

# NAVIGATION PART I

*"THE DESIRE TO REACH FOR THE SKY RUNS DEEP IN OUR HUMAN PSYCHE."*

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# QUICK REVIEW

- What have you learned so far?
    - What is an airplane and how does it fly
    - How to communicate with other planes
    - Rules of flying
    - How to read weather reports
    - How to fly in various weather conditions
    - But...
    - How do you actually know where to go?
    - NAVIGATION!
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# MAPS



- A **map** is a small scale flat surface representation of some portion of the earth's surface.
  - A representation that is designed for plotting navigational information is called a **chart**
  - Maps have some distortion
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# ELEMENTS IN AN MAP



- The mathematical bases on which maps are constructed are termed **projections**.
  - **4 basic elements** that are found in all map constructions
    1. Areas
    2. Shapes
    3. Bearings
    4. Distances
-

# AIR NAVIGATION



- **Pilotage:** navigation by reference only to landmarks
  - **Dead Reckoning:** navigation by use of predetermined vectors of wind and true airspeed and recalculated heading, ground speed and ETA
  - **Radio Navigation:** navigation by use of radio aids
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# AIR NAVIGATION

- **Inertial Navigation:**

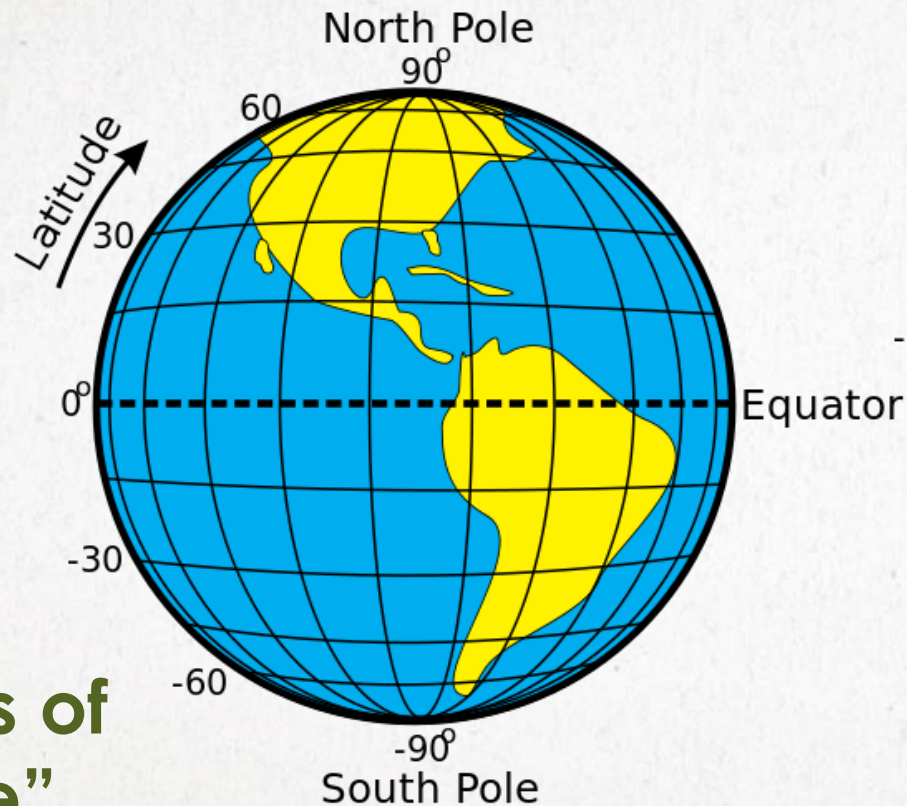
- navigation by self-contained airborne gyroscopic equipment or electronic computers that provide a continuous display of position

- **Satellite navigation:**

- is navigation by use of positioning and guidance system using transmitter and receiver that provide pinpoint positioning accuracy via satellites.
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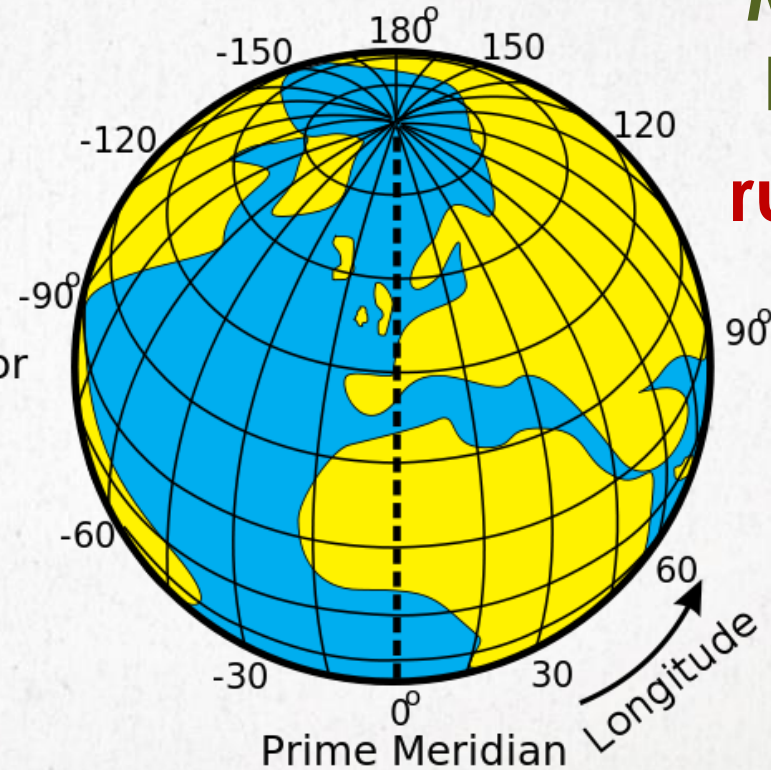


# LATITUDE AND LONGITUDE



“Parallels of  
Latitude”

run North/South



“Meridians of  
Longitude”

run East/West







# UNITS AND CONVERSIONS



- **Nautical mile:** 6,080 feet
- **Statue mile:** 5,280 feet
- **Kilometer:** 3,280 feet

# UNITS AND CONVERSIONS EXAMPLE I

- Q) How long in **feet** is 42 statue miles?
- A)  $42 \text{ statue miles} \times \frac{5280 \text{ feet}}{1 \text{ statue mile}} = 221,760 \text{ feet}$



## UNITS AND CONVERSIONS EXAMPLE II

- Q) How long in **statue miles** is 100 nautical miles?

- A)  $100 \text{ nautical miles} \times \frac{6080 \text{ feet}}{1 \text{ statue mile}} = 608,000 \text{ feet}$

$$608,000 \text{ feet} \times \frac{1 \text{ statue mile}}{5280 \text{ feet}} = 115.2 \text{ statue miles}$$

# T-V-M-D-C



- **T**True North (geographical pole of Earth)
- **V**ariation (difference between True North and Magnetic North)
- **M**agnetic North (north pole that changes constantly)
- **D**eviation (error between Magnetic North and Compass North)
- **C**ompass North (the direction of the needle in a compass points)

“TV Makes Dumb Cadets”

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# T-V-M-D-C RULES



T  
V  
M  
D  
C

*Add: West*  
*Subtract:*  
*East*



T  
V  
M  
D  
C

*Add: East*  
*Subtract: West*

# **T-V-M-D-C EXAMPLES**