**Navigation Charts**

Navigation Charts are designed to be as useful as possible for the purpose of navigation.

There are three basic properties that are important as follows:

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| **Conformality****(Orthomorphism)** | Angles on the chart should be accurately presented in relation to those on the Earth’s surface. |
| **Scale** | The distance on the chart between one place and all other places should bear a constant ratio to the true distance on the Earth. |
| **Equivalence** | The presentation of area on the chart should be in correct proportion to that on the Earth. |

The following considerations can also be taken into account:

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| **Great Circle** | As the shortest distance between two places on the Earth’s surface is along a Great Circle, it would be convenient to have Great Circles appearing as straight lines. |
| **Rhumb Line** | This is the path followed by an aircraft in flight maintaining a constant heading; therefore it would be convenient if this appeared as a straight line on a chart. |

Properties of the Lambert Conformal Conic projection:

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| **Conformality** | The chart is made conformal by construction and therefore all angles and bearings are accurately portrayed. |
| **Scale** | Although scale varies slightly, contracting inside the standard parallels and expanding outside them, the scale over the whole chart can be taken, for all practical purposes, as constant. |
| **Equivalence** | The chart can be regarded as having the property of equal area. Therefore, the shapes of woods, lakes, etc will appear the same as on the Earth’s surface. |
| **Great Circles** | These can be considered to be straight lines on the chart. |
| **Rhumb Lines** | With the exception of the meridians, rhumb lines will appear as curves concave towards the nearer pole. |

Properties of the Transverse Mercator projection:

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| **Conformality** | The chart is made conformal by construction and therefore all angles and bearings are accurately portrayed. |
| **Scale** | The scale is correct at the central meridian which is used as the datum. Either side of this, it expands; however due to the relatively small area covered on individual charts, the expansion is small. |
| **Equivalence** | Area becomes distorted either side of the datum meridian. |
| **Great Circles** | Although over large distances, Great Circles become complex curves; when small areas are involved, Great Circles are a close approximation to straight lines. |
| **Rhumb Lines** | These are curves concave to the nearer pole |

Properties of the Direct Mercator projection:

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| **Conformality** | The chart is conformal so that all angles and bearings are accurately portrayed. |
| **Scale** | The scale expands away from the equator. |
| **Equivalence** | The chart can only be considered as having areas proportional to the Earth in the vicinity of the Equator. Area becomes increasingly distorted north and south of the Equator. |
| **Great Circles** | With the exception of the Equator and meridians of longitude, all great circles are curves concave to the equator. |
| **Rhumb Lines** | These are straight lines intersecting the meridians at their correct angle so bearings can be accurately measured. |

Lambert Conformal Conic projection model:



Transverse Mercator Projection model:



Direct Mercator Projection model:

