Often referred to as the correction or adjustment for curvature, the effect can be very large at higher latitudes. For example:

> At latitude 45° N., it is 52" (seconds) per mile of departure. The adjustment for curvature, at the midpoint of a parallel of latitude line 1 mile in length, at latitude 45° is 0.3 lks. dist.
>
> For latitude 70° N., it is 2' (minutes) 23" (seconds) per mile of departure. The adjustment for curvature, at the midpoint of a parallel of latitude line 1 mile in length, at latitude 70° is 0.7 lks. dist.

Convergency of Meridians

2-19. The linear amount of the convergency of two meridians is a function of their distance apart, the length of the meridian between two reference parallels, the latitude, and the spheroidal or ellipsoidal form of the earth's surface.

The following equation is convenient for the analytical computation of the linear amount of the convergency on the parallel, of two meridians any distance apart, and any length. The correction for convergency in any closed figure is proportional to the area and may be computed from an equivalent rectangular area.

Curvature and convergency can be computed as follows:

e = Factor of eccentricity

$$e = \sqrt{1 - \frac{b^2}{a^2}}$$

Using constants for the Clarke Spheroid of 1866 as an example, then:

a = 6378206.4 meters Ellipsoid semi-major axis

b = 6356583.8 meters Ellipsoid semi-minor axis

Then we find:

R_p = Radius of parallel at base latitude (same units as a).

$$R_p = \frac{a}{\tan(\Phi)\sqrt{1 - e^2 \sin^2(\Phi)}}$$

Note that:

C = Curvature in degrees for difference in departure "m_λ".

$$C = \left(180°/\pi\right)\left(m_\lambda/R_p\right)$$

Finally, given a cardinal figure with the dimensions:

m_λ = Measurement along the parallel.

m_Φ = Measurement along the meridian.

dm_λ = Linear convergency of meridians.

The formula for computation of the linear convergency of meridians dm_λ is:

$$dm_\lambda = \frac{m_\lambda m_\Phi}{R_p}$$

The results are in the same units as the arguments, where the units for all arguments are the same.

Lengths of Arcs of the Earth's Surface

2-20. All computations involving a difference of latitude for a given measurement along a meridian or the converse calculation, or other computations involving a difference of longitude for a given measurement along a parallel, require the computation and reporting of the distance as a latitudinal arc length.

Distance measurements are reduced to horizontal and reported at the mean elevation of the line above sea level. As defined within the framework of a geoid model, this would be analogous to a horizontal line reported at the mean orthometric height of a line. The length of a line as reported in the PLSS datum reflects the degree or increment of curvature applied to the line.

Geometric Effects and Apparent Misclosure

2-21. As stated earlier, the basis of bearing for the PLSS is not rectangular. As a result, the use of plane survey computations to lay out or evaluate PLSS surveys requires special knowledge of how to properly interpret and apply the results. Attempting to use plane computational methods creates a geometric effect called the "apparent misclosure due to meridional convergence." In the PLSS datum, if all measurements for a survey