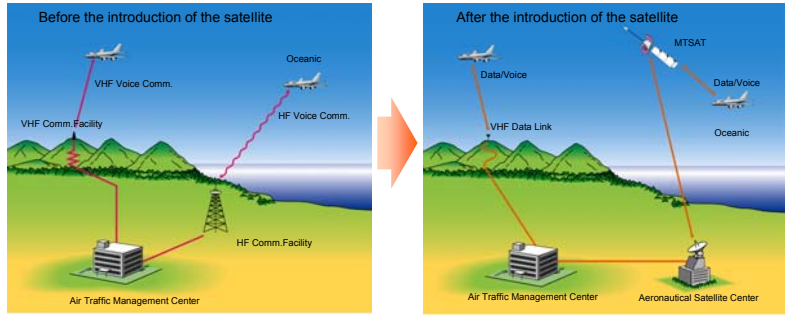
2. MTSAT Functions

The aeronautical mission functions of the MTSAT are as follows;

(1) Communication Functions

At present, VHF and HF voice communications are used in domestic and oceanic airspaces respectively, between aircraft and the ATC facilities. In VHF communications however, lower altitude aircraft sometimes experience the blinded areas due to line of sight limitation and other topographical obstacles. Also in HF communications, the problems are the shortage of channels as well as unstable communications inherently relying on the ionospheric layer conditions; it is sometimes difficult to set up a communication channel to utilize the ionospheric layer reflection.

In contrast to above, the communication functions of MTSAT in the CNS/ATM system will enable the connection between the aircraft and ATC facilities via the satellite, eliminating such topographical effects as the blinding by mountains. Moreover, the communication quality will be improved to a great extent compared with the case of HF; communication capacity will be increased by use of data communication technology, enabling the direct transmission of weather data, NOTAM (aeronautical information), and flight plan to the onboard FMS (flight management system). The contents of the communication can be confirmed on the display, thus preventing miscommunications.



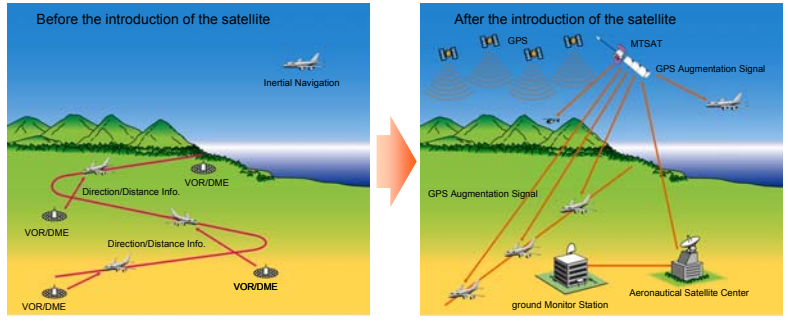
(2) Navigation Functions

The GPS system is a satellite based system for position determination, rapidly expanding its utilization today in various areas including the car navigation. In order to utilize the GPS system as a navigation means in the field of civil aviation, high reliability and accuracy have to be realized; GPS alone cannot satisfy the requirement for this. Therefore, such augmentation system is required to improve the performances in the following four elements:

- Integrity (provision of GPS defective information)
- Accuracy
- Service Continuity
- Availability (the degree of safe utilization for the aeronautical service)

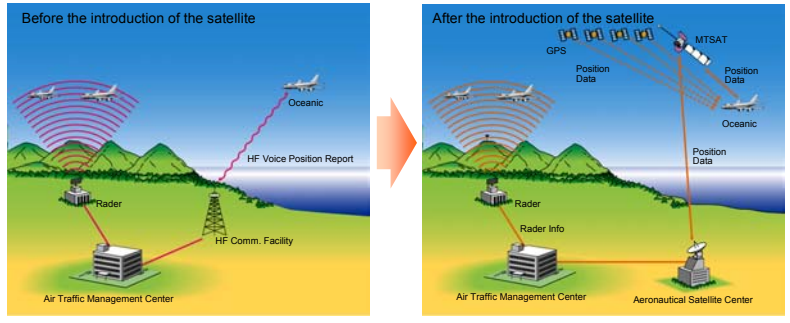
[MSAS Overview]

MSAS (MTSAT Satellite-based Augmentation System) is a system to provide the augmentation information to improve the reliability and accuracy of GPS via MTSAT for the aircraft utilizing the GPS position information for their navigation. Unlike the conventional navigational means such as VOR or DME, it can be utilized to cover a wide range of oceanic and ground areas making it possible to set up flexible flight routes.



(3) Surveillance Functions

In the present system, the aircraft positions are monitored in real time when the aircraft is within the coverage of the ground surveillance radars. Outside the radar coverage such as over the Pacific ocean, the aircraft position is confirmed by the verbal position report given by the aircraft pilot. In contrast to this, the CNS/ATM system will utilize the Automatic Dependent Surveillance (ADS) function, which is for the aircraft to send its own position information obtained by using the positioning satellites, GPS and MSAS, to the ground ATC facility via MTSAT, for more accurately monitoring the positions of aircraft flying the oceanic routes outside of the radar coverage. This function can contribute to the reduction of workloads of the pilots as well as the controllers, improving the aircraft surveillance capabilities for achievement of higher safety. This function is required for increased air traffic volume and for the selection of optimum flight course within a limited time and space availability.



3. Aeronautical Satellite Center

The Aeronautical Satellite Center has been facilitated for the monitoring and control of MTSAT's position, attitude, and operational conditions; it also has the function to relay the ATC / data communications between aircraft and the ACC facilities via the MTSAT in addition to the generation and provision of the augmentation signal for the satellite navigation. Two Aeronautical Satellite Centers are located at Kobe and at Hitachi-Ota, considering the continuity and reliability of the operation.

Kobe Aeronautical Satellite Center

Hitachi-Ota Aeronautical Satellite Center