

# Basic Geodesy

Issue 9

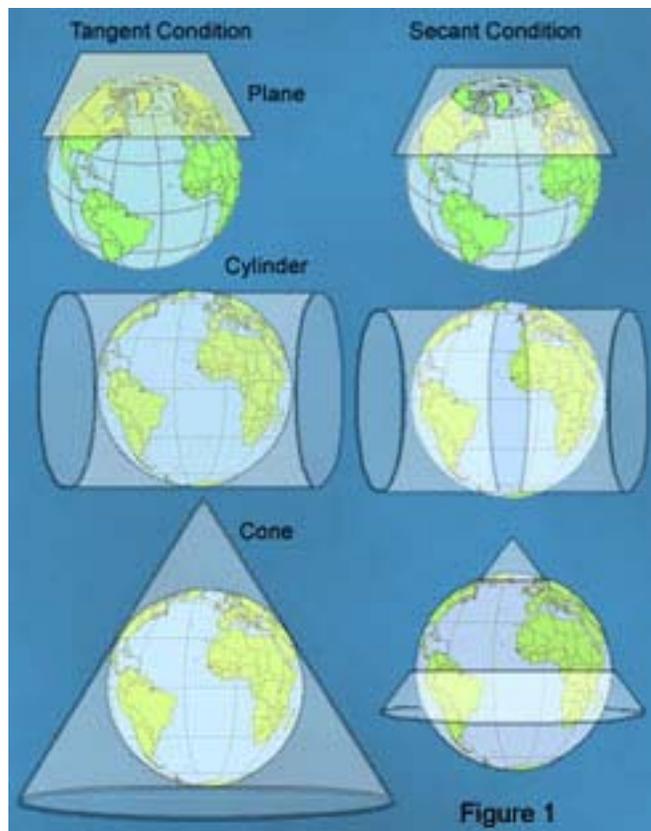
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## Projection Surfaces

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As discussed in the previous basic geodesy article, there are always distortions when an ellipsoidal surface, such as the earth, is projected onto a flat sheet of paper. This projection surface can be shaped into a flat plane, a cylinder, or a cone as demonstrated in Figure 1. The projection surface may touch the earth at only one point or one line (tangent condition) or may extend through the earth's surface (secant condition) as also shown in Figure 1.

The secant condition is preferred for mapping and charting. Distortions are minimized by bounding an area of interest.



Depending on the projection being used and what properties are desired on the final product, the “origin of the projecting lines” is determined. In Figure 2, the origin of the projecting lines is represented by a light bulb inside a hemisphere of a globe. The light rays (projecting lines) from the light bulb projected through the earth would result in the lines of latitude (parallels) and longitude (meridians) shown in the top portion of the figure. The bottom portion of the figure shows how the features would appear on a worldwide Mercator chart after the cylinder is “cut” open. (NOTE: These diagrams are only used to help visualize mapping concepts. Projections used by NGA are actually mathematical projections instead of geometric projections as shown.)

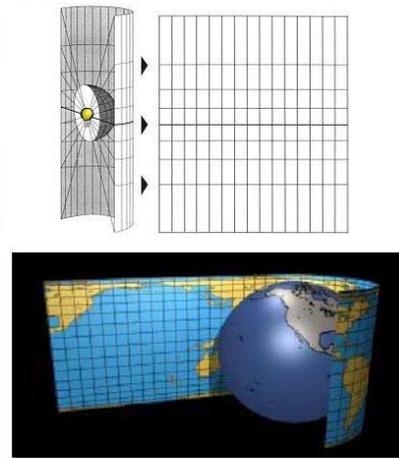


Figure 2

The above diagram came from the National Geospatial-Intelligence College.

## Mercator Projection

The next article will be the first in a series of articles to discuss in more detail the four projections (Mercator, Transverse Mercator, Polar Stereographic, and Lambert Conformal Conic) that are predominately used for NGA products. The first article will discuss the Mercator projection that is used for most NGA produced hydrographic charts.