

Chart Projections

A chart projection is a way to project the earth's surface, which is spherical, onto paper, which is flat. So there will always be distortion. The navigator must know the different types of chart projections and the principles of their constructions, so that the chart projection that will have the least possible distortion for a particular area can be chosen.

Types of Projections

- Gnomonic
- Lambert Conformal
- Mercator
- Polar Stereographic
- Polyconic.

Each projection has its own advantages and disadvantages. The most popular for navigational charts are the Gnomonic and Mercator projections. Gnomonic charts are usually used for the Polar Regions, while Mercator charts are usually used for the remaining areas on earth.

Gnomonic Chart

A Gnomonic chart, sometimes called a "Great Circle Chart", is constructed on the gnomonic projection. It is a geometrical projection in which surface features and the reference lines of the sphere are projected outward from the center of the earth onto a tangent plane. A Gnomonic chart is often used to transfer a great circle to a Mercator chart.

Advantages

- A great circle is drawn as a straight line;
- Distortion is tolerable within 1,000 miles of the point of tangency;
- The polar region can be shown.

Disadvantages

- It is not conformal (orthomorphic), so the true shapes are presented only near the region of tangency;
- Rhumb lines cannot be drawn as straight lines;
- Distance and direction cannot be measured directly.

Mercator Chart The Mercator is the projection most widely used in marine navigation, except for the areas of the poles. It is a cylindrical projection. Imagine a cylinder rolled around the earth, tangent at the equator, and parallel to the earth's axis. Meridians appear as straight vertical lines when projected outward onto the cylinder from within the earth. The amount of lateral distortion steadily increases with distance from the equator. Consequently, the latitude scale must be expanded to maintain true shape. The latitude scale is expanded mathematically on all Mercator charts.

- Advantages*
- It is orthomorphic; therefore, the navigator can see the shape of the land correctly on the chart.
 - Position, distance, and direction can all be easily determined. The distance can be measured from latitude scale.
 - The meridians and parallels are always at right angles; therefore, the rhumb line can be drawn as a straight line on the chart.

- Disadvantages*
- Great circles cannot be drawn as straight lines.
 - The higher latitudes are stretched, so that the shape of the land further north is stretched vertically.
 - The areas near the poles cannot be shown on the chart.