NAVIGATION PART II

"AERONAUTICS WAS NEITHER AN INDUSTRY NOR A SCIENCE. IT WAS A MIRACLE."

REVIEW

COMPASS ERRORS

- A compass has several errors which cause the compass to not point directly to magnetic north.

MAGNETIC DIP

- The earth's lines of force are **horizontal** at the **equator** but become **vertical** towards the **poles**
- Causes the compass to dip in higher altitudes

COMPASS ERRORS

- **Northerly Turning Errors**
  - Error is greatest over the poles
  - Always make sure the wings are level when reading the compass on a north or south heading
  - On turns from **NORTH**, this error will cause the compass to **LAG**
  - On turns from the **SOUTH**, this error will cause the compass to **LEAD**

ACCELERATION AND DECELERATION ERRORS

- There is **no effect** of A&D on **north and south headings**
- When reading the compass on east and west headings, always make sure the airspeed is constant.
- **Acceleration** makes the compass turn **NORTH**
- **Deceleration** make compass turn **SOUTH**

"ANDS"

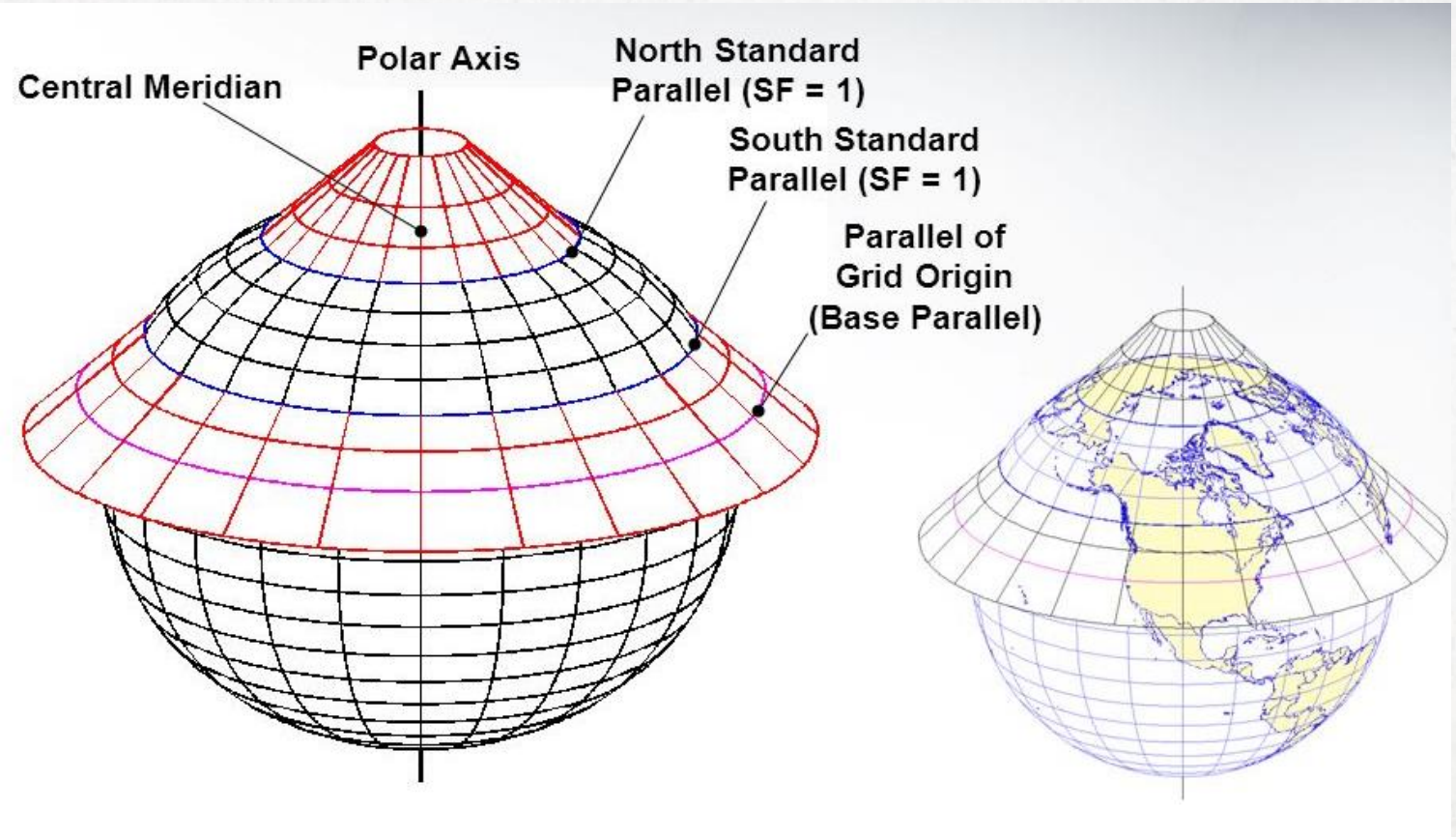
TYPES OF MAP PROJECTIONS

- 3 main types of projections
  - Lambert Conformal Conic Projection
  - Mercator Projection
  - Transverse Mercator Projection

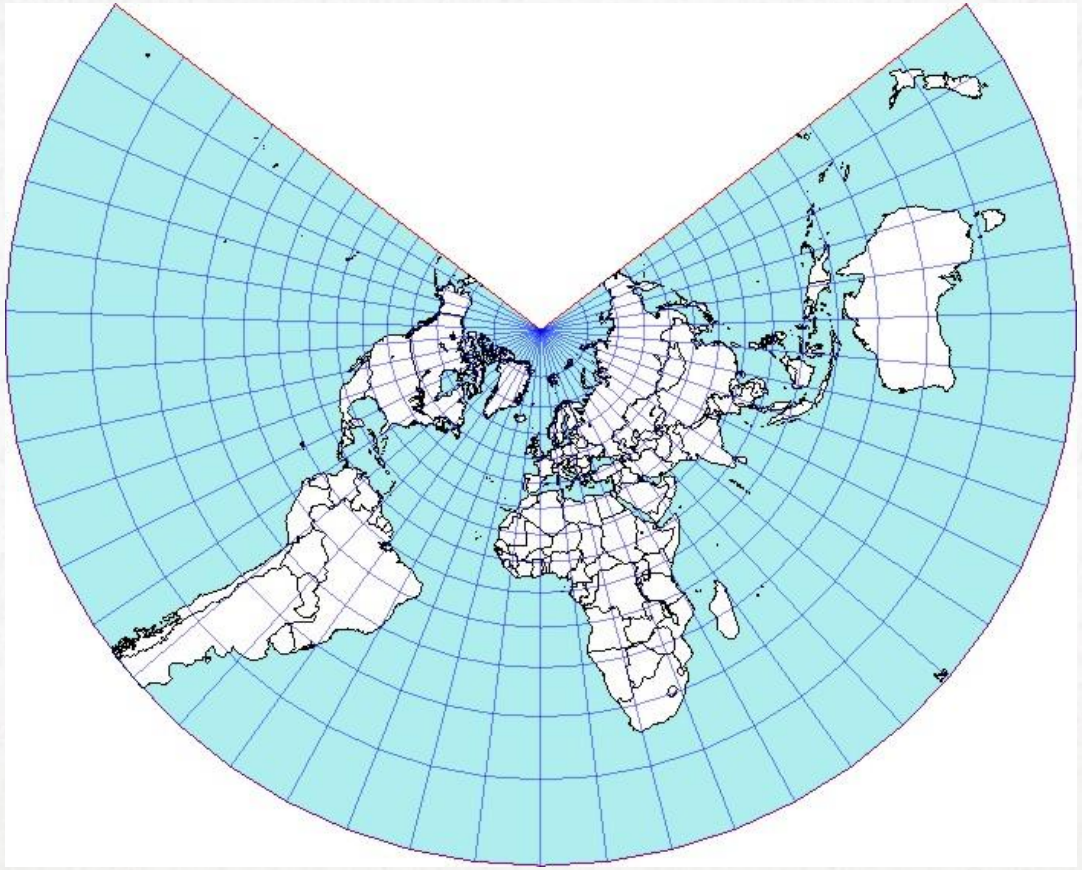
LAMBERT CONFORMAL CONIC PROJECTION

- Concept supposes a cone superimposed over the surface of a sphere
- Properties
  - Meridians of longitude **converse** towards the pole
  - Parallels of latitude are curves which **concave** towards the pole
  - Scale is almost **perfectly uniform**
  - A straight line draw on this map is a **great circle.**

LAMBERT CONFORMAL CONIC PROJECTION



LAMBERT CONFORMAL CONIC PROJECTION



MERCATOR PROJECTION

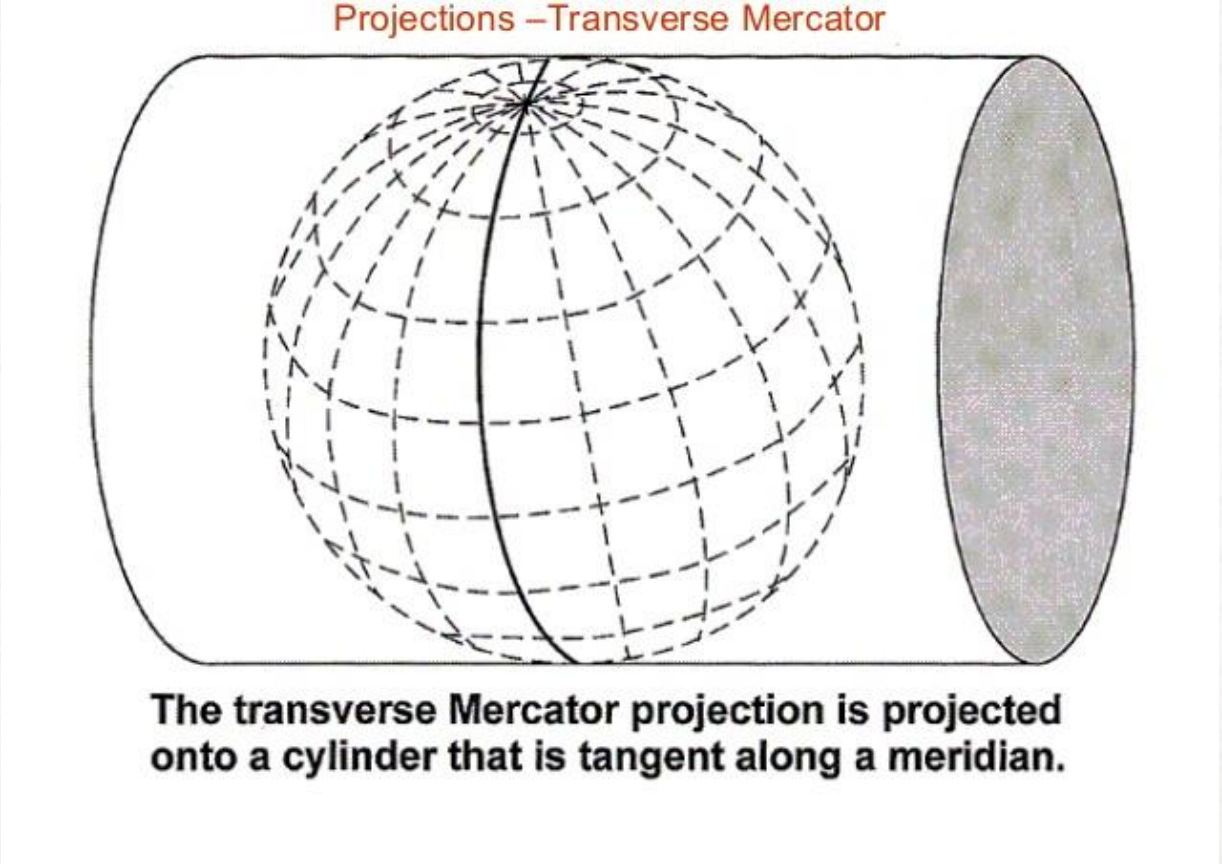
- Based on the fact that a cylinder has its tangency at the equator
- Properties:
  - Meridians of longitude are **straight and parallel**
  - Parallels of latitude are **straight and parallel**
  - There is **no constant scale**
  - A straight line drawn on this map is a **rhumb line**
  - **Extreme exaggeration** of longitude in northerly areas
  - Equator areas are fairly precise.

MERCATOR PROJECTION

TRANSVERSE MERCATOR

- Similar to Mercator Projection except the cylinder is **rotated 90 degrees** so that point of tangency is a meridian of longitude rather than the Equator
- Properties
  - **Quite accurate** at depicting scale
  - Distance is accurate along the meridian
  - Distortion occurs at the **edge of the map**

TRANSVERSE MERCATOR



COMPARISON

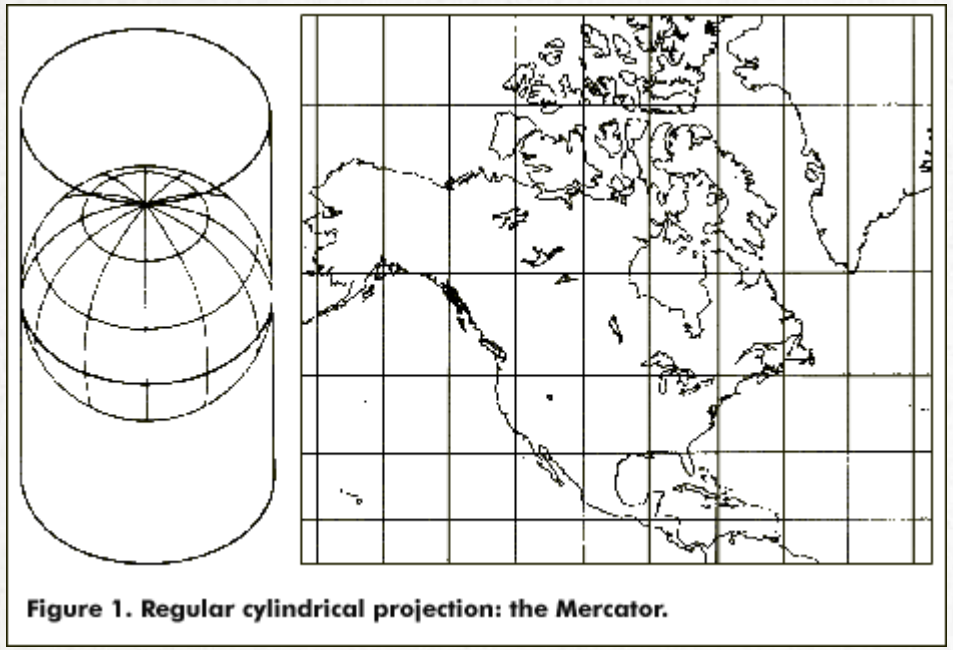


Figure 1. Regular cylindrical projection: the Mercator.

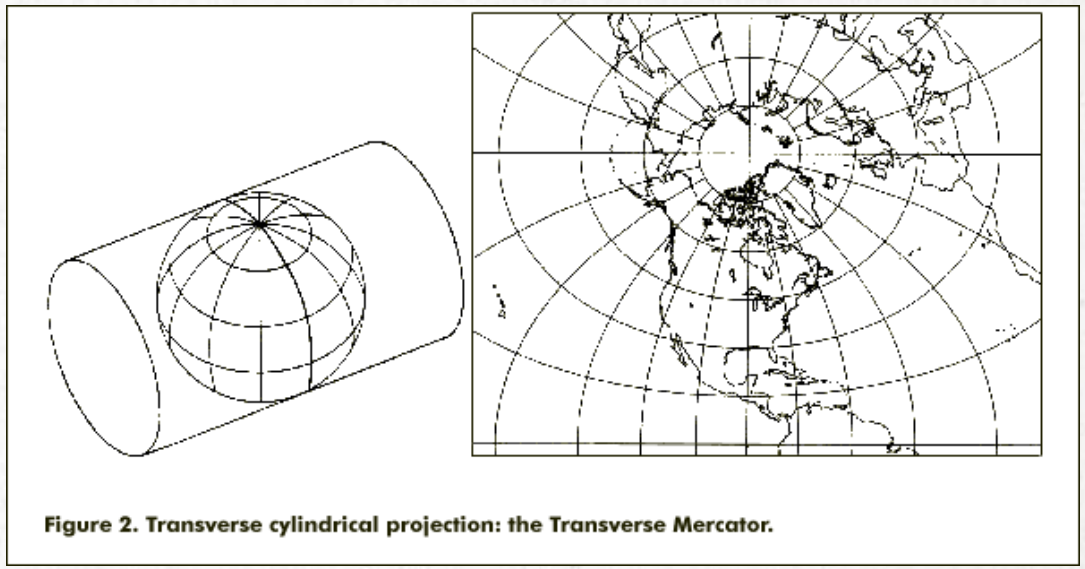


Figure 2. Transverse cylindrical projection: the Transverse Mercator.

CHECKPOINT - *WUN*

- What does a straight line drawn between any two points on **a Lambert Conformal Conic Projection** represent?

AVIATION CHARTS

- **VFR Navigation Charts (VNC)**
  - Depict extensive geographical areas
  - Based on the Lambert conformal conic projection
  - Useful during flight at lower altitude and slower speeds
  - Chart is defined by name of principle landmark
  - **Scale is 1:500 000**

AVIATION CHARTS

- **World Aeronautical Charts (WAC)**
  - Designed for visual navigation at higher altitudes and greater speeds
  - Chart is identified by a letter and number
  - **Scale is 1:1 000 000**

AVIATION CHARTS

- **VFR Terminal Area charts (VTA)**
  - Based on Transverse Mercator projection
  - **Scale is 1:250 000**
  - VTA charts provide detailed information in congested air traffic areas.
  - The **seven** charts of the series cover Toronto, Montreal, Vancouver, Winnipeg, Calgary and Edmonton.

ACTIVITY