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Keelboat Sailing Instruction to CYA standards

Wavelength

Dead Reckoning

Dead Reckoning (from Deduced Reckoning) is the plotting of course and position based only on speed, time and heading. It is used as an estimate of current position, time of arrival, etc. between more accurate determinations such as a fix.

We use a form of dead reckoning in everyday travel for example if I drive at 100 km/hr, how long will it take to get to Toronto which is 250km away. The answer is:

250km/100km/hr = 2 ½ hr.
So if I leave at 0900 I will arrive at 1130.

Say now that I have driven for 2 hrs. when I encounter road works and my speed drops to 50km/hr. So my time of travel to Toronto is:

In 2 hr I have travelled 2hr X 100km/hr = 200 km
So I have 250 km – 200 km = 50 km to travel
Time to drive the final 50 km at 50 km/hr = 1 hour
So now my total travel time is 2 hr + 1 hr = 3hr
And I will arrive at 1200.

Now let's put it in the context of boating.
Let's say that I start from the Marina and sail at 5 knots. I sail directly to a destination 12 nautical miles (nm) away when will I get there?

5 knots is 5 nautical miles/hr
So time of arrival is 12 nm / 5 nm/hr = 2.4 hrs
0.4 hrs is 0.4 X 60 min = 24 min
So I will arrive 2 hr 24 min later
If I leave at 0900 then I will arrive at 1124

Now supposing after 1 hour the wind drops and I only make an average speed of 3 knots for the remainder of the trip.

In 1 hour I have travelled 1 hr X 5 nm/hr = 5nm
So I have 12 nm - 5 nm = 7 nm to travel
Time to travel 7nm at 3 nm/hr = 7 / 3 hr = 2 1/3 hr
1/3 hr = 1/3 X 60 min = 20 min

So total time of travel is 1 hr + 2 hr + 20 min = 3 hr. 20 min
So I will arrive at 1220

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So far we have ignored the heading.
Including the heading means we will need to plot the course on the chart and plot or measure distance along the course.
So supposing we are sailing at 270^{o} true (due West) then after 1 hour at 5 knots our DR position will be 5 miles West of our current position.
In a sailboat speed is often changing so an estimate of average speed is needed to calculate the distance travelled. Usually a boat will have a knotmeter with a log (which records the distance travelled). In this case you can determine the distance directly from the log without trying to average speed.

Our true position will depend on a number of other factors including:

- Variation in speed
- Changes in heading (helming errors)
- Currents
- Leeway

So while Dead Reckoning will give us a good idea of our position and estimated time of arrival, to find our true position we still need to take a fix by some means.