3)
    - Within Fukuoka FIR
    - Horizontal guidance only due to ionosphere
  - **NOTAM** for Operational Information
    - Service Interruption
    - Service Prediction
MTSAT Satellite-based Augmentation System

Current MSAS Configuration

GPS Constellation

MTSAT-2
Dual PRN Operation

User

PRN129
PRN137

GMS & MCS
Kobe

GMS & MCS
Hitachiota

GMS
Sapporo

GMS
Tokyo

GMS
Fukuoka

GMS
Naha

MCS Hitachi-Ota
with GMS

MCS: Master Control Station
GMS: Ground Monitor Station

1 SAT 2PRNs
6 GMSs
2 MCSs

MCS Kobe
with GMS

Civil Aviation Bureau Ministry of Land, Infrastructure, Transport and Tourism
MTSAT Satellite-based Augmentation System

Integrity • Availability

Stanford Chart

Protection level

Alert Limit
(NPA Horizontal: 556m)
(APV-I Horizontal: 40m)
(APV-I Vertical: 50m)

Position error

Not available

HMI, not good

Available and safe

HMI, not good

HMI, unsafe and available

Civil Aviation Bureau  Ministry of Land, Infrastructure, Transport and Tourism
Typical Performance

- **MSAS PRN137**
- Evaluated at: HASC GME-A
- **2015/9/8**
- (24 hours)
- **HAL=556m**

**Loss of Availability & Integrity**

- **Horizontal Protection Level (HPL)**

- **Loss of Availability**
- **Loss of Integrity**
- **Normal Operation**

**Actual Error**

**Horizontal Protection Level (HPL)**

- Extremely Safe Operation
MSAS Configuration (Now)

- 1 SAT
- 2 PRNs
- 6 GMSs
- 2 MCSs

MTSAT-2

Uplink

Ku

PRN129

PRN137

MCS Kobe

MCS Hitachiota

Dual Uplink Function

PRN129 & PRN137
MSAS Configuration (2018-2020)

QZSS Facility (Cabinet Office: CAO)

1 SAT (1PRN)
13 Monitor Stations
2 QZSS Master Control Stations
3 Up Link stations for GEO
   (1 operation, 2 Backups)
2 Communication Networks

JCB Facility

2 MSGs (MSAS Signal Generator)
   (1 Operation, 1 Backup & Evaluation)
2 MCSs (for MTSAT-2)
1 SAT (for MTSAT-2)
MSAS System Diagram with QZSS (After 2020)

MTSAT Satellite-based Augmentation System

MSAS service segment

GPS

L1C/A

Initial service
En-route – NPA

Civil Aviation Bureau Ministry of Land, Infrastructure, Transport and Tourism
MSAS Configuration
(After 2023 TBD)

SBAS Equipment

Technical Management Center
- Evaluation/Validation
- Backup for Hitachiota

Hitachiota

3 (TBD) QZSGEO satellites

Uplink Stations

Master Control Stations (MCS)

QZSS

JACB

CAO

Under planning
MSAS users have been increasing

Regional Air carrier

Now, They are interested in LPV

Other users

Medical

Private

Business

Etc…
MTSAT Satellite-based Augmentation System

GNSS & PBN

As of September 2016
(RNAV / RNP Approach 60 airports)
- Breakdown of RNAV/RNP Approach -

- RNAV Approach serving 19 airports
- RNP AR Approach serving 17 airports
- RNP Approach serving 18 airports
- Basic RNP 1 serving 24 airports
- RNAV1 serving 37 airports
Japanese aircraft with SBAS capability

- Mitsubishi Regional Jet (MRJ) 70-90 seat
  - Now, Flight test and evaluation
    - First delivery of MRJ is planned in 2017.
- Rockwell Collins Pro Line Fusion has a LPV capability
- Purchase Agreement with ANA 25 aircraft, Trans States Holdings 100 aircraft, SkyWest 200 aircraft, Eastern Air Lines Group 40 aircraft, Air Mandalay Limited 10 aircraft, And JAL 32 aircraft, Aerolease Aviation LLC 20 aircraft,
Thank you for your attention.