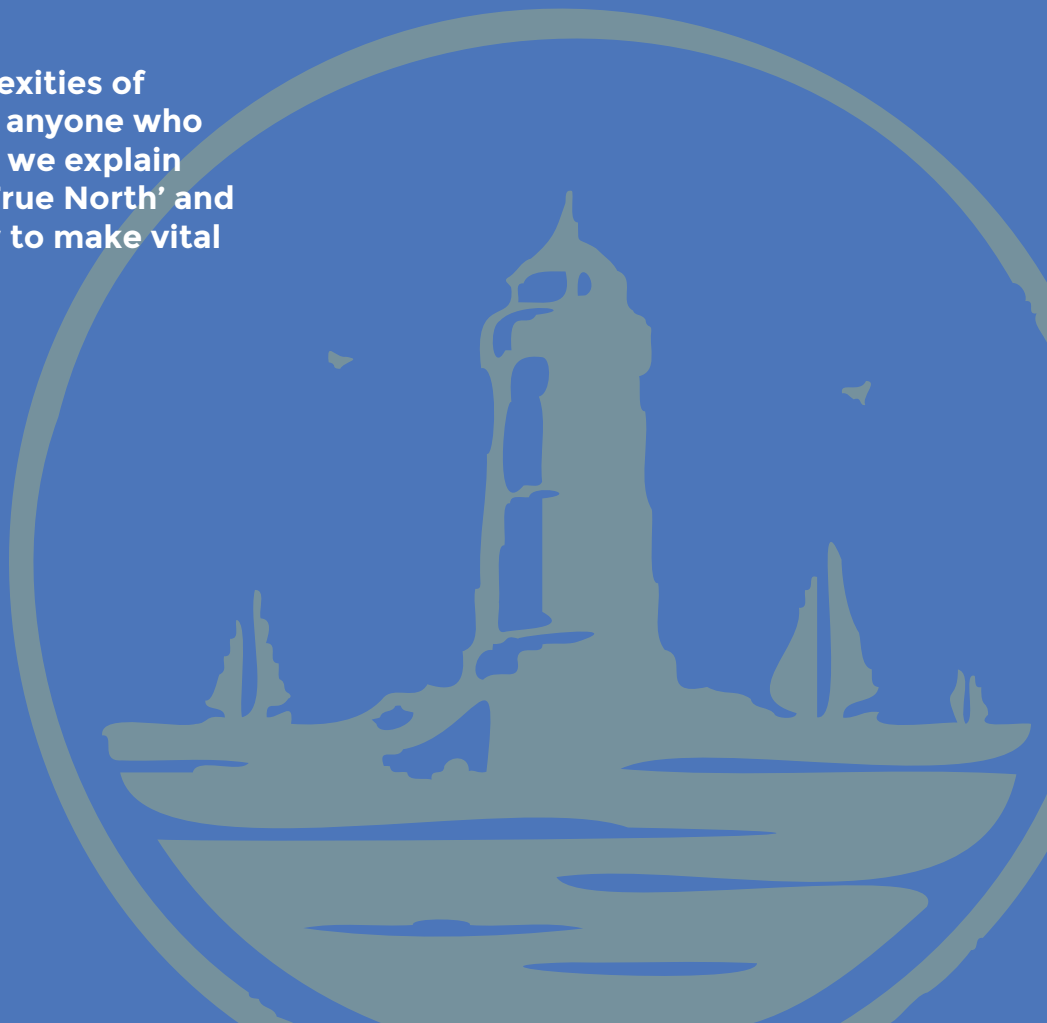




# VARIATION

Understanding the complexities of navigation is essential for anyone who wishes to sail safely. Here we explain the difference between 'True North' and 'Magnetic North' and how to make vital navigation calculations.



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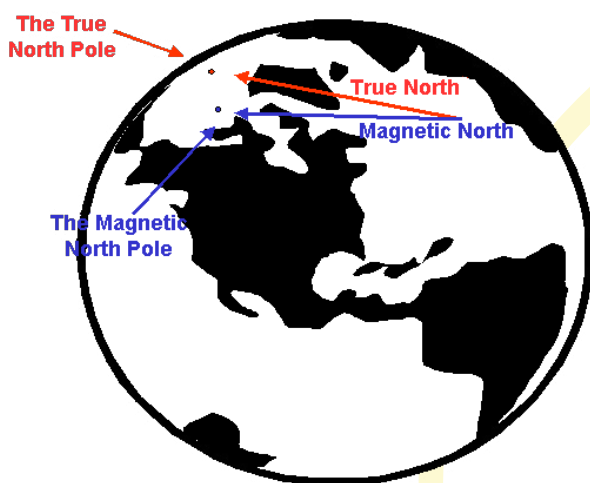
# VARIATION

## True North & Magnetic North

Knowing the difference between **Magnetic North** and **True North** is essential when navigating.

True north is shown on navigational charts as straight up.

Magnetic north is quite different; it is the direction that a compass needle points to as it aligns with the Earth's magnetic field. To elaborate, a **compass**, in its simplest form, uses the iron ore within the earth's core to determine **Magnetic North**. Iron ore within the earth is constantly moving, changing the position of Magnetic North.



## Clear communication

When you write or verbally describe a bearing or course, make sure you confirm whether it is a Magnetic bearing, written as  $045^{\circ}$  (M), or a True bearing written as  $045^{\circ}$  (T).

## Variation & Deviation

When navigating you will always have to make adjustments for **Variation** and **Deviation**.

**Variation** is a magnetic interference common to all vessels and **Deviation** is a magnetic interference unique to the vessel itself.

**Easterly or Westerly Variation** is dependent on whether your compass is east or west of Magnetic North. Variation is also referred to as **Difference** (Easterly or Westerly Difference).

## Navigational aids

To navigate you will need to use a combination of paper charts, almanacs and pilot books, together with a compass.

- A **steering or hand-held compass** will give you a heading or bearing based on **Magnetic North** and is subject to **Variation** and **Deviation**.
- **Charts** use a projection of the earth and **True North** to allow you to accurately plot your position and navigate.
- **Chart plotters** are devices that allow you to prescribe how **North** is determined, and therefore how all bearings are presented to you. Chart plotters can automatically update **Variation** based on your vessel's position. You can also adjust settings to have **North** represented with either **Easterly or Westerly Variation**.

## Compass

Compass calculations are based on the angle that your vessel is at in comparison to the current position of Magnetic North.

Currently (December 2022), Magnetic North is nearer to Canada compared to the position that the lines of longitude point to on a paper chart.

There may be times when in transit, that your vessel is in a position that lines up with both Magnetic North and True North; in this case Variation is zero.

**Examples:** Currently, depending where you are in England, the difference between True and Magnetic North could be zero. However in the North Atlantic, nearer the US, the Westerly Variation (or Westerly difference) is considerable. As examples, Nova Scotia is 16 degrees West Variation, and within the South Pacific the Easterly Variation for New Zealand is 8 degrees East.

## Charts

To aid us with variation, charts indicate the specific variation from True to Magnetic North in degrees and also the change per year in minutes. This information is contained within the chart's compass rose, confirming the date the chart was produced, the year the variation was calculated, the minutes it will change each year and the direction it is changing. This will allow you to calculate the variation on any particular year. Check variation from a given latitude and longitude using this link:

<https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml>

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# VARIATION

## CADET

When making the adjustment from Magnetic to True, add Easterly variation and subtract Westerly variation.

A good way to assist in this process is to use the mnemonic **CADET**.

When you move from magnetic, or a bearing taken from a Compass **C**, you **AD** the East **E** to get the True **T** bearing. If you are moving from magnetic to true and have Westerly variation then the adjustment is to take away the amount of Westerly variation.

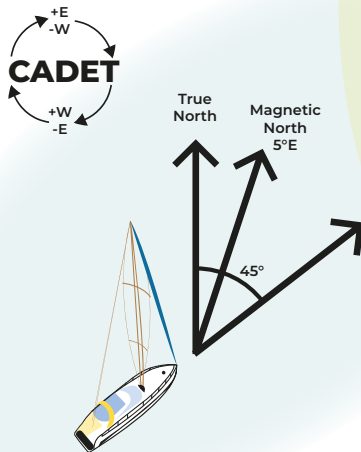


When going from a True bearing on a magnetic course the process works in the opposite direction.



## Example 1

The heading the boat is on (the bearing) to the channel markers is 045° (M).

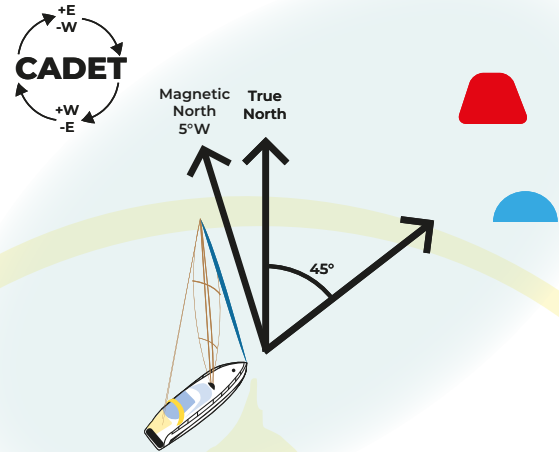


Using the CADET mnemonic shows that you will need to add the Easterly variation to make the adjustment from the Magnetic to True.

**Compass bearing** = 045° (M)  
**Variation** = 005° East  
**True Bearing** = 045° (M)  
 + 005° East variation  
 = 050° (T)

## Example 2

Here the variation is 5° West. The heading the boat is on (the bearing) to the channel markers is 045° (M).



Using the CADET mnemonic shows that you will need to subtract the Westerly variation to make the adjustment from Magnetic to True.

**Compass bearing** = 045° (M)  
**Variation** = 005° East  
**True Bearing** = 045° (M)  
 - 005° West variation  
 = 040° (T)

There are other mnemonics that can be used effectively, particularly when making adjustments that include Deviation.



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