- a = the semi-major ellipsoid axis.
- GM = the Geocentric Gravitational Constant.
- J_2 = Zonal spherical harmonic coefficient of second degree.
- w = the earth's angular velocity.

The ellipsoid flattening or eccentricity, the second parameter required for geometrical geodesy, can be computed from the 4 physical geodesy parameters, see equation (12-45) Burkholder (1987).

The North American Datum of 1983 (NAD83) is a global geodetic datum and based upon the Geodetic Reference System of 1980 (GRS80) ellipsoid. Other global geodetic datums include datums implemented by the U.S. Department of Defense such as the World Geodetic System of 1972 (WGS72) and the World Geodetic System of 1984 (WGS84).

An important point made earlier is that GPS operations are defined in the WGS84 system but the NAD83 is based upon the GRS80 ellipsoid. Although the two ellipsoids are not identical, they are very nearly so and GPS data can be used with NAD83 coordinates without making a datum correction or transformation, see Chapter 22 Schwarz (1989).

<u>Reasons for Adjusting the NAD 27:</u> National Academy of Science (1971)

- **Quality observations were being forced to fit inadequate network.**
- **The triangulation arc to Alaska was not completed until World War II and was not included in NAD27 network computation/adjustment.**
- **Azimuth control throughout the network was found to be deficient.**
- **Many NAD27 control stations have been lost or destroyed.**
- **Relative tectonic plate movements up to 5 cm per year have been observed.**

The project to readjust the NAD27 was formally begun by the National Geodetic Survey in 1974 and completed in July 1986. The name of the new datum, North American Datum of 1983, springs from the anticipated completion date when the project was started.

