

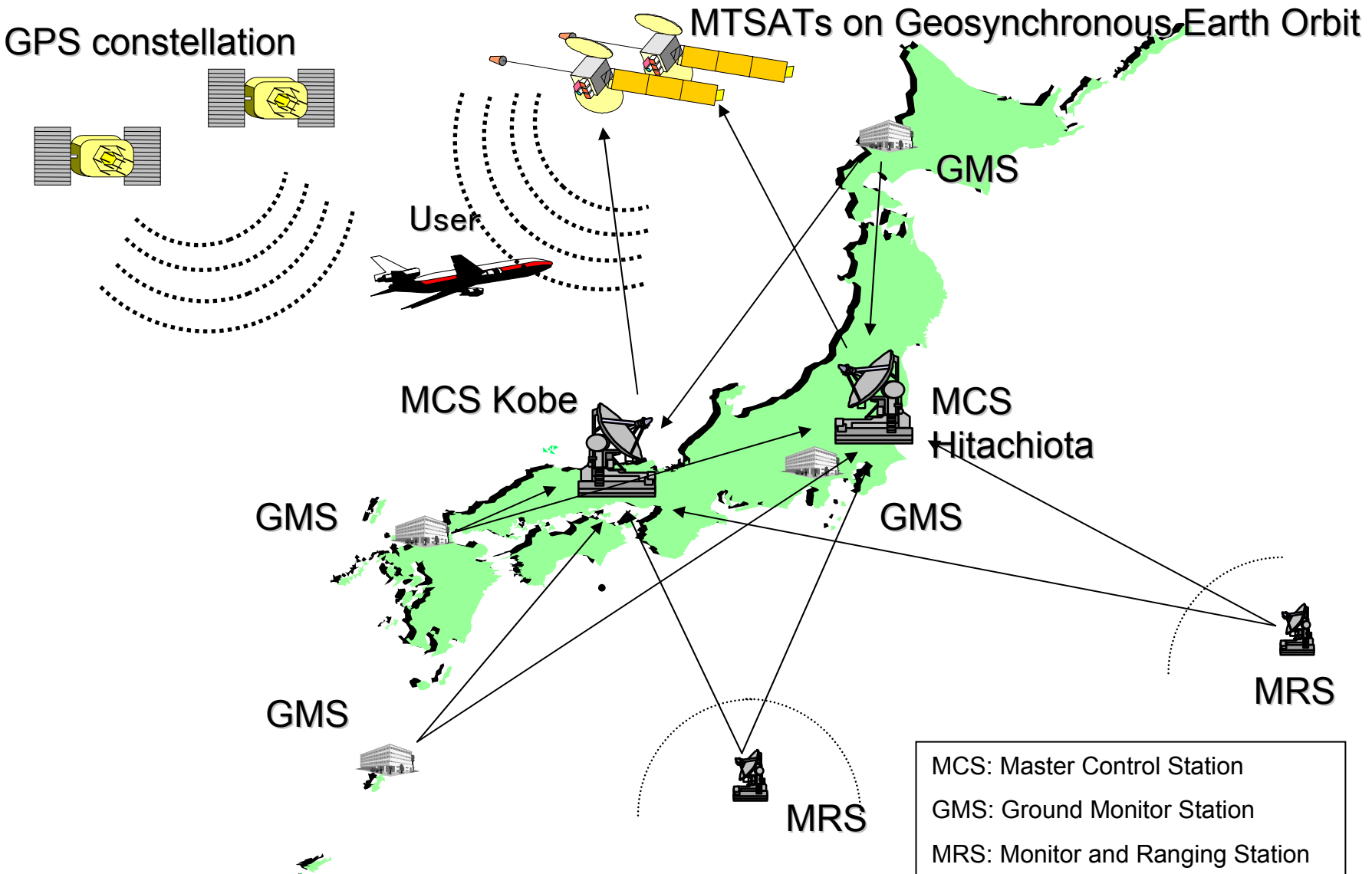
Overview of MSAS

MTSAT Satellite-based Augmentation System For ICG-4

Office of Aeronautical Satellite Systems
ATS Engineering Division
Japan Civil Aviation Bureau

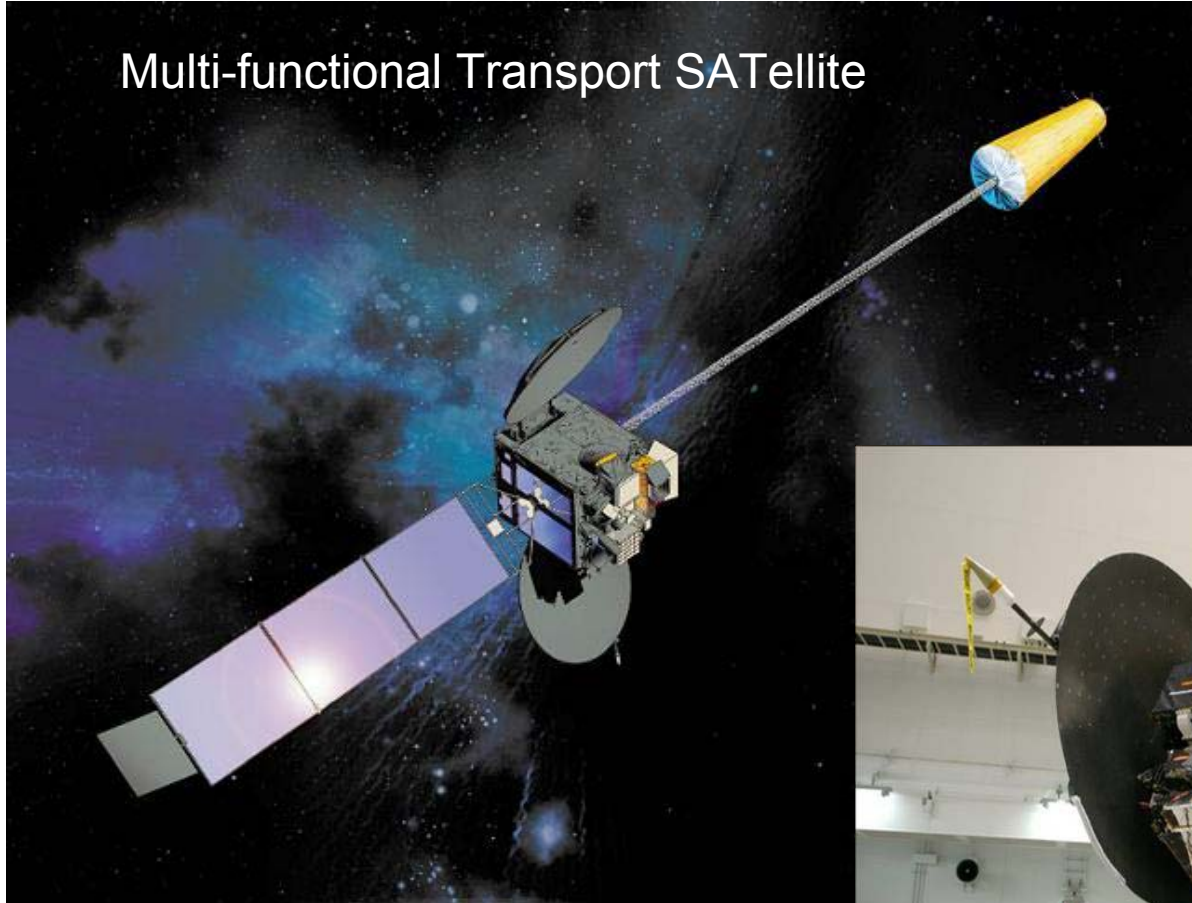


1. Configuration of MSAS



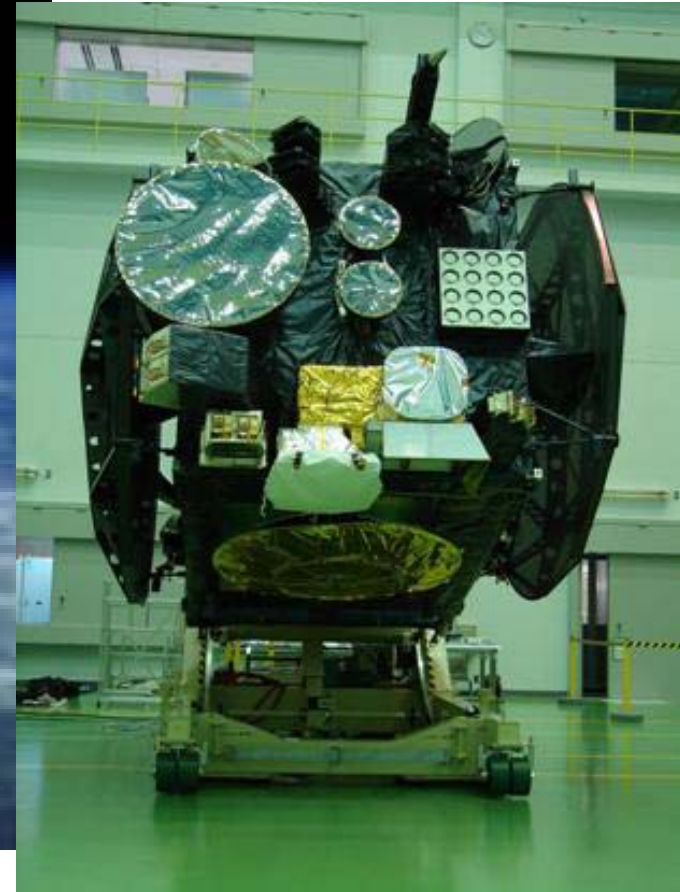
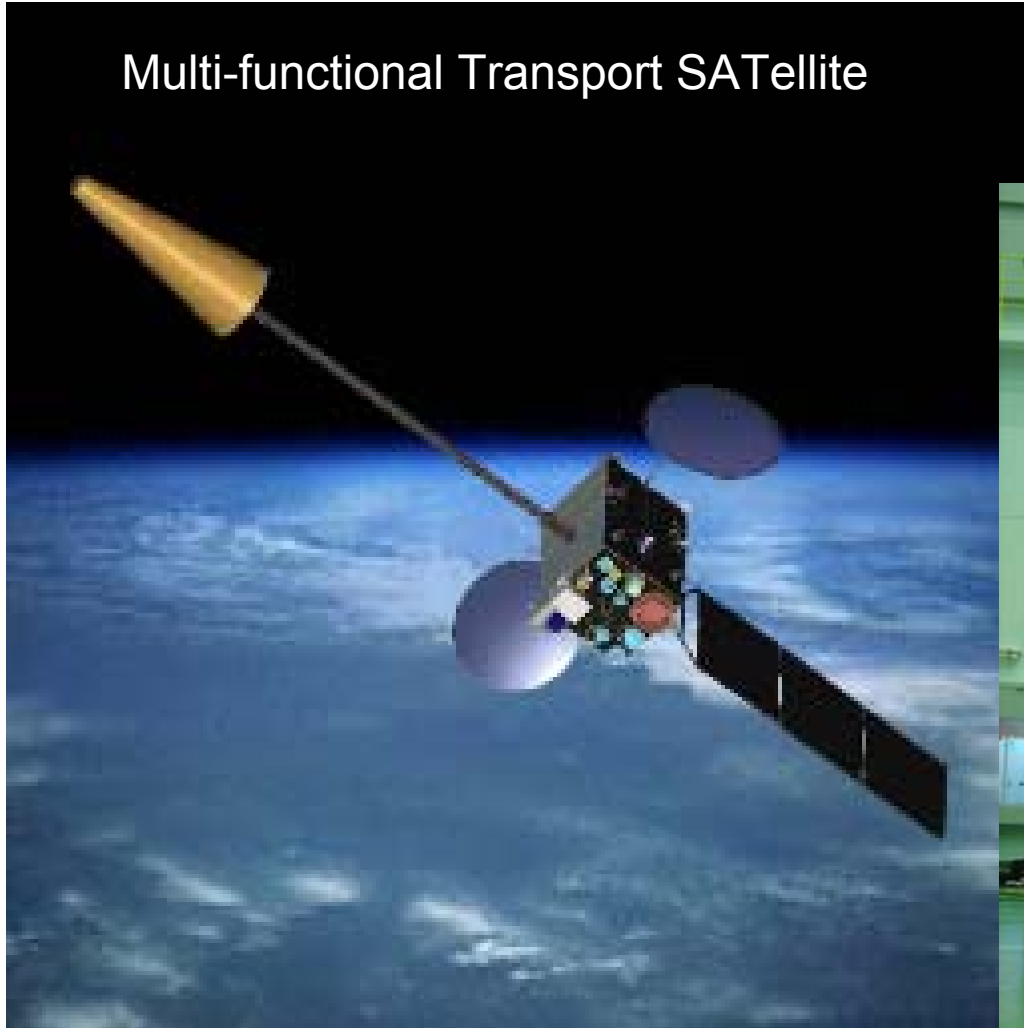
1. A. Space Segment(1/2) MTSAT-1R @140E

Multi-functional Transport SATellite

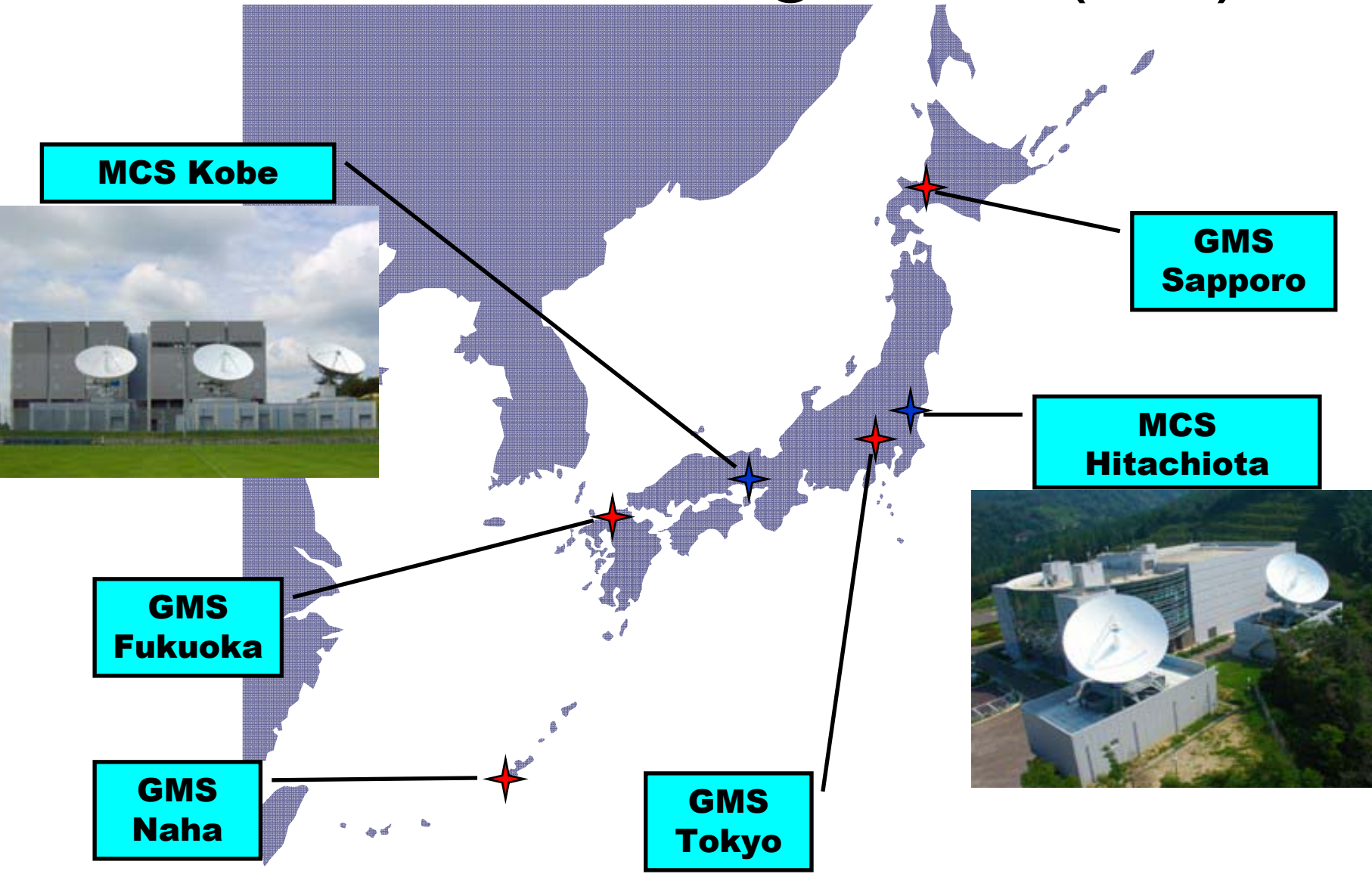


1.A. Space Segment(2/2) MTSAT-2 @145E

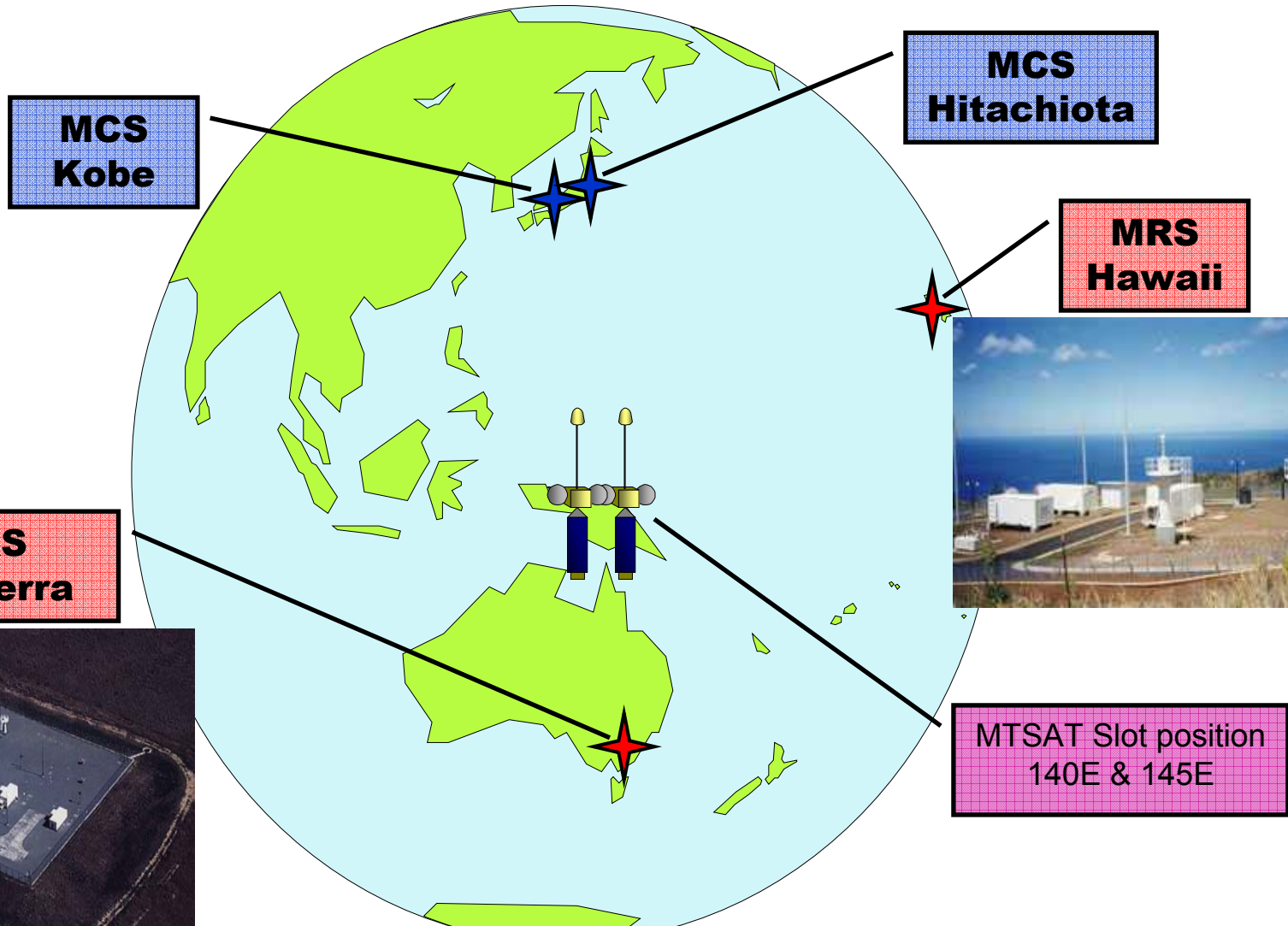
Multi-functional Transport SATellite



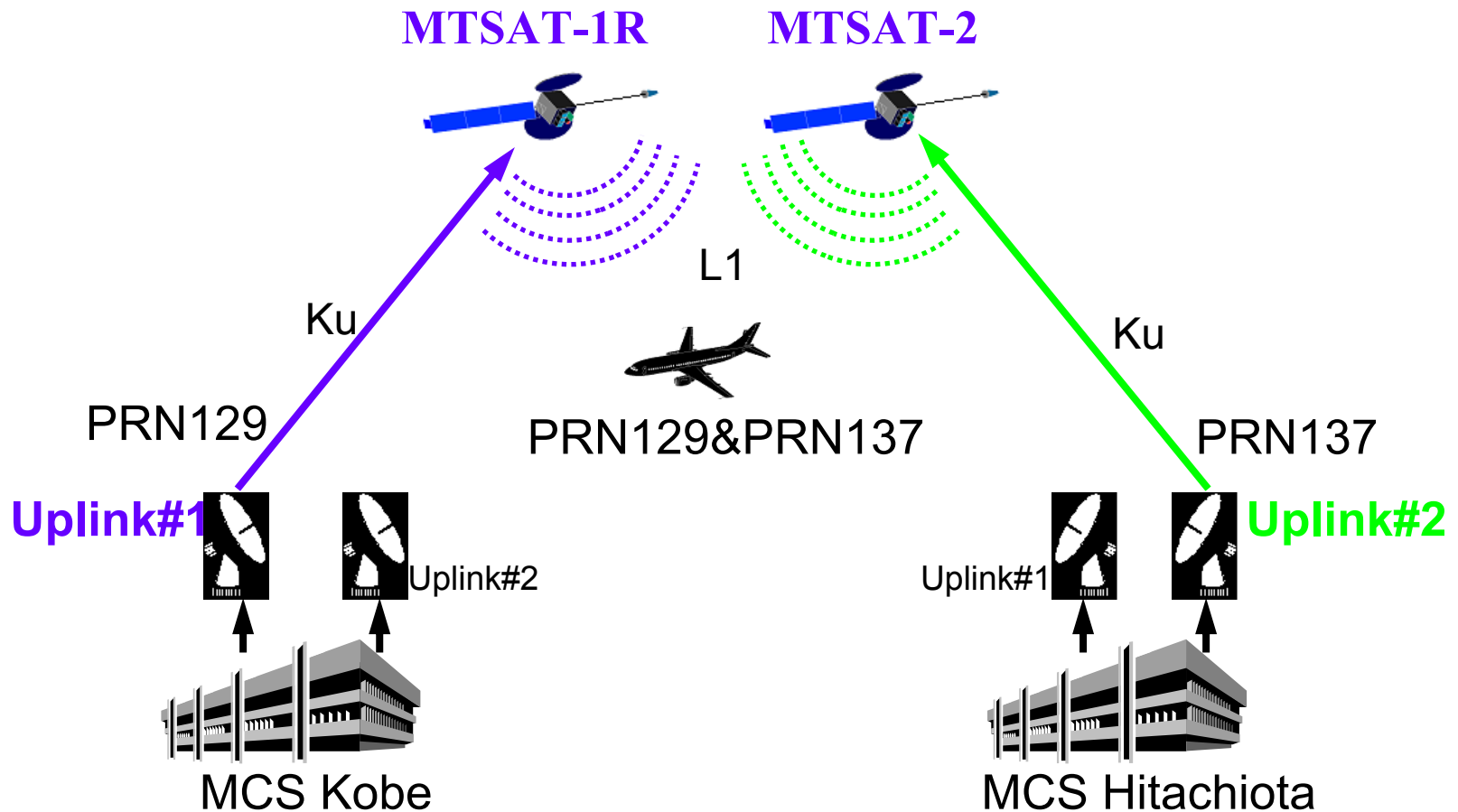
1.B. Ground Segments(1/2)



1.B. Ground Segments(2/2)



1.C. Signals –PRN code



1.C. Signals -specifications

- Signal characteristics are compliant with ICAO SARPs (See paragraph 3.7.3.4.4.)
 - Frequency ; L1 1575.42MHz
 - Band width ; 2.2MHz
 - 500 BPS FEC
 - Signal strength on the earth surface $>-161\text{dBw}$
- Planned signals
 - Band width expansion for L1
 - L5 signal



1.D. System time and geodetic reference frame

- MNT(MSAS Network Time)
 - Difference from GPS time is always kept less than 50ns (nano-second).
- WGS-84 is used.



1.E. Performance

-Required & observed-

For Non-precision approach

- Horizontal Accuracy (95%)
 - Required : Less than 220m (with SA on)
 - Observed value is less than 2.2m
- Integrity (Probability of HMI)
 - Required : Less than 1×10^{-7} /hour
 - Fault Tree Analysis leads 0.903×10^{-7} /hour
- Availability
 - Required : More than 99.9%
 - Observed : 99.926%



2. Service provision

- Service for air navigation
 - 24hours a day, 7days a week
 - Operational Information is provided as NOTAM
 - Service Interruption, degradation of service
 - Use for En-route through Non Precision Approach phase of flight
 - Performance improvement plan is now under consideration



2. Service Provision

- System is operated and maintained by certified specialists
 - MSAS and MTSATs
 - JCAB has a direct responsibility for entire operation of MSAS and MTSATs

3. Compatibility & Interoperability

- Compatibility and interoperability are achieved by those activities;
 - Participating and discussing on the SBAS Technical Interoperability Working Group (IWG).
 - Participating and discussing on the ICAO Navigation System Panel meeting (NSP).



4. GNSS Spectrum Protection Activities

- A. National-level spectrum regulation is achieved by other ministry.
- B. Interference detection and mitigation work also.

