

Plotting a Course Through History **A Navigation History Timeline**

Mariners know how to navigate from here to there and back again. But we seldom stop to wonder who figured out how to determine position in the middle of an ocean, who developed the concept of latitude or who invented the sextant.

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c. 3500 B.C- 500 B.C.

The Mesopotamians divide a circle into 360 degrees, a day into 24 hours, an hour into 60 minutes and a minute into 60 seconds.

c. 700 B.C.

Homer, Greek, tells of Odysseus navigating by the Great Bear.

c. 600 B.C.

The Greeks build the first navigational aid, a lighthouse at Sigeum.

c. 240 B.C.

Eratosthenes, Greek, calculates Earth's circumference with great accuracy.

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c. 150 B.C.

Hipparchus, Greek, invents the astrolabe, the first instrument for taking sights on heavenly bodies. He also proposes a system of latitude and longitude.

c. 120 B.C.

Zhang Heng, Chinese, creates the first geographic grid for maps.

c. A.D. 150

In Alexandria, the Greek astronomer and mathematician Ptolemy lists latitudinal and longitudinal coordinates of 8,000 places on Earth. His maps depict Earth as a great landmass with small oceans.

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c. 1100

In China, the first written account of the magnetic compass used as a navigational aid appears.

1154

Al-Idrisi, Arab, writes *Book of Roger*, a survey of all countries then known, and creates a rectangular world map.

1300

European portolan charts of the Mediterranean and Black seas show compass directions. The compass card is divided into 32 points of direction.

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1406

A Latin translation of Ptolemy's *Geographia* begins to circulate in Europe.

1418

Prince Henry (1394 – 1460) the Navigator of Portugal founds the first navigation academy at Sagres, Portugal, to collect navigational data and produce charts.

1436

Johannes Gutenberg, German, begins building the first European printing press that uses movable type, making printed maps available.

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1464

Johann Muller, German, writes the first major exposition of trigonometry, enabling navigators to calculate the relationship of celestial bodies and the location of ships.

c. 1470

The age of European exploration begins.

c. 1480

The Portuguese compile latitude tables for the first navigation manual, which also tells how to determine latitude by sighting the noon sun.

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1492

Martin Behaim, German, creates the oldest surviving terrestrial globe. Christopher Columbus, an Italian explorer sailing for Spain, discovers Earth's landmass is much smaller and its oceans are much larger than Ptolemy reckoned.

1493

Pope Alexander VI established 0° longitude in the Atlantic Ocean West of the Azores to divide territories of Spain and Portugal.

1507

Martin Waldseemuller, German, writes "America" on a map of the continent; the name sticks. The map, now in the Library of Congress, identifies the Pacific Ocean as a distinct body of water.

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1522

Ferdinand Magellan's crew completes the first circumnavigation of the globe. The log, accurately kept by Antonio Pigafetta, Italian, is one day short of local time, proving Earth is round.

1569

Gerhardus Mercator, Flemish, produces a map of the globe that depicts parallels that are more widely spaced at higher latitudes. Navigators can now draw straight lines that cross all meridians at the same angle. These rhumb lines represent a ship's constant compass direction.

1570

Abraham Ortelius, Flemish, produces the first modern atlas.

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1580

William Borough determined variation at Limehouse England to be $11^{\circ} 25'$ east.

c. 1600

Magnetic variations begin to appear on maps and tables.

1614

John Napier, Scottish, publishes the first table of logarithms, facilitating onboard calculation of trigonometric position.

1656

Christiaan Huygens, Dutch, invents the pendulum clock.

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1686

Edmond Halley, English, produces the first weather map, which shows the direction of trade winds.

1700

Halley produces the first map showing variation of Earth's magnetic field.

1714

England's Parliament established the Longitude Act on July 8th that offered a prize of 20,000 pounds for a method to determine longitude to an accuracy of half a degree of a great circle.

1731

John Hadley, English, and Thomas Godfrey, American, working independently, invent the reflecting octant, a precise instrument for measuring the altitude of celestial bodies.

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1735

John Harrison, English, builds the first accurate marine chronometer, enabling more precise determination of a ship's longitude.

c. 1750

Finding longitude by the method of lunar distance proposed.

1757

Under the direction of fellow Englishman John Campbell, John Bird elongates the arc of the octant to 60 degrees, the sextant of a circle.

1766

The first edition of English astronomer Nevil Maskelyne's annual *Nautical Almanac* appears. It contains tables of celestial positions for 1767 to help sailors determine location.

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1802

Nathaniel Bowditch, American, publishes *The New American Practical Navigator*, which explains the principles and methods of sea navigation.

1803

Matthew Flinders, English, writes a paper explaining how to compensate for compass deviation caused by shipboard iron.

1837

Thomas Sumner, American, develops celestial line of position navigation to verify the accuracy of an assumed geographic fix.

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1842

U.S. Navy Lt. Matthew F. Maury charts the direction of winds and ocean currents.

1884

Greenwich, England, is designated as the prime meridian by an international conference in Washington, D.C. The 24 time zones are also codified.

1897

Guglielmo Marconi, Italian, sends the first ship-to-shore radio signal.

1903

Herman Anschutz-Kaempfe, German, patents the gyrocompass.

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1910

J.A.D. McCurdy, Canadian, sends the first air-to-ground telegraph message.

1919

Robert Watson-Watt, Scottish, patents a precursor to radar, a device using short waves to locate aircraft.

1928

Drisenstok H.O. Pub No. 208 sight reduction tables first published.

1931

Ageton H.O. Pub. No. 211 sight reduction tables first published.

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1933

P.V.H. Weems, American, compiles the first *Air Almanac*, used by aviators to navigate using celestial bodies.

1936

H.O. Pub. No. 214 sight reduction tables first published.

1942

The United States begins building the first Long Range Navigation (LORAN) station.

1951

H.O. Pub. No. 249 sight reduction tables first published.

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1945

The U.S. National Bureau of Standards begins transmitting a standard time announcement in telegraphic code on radio station WWV, making precise determination of longitude possible.

1953

Charles S. Draper, American, develops the first fully inertial navigation system, which does not depend on outside signals.

c. 1960

Seymour Cray, American, develops the first transistorized computer, enabling faster onboard calculations.

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1964

Transit, launched by the U.S. Navy, begins offering continuous navigation satellite service.

1971

H.O. Pub. No. 229 replaced H.O. Pub. No. 214 for sight reduction.

1978

The U.S. Air Force launches the first Global Positioning System satellite.

1989

Nautical Almanac sight reduction method first published in the Nautical Almanac.

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1995

GPS becomes fully operational with 24 active satellites.