

04. Figuring out where you are in the middle of the ocean

Raphaëla Le Gouvello Education packet - Windsurfing solo across the Indian Ocean

<http://www.respectocean.com>



Technology



Three satellites make for one a lucky star

At sea, there aren't any mile markers. And the days when sailors mapped their routes using the sun, a clock, and a compass are long gone!

These days, everyone uses a G.P.S. which stands for Global Positioning System.

Using data transmitted by several satellites 20,200 kilometers (66,273 feet) above the Earth, navigators can figure out exactly where they are to a few dozen meters.

How it works

The boat emits a signal picked up by a satellite, which calculates the distance between itself and the boat based on how long it takes for the signal to reach it. Using this distance, the satellite locates the boat in an imaginary sphere centered at itself.

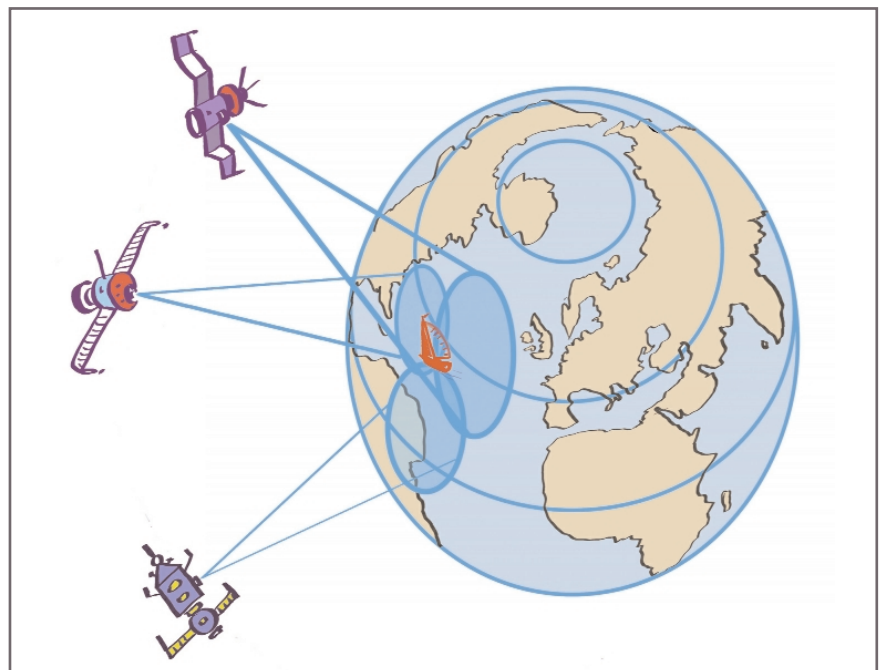
To refine the location, a second satellite uses the boat's signal to make a similar calculation, determining a second sphere.

These two spheres intersect in two points, and the boat has to be at one of these two points...

But which one? This is where the third satellite comes in. Using the boat's signal, it determines a third sphere. The boat is exactly at the intersection of the three spheres.

Activity

Can you name other ways in which G.P.S. are used in daily life?



04. Figuring out where you are in the middle of the ocean

Raphaëla Le Gouvello Education packet - Windsurfing solo across the Indian Ocean

<http://www.respectocean.com>



Communication

To communicate with land-based teams, sailors use satellite telephones or V.H.F. radios. However, such radios have a **maximum range of just two nautical miles**.

And what do you do if the phone doesn't work? Of course, the Argos beacon can be used to follow the boat's course (see "The Argos beacon: emergency rescue for sailors"): a varying pace between day and night indicates that everything is normal on board.

But if there is a storm, Raphaëla might remain inside her sleeping quarters for several days and nights. How can she send a signal? Another system is needed. As a back-up, she can remove the temperature sensor from her beacon and plunge it into **boiling water**. This sends a signal to land indicating the position of her sailboard and... an abnormally high temperature. The land team will conclude that Raphaëla is still "at the helm," even if she can no longer communicate.

Activity

Using the nautical mile (one mile = 1,852 meters), calculate the maximum range of a V.H.F. radio.

Back in time

On May 24, 1844, Samuel Morse of the United States sent the first message between Philadelphia and Washington, a distance of 60 kilometers (37 miles), using a telegraph. The telegraph transmits a series of electric pulses (long and short) across a wire, each pulse sequence corresponding to a letter of the alphabet. This means of communication was used by sailors throughout the world for more than a century.



The Morse Code

A	· -	N	- ·
B	- · · ·	O	- - -
C	- · · · ·	P	· · · ·
D	- · ·	Q	- - · ·
E	·	R	· · ·
F	· · · ·	S	· · ·
G	- - ·	T	-
H	· · · ·	U	· · -
I	· ·	V	· · · ·
J	· - - -	W	· - -
K	- · -	X	- · · -
L	· · · ·	Y	- - - -
M	- -	Z	- · · ·

Activity

Can you decode the names of two boats that have been responsible for oil spills?

One sank in December 1999 off the Brittany coast, the other off the coast of Spain in November 2002.

· · · · · - - - -
and · - - · · · · · - · - - -

