

# THE LOST AT SEA ASSIGNMENT



# Lost at Sea Assignment

How do you know where you are?

- You will use **wind patterns and ocean currents** we discussed in lecture.
- Some calculations required for longitude.

# Global Positioning System (GPS)

Provides location (lat, long) and elevation using orbiting satellites.



The smallest GPS modules today are limited in both their ability to transmit and battery life.

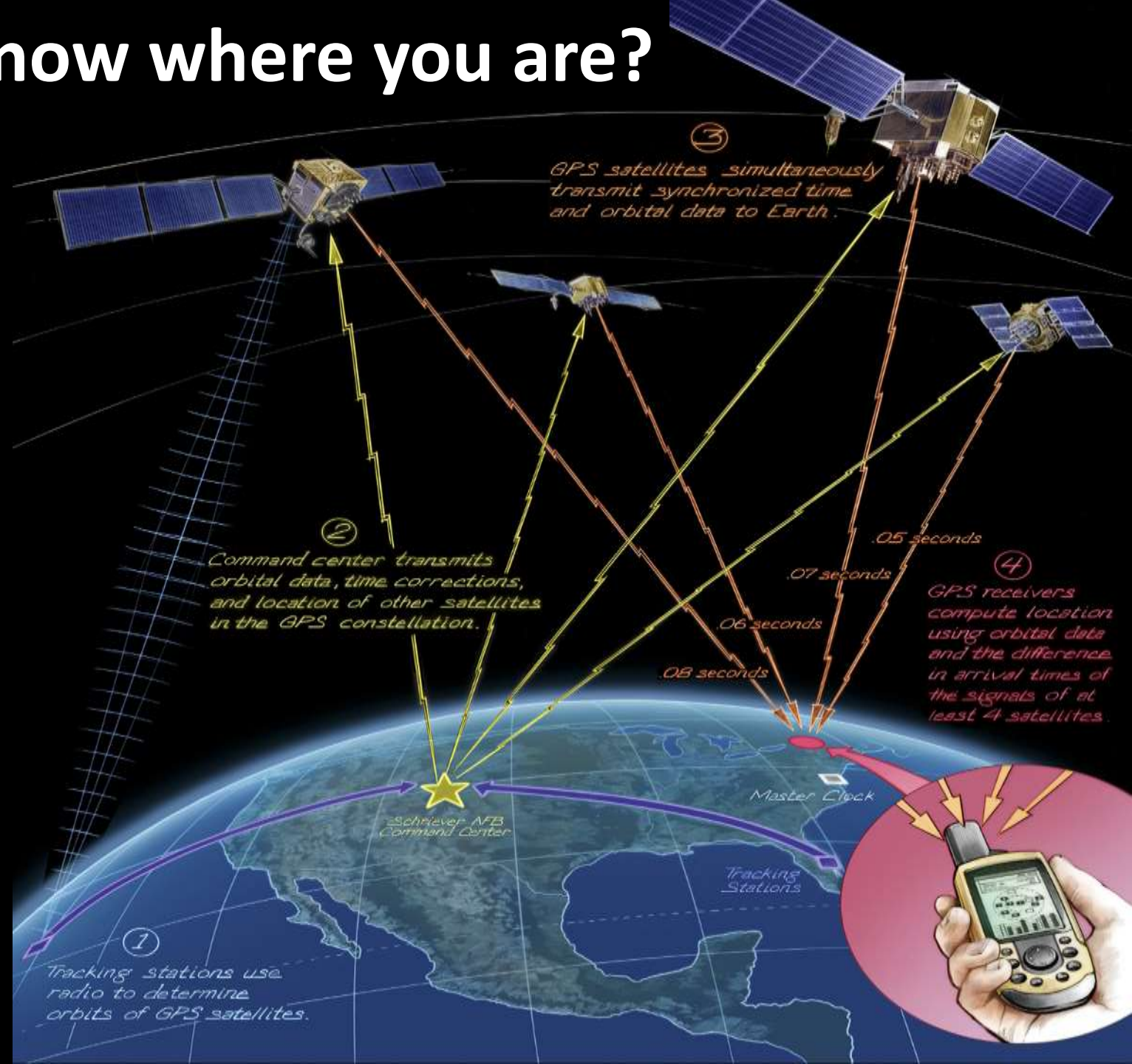


Working well after midnight on July 19, 1977, a Rockwell Collins engineer named David Van Dusseldorp sat on the rooftop of a company building in Cedar Rapids, Iowa, adjusting an antenna every five minutes to receive a signal from the world's first **Global Positioning System (GPS)** satellite, known as **NTS-2**.

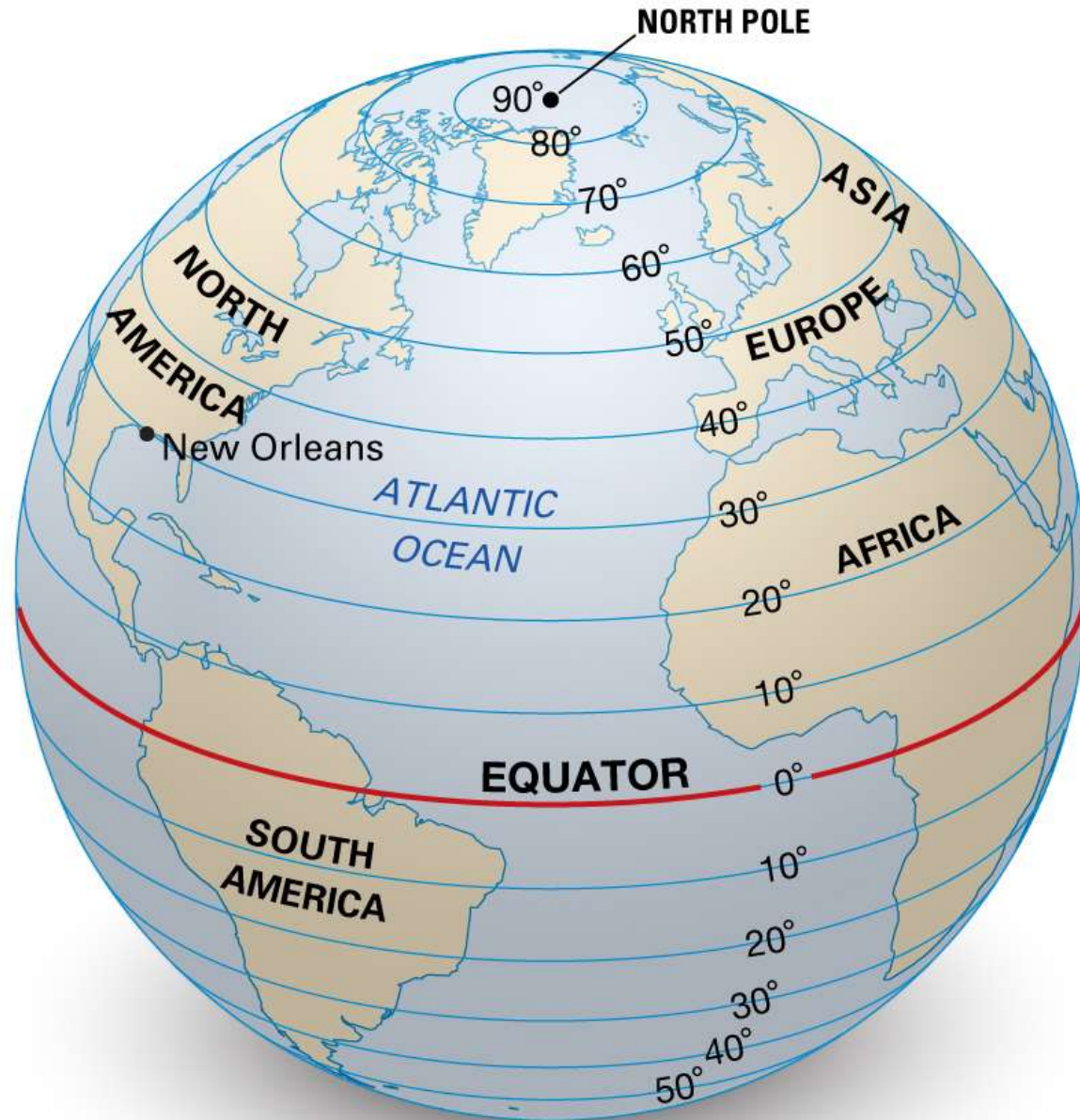
# How do you know where you are?

## One way: GPS

- **31 total GPS satellites** orbit the Earth.
- Of these, 24 are always operational.
- **6 GPS satellites** are always “visible” from your location.
- Satellites continuously transmit their precise location and time.
- GPS receivers pickup the satellite signal and determine location by triangulation.



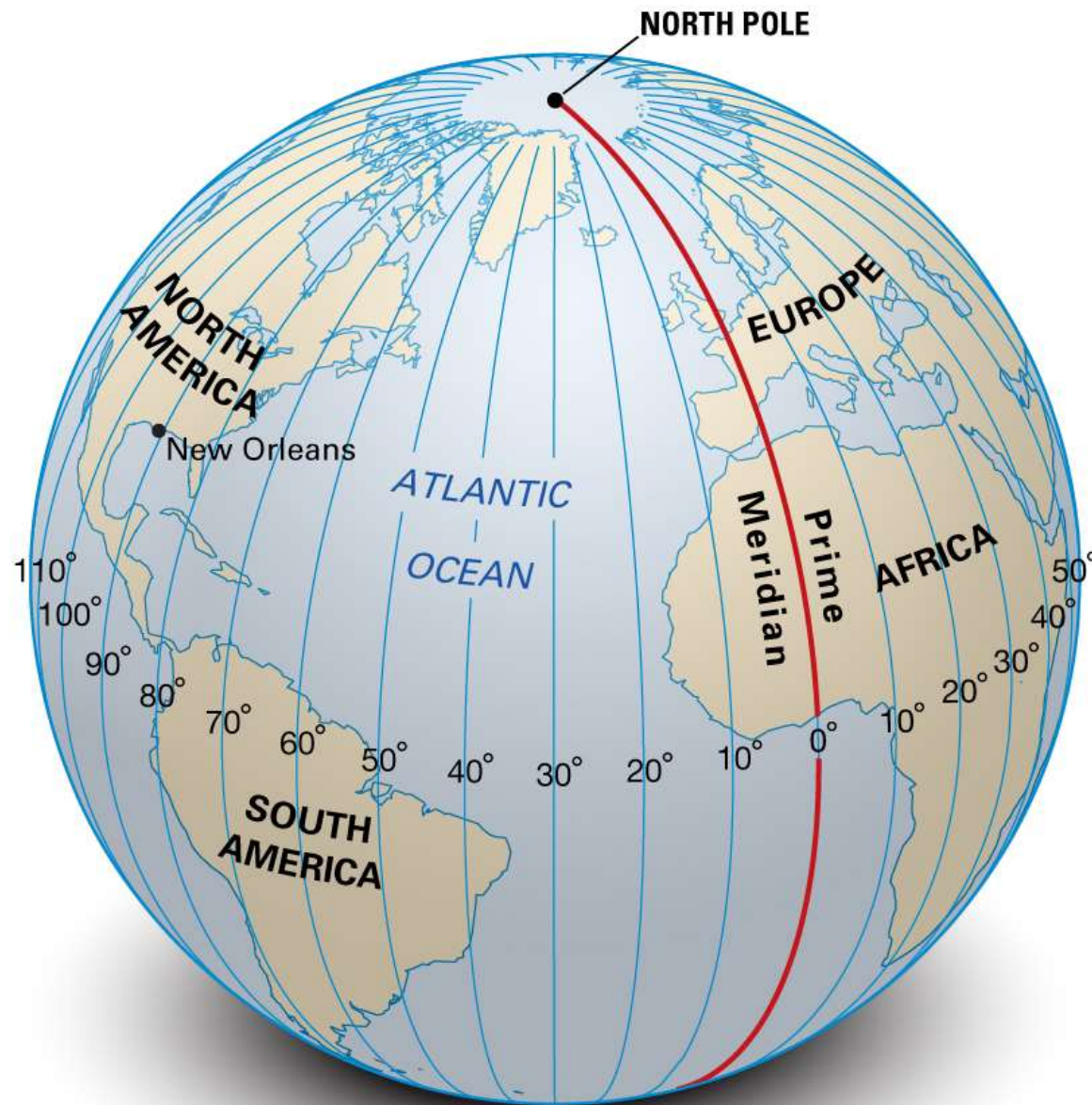
# Describing Locations on Earth... **Latitude**



## FACTS ABOUT LINES OF LATITUDE

- Are known as parallels.
- Run in an east-west direction.
- Measure distance north or south from the Equator.
- Are parallel to one another and never meet.
- Cross the prime meridian at right angles.
- Lie in planes that cross the Earth's axis at right angles.
- Get shorter toward the poles, with only the Equator, the longest, a great circle.

# Describing Locations on Earth... Longitude



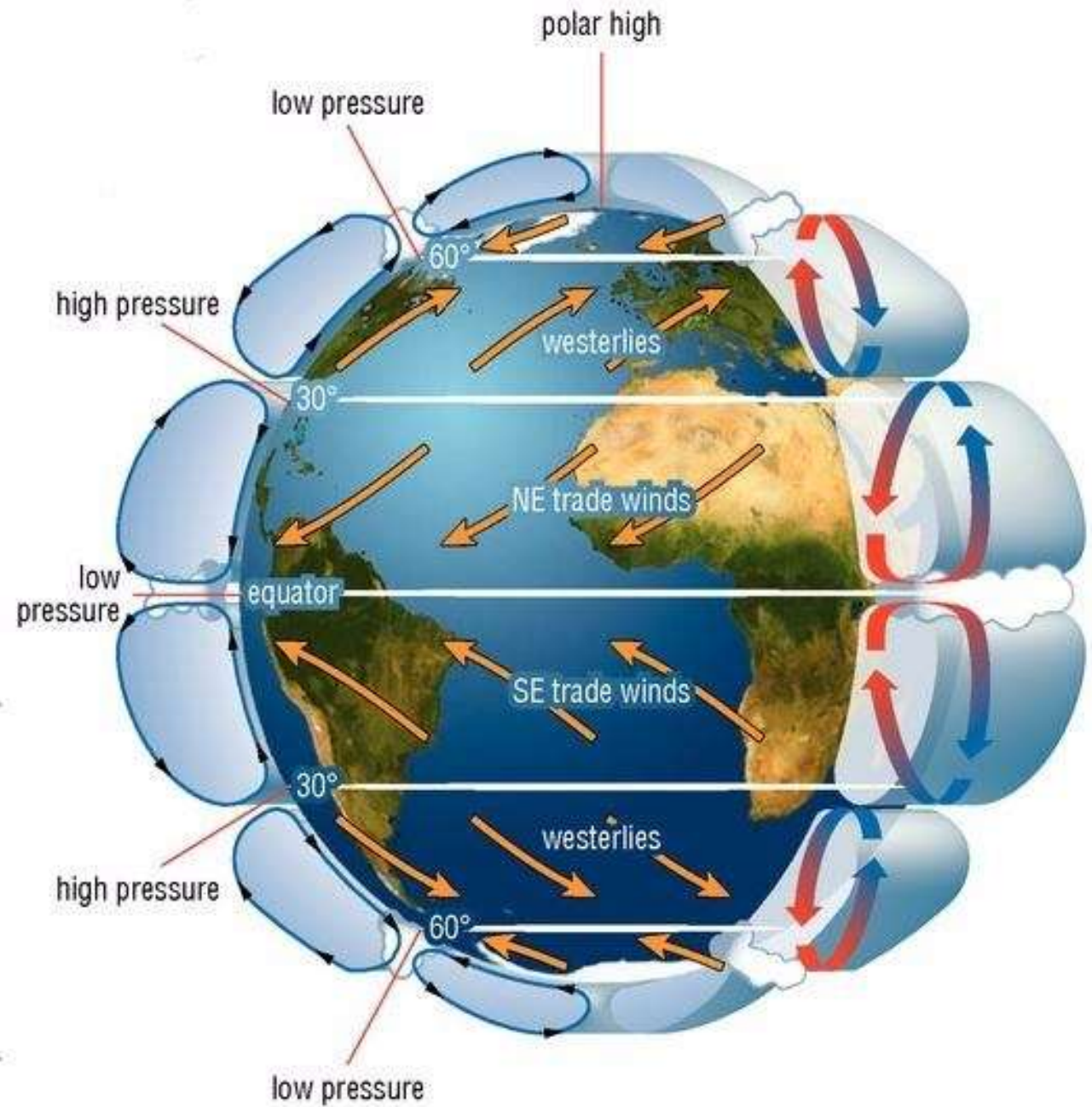
## FACTS ABOUT LINES OF LONGITUDE

- Are known as meridians.
- Run in a north-south direction.
- Measure distance east or west of the prime meridian.
- Are farthest apart at the Equator and meet at the poles.
- Cross the Equator at right angles.
- Lie in planes that pass through the Earth's axis.
- Are equal in length.
- Are halves of great circles.

# LOST AT SEA

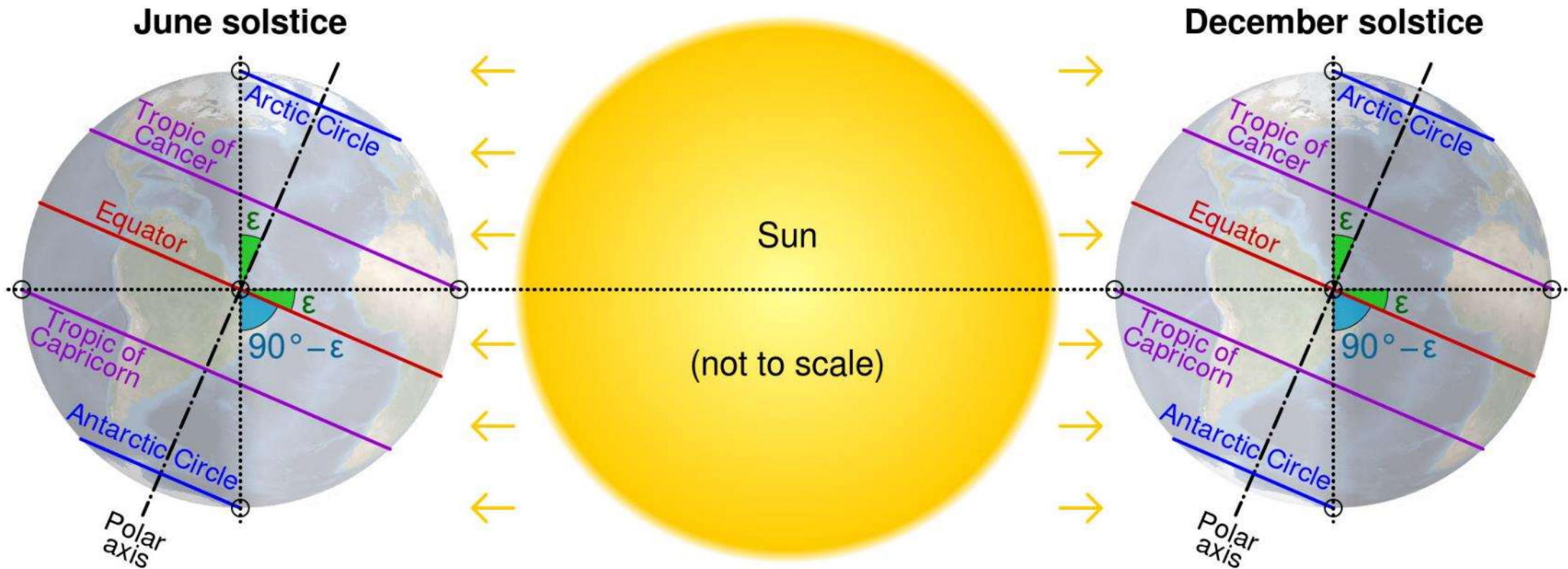
What are the **major ocean currents** that circle the Atlantic Ocean?

What are the **two major winds** that drive the currents you will use in Questions 1?



# LOST AT SEA

3. The Sun is directly overhead, and your watch says that it's June 21. What's your approximate latitude? How do you know?





# Eastern and Western Hemispheres of the Earth

The **PRIME MERIDIAN** divides the **eastern and western hemispheres** of the Earth.

- just as the **EQUATOR** divides the **northern and southern hemispheres**.

If you stand with one foot on one side and the other on the left, you are perfectly in the middle of east and west, according to the prime meridian line.

The line in Greenwich, England represents the historic Prime Meridian of the World - Longitude  $0^{\circ}$ .

Every place on Earth was measured in terms of its distance **east or west** from this line.

Benin  $64^{\circ} 30' W$

Benin  $78^{\circ} 00'$

Tehran  $51^{\circ} 26' E$

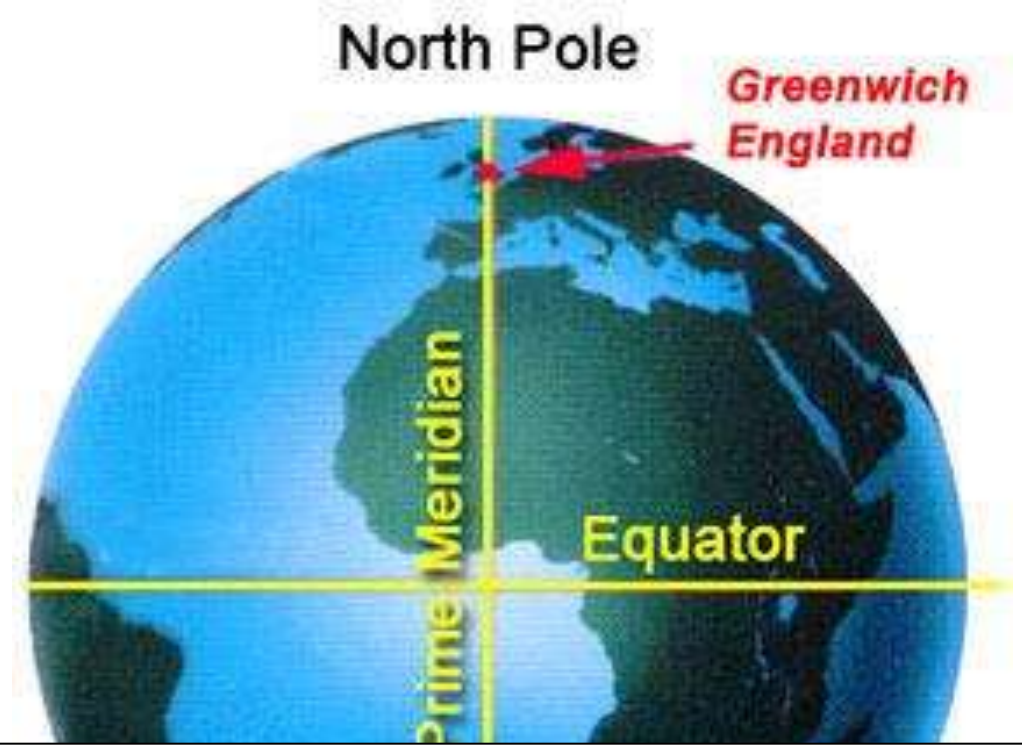
Jerusalem  $35^{\circ} 13' E$

Cairo  $31^{\circ} 15' E$

Il-170441 E

# Greenwich, England

Greenwich 00°00'



## What is Greenwich Mean Time (GMT)?

Before the 19<sup>th</sup> century, almost every town in the world kept its own local time. There were no national or international conventions which set how time should be measured, or when the day would begin and end, or what length an hour might be.

When the railway and communications networks expanded in the 1850s and 1860s, there needed to be an international time standard.

Greenwich was chosen as the center for world time.

# Time equals longitude

There is a direct relationship between time and longitude. At any instant in time, local solar time at a location varies by...

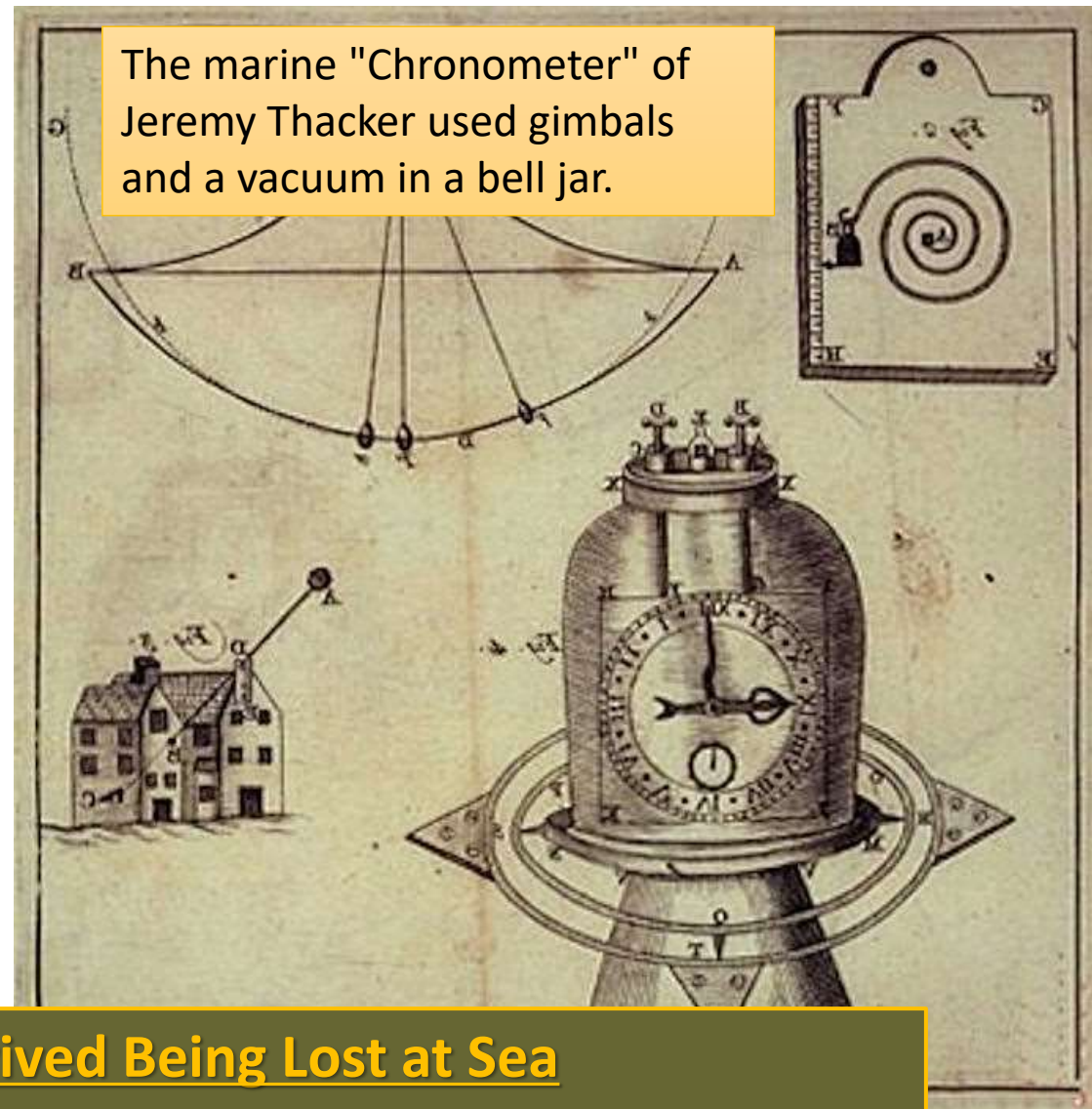
**...one hour for every 15° change of longitude**

(think 360° divided by 24 hours)

**...or about 1° for every 4 minutes.**

If the navigator knew the time at a fixed reference point when some event occurred at the ship's location, the difference between the reference time and the apparent local time would give the ship's position relative to the fixed location.

The marine "Chronometer" of Jeremy Thacker used gimbals and a vacuum in a bell jar.



## [Link: 9 Fortunate Souls Who Survived Being Lost at Sea](#)

The sea is like a wet desert. There's no food. There's no shelter. Nothing to drink. In every direction, the view is the same: nothing. Plus, dangerous predators lurk just beneath the depths.

A shipwreck out on the open ocean can be a death sentence. If rescue doesn't come in the first 48 hours, it probably never will. Learning to survive will take skill, courage, and not a small amount of luck.

# Lost at Sea Assignment

**Now calculate your longitude. Your watch is still on London time, but you notice that when the Sun is directly overhead at your current position, your watch reads 1:12 p.m.**

**You realize you can calculate your longitude. What is it?**

Calculating your longitude based on London time...

- The Earth rotates 15 degrees in 1 hour
- ...or will take 4 minutes to rotate 1 degree.

# Lost at Sea Assignment

You recall a real-life story of a similar situation - one man spent 76 days adrift at sea before drifting ashore. He survived (but was very skinny by the end).

You've been at sea 21 days, and you guess you are 4,000 km from land and traveling 1.4 m/sec.

**How much longer will you be drifting?**

Be sure to show your work.

**How many seconds would it take to go 4,000 km?**

**Convert seconds to days....**