

2.2 Space-to-Space Weapons Situation (Continued)

simplified by the fact that they do not need to track the satellite as it crosses the sky. In addition, the high altitude of the orbit enables the satellite to view all but the extreme edges of the hemispherical disk of the earth. Three equally spaced satellites about the earth's equator are required to view all of the earth except for the extreme polar regions.

Because the geosynchronous orbit does not provide clear line of sight to installations in high Arctic regions, an alternative orbit is employed. A highly elliptic orbit inclined at approximately 63° to the earth's equator with its apogee positioned over the Northern Hemisphere, permits 8 or more hours of its 12 hour period to be within a clear line of sight of the North Polar region. An inclination of 63° is critical to the maintenance of the apogee above the Northern Hemisphere, as gravity anomalies caused by the non-spherical shape of the earth tends to disturb the orbit from this optimal alignment. Ground stations in this case need mechanisms to steer the communications antenna as it follows the motion of the satellite in the sky.

Another circular orbit with a 12 hour period is utilized exclusively by navigation satellites. This semi-synchronous orbit is also inclined at approximately 63° to null the effect of the earth's gravitational aberration. A constellation of 6 satellites equally spaced in three such orbits also equally positioned about the earth, enable a number of satellites to be visible to an observer on the ground at any one time. This multiplicity of observable satellites, enables an observer to calculate his position in three dimensions to a high degree of accuracy. The American Global Positioning System (GPS) enables a position fix to be calculated with an error less than 10 meters.

The fourth orbital domain is the range of orbits classified as Low Earth Orbit (LEO). An orbit is defined to be a LEO orbit simply if the altitude of the orbit is less than 3,000 km. However, most satellites of interest to antisatellite weapons in this domain lie between the inclinations of 50° to 105° and altitudes between 160 km and 1,500 km.