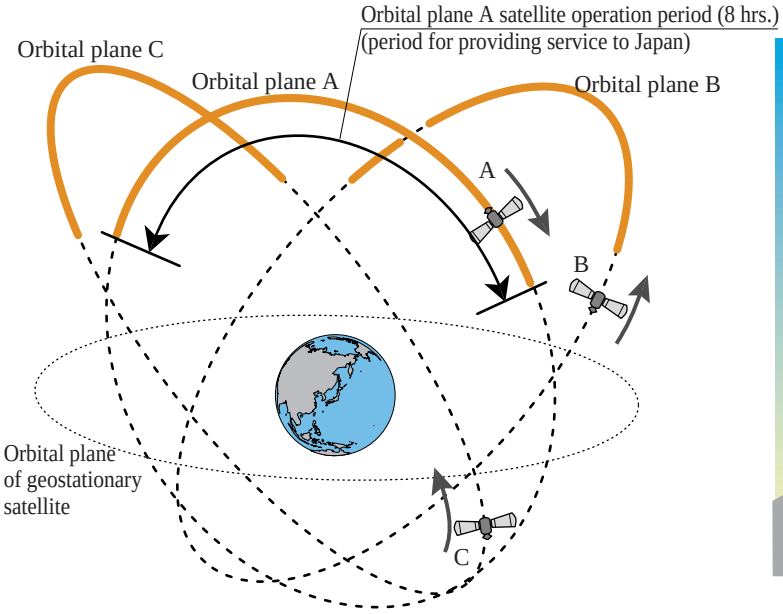
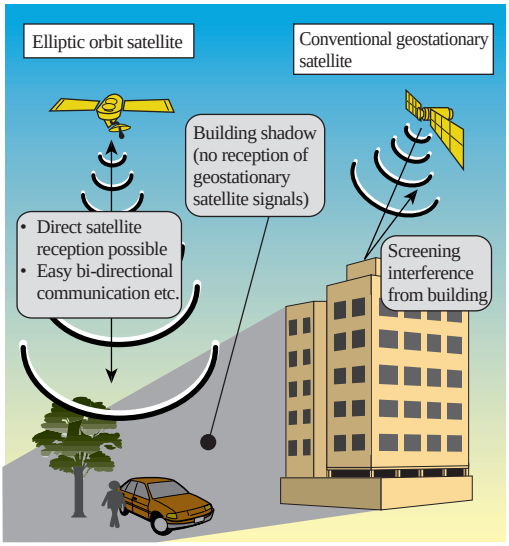
Elliptic Orbit Satellite System

(This paper first appeared on Hitachi Technology 2000, p. 44, 2000 published by Hitachi, Ltd.)





A next-generation satellite broadcast system comprising three satellites in elliptical orbits. The system brings high-quality picture and voice data to mobile units (e.g. automobiles) with minimal screening interference.

Hitachi, Ltd. has developed the “Elliptic Orbit Satellite System” (ES System) which employs three satellites moving in different elliptical orbits. The satellites have overlapping 8-hour usage periods to provide service on a 24-hour-a day basis, with one of the satellites always nearly directly over Japan (minimum angle of elevation 70, for Tokyo 80).

Principal features are as follows.

(1) Due to the satellites’ high angle of elevation, screening interference from mountains and skyscrapers is minimized. Signals can be received directly from satellites; thus as a general rule uniform nationwide service can be provided without the use of ground repeaters.

(2) Signals can be directly transmitted from terminal to satellite; thus bi-directional communication networks can be easily constructed.

(3) Pure radio wave propagation routes are used, minimizing multiple reflection waves and enabling signal intensity fluctuation to be greatly reduced.

(4) Reception antenna beam can be restricted to the upper-sky direction; thus antenna gain can be increased.

Furthermore, the range covered by the system will include Australia and Southeast Asia, and this creates possibilities for joint use of the system as a satellite infrastructure for these areas as well.

Conventional satellite broadcasting employs geostationary satellites orbiting above the equator. As a consequence, the satellites’ angle of elevation relative to Japan is only 45, and in some cases signals cannot be received due to screening interference from southward-facing mountains and buildings. And in some cases the reception antenna of cars or other mobile units must always be facing southwards for signals to be received. With the ES System, however, this problem is solved since one of the system’s satellites is always nearly directly above Japan.

The 21st century will see full-scale development of digital broadcasting and communication services, and there will be a wide variety of ways of accessing these services-from homes, from cars, from mobile telephones. We can also expect to see a fusing of today’s image environment—chiefly represented by television—and today’s data environment-chiefly represented by personal computers-into one environment encompassing media of all types. In such an environment, the ES System can be expected to find widespread application as an integrated digital broadcast/communications system, bringing a wide range of uses to the people of Japan, whether they are at home or on the move somewhere.

Hitachi today is working hard-in cooperation with other companies and government agencies—to complete the system construction and make it available to users both within and outside Japan.

REFERENCES

(1) “Satellite Infrastructure and New Services,” Hitachi Today (May/ June 2000)
(2) H. Kondo et al., “Digital Broadcasting Systems for ITS” (November 2000) (to appear)