

Navigating by Guessing – Ken Altfather v2 modified 4/10/09

This article springs from a navigation presentation Dave and I gave to the Rough Riders in March 2009. Dave gave the difficult portion of the talk dealing with precision, that is, charts, compass bearings, magnetic declination, etc. and I gave the fun portion dealing with plain old guessing.

In this day and age of GPS's you might wonder why bother learning navigation, particularly the difficult task of dead reckoning. Isn't it a little bit like learning how to use a slide rule in the age of the computer?

Well, for one, it's stimulating to learn this stuff and fun to practice. And then do you really want to put all your eggs in an electronic gadget that can run out of juice, fall overboard, be left home, or have any number of other bad things happen to it?

So, I thought I'd make this portion of the talk available to all our friends. With each of these techniques, we aren't actually guessing, we are using various observational skills and a bit of math to estimate various data that could be important to us.

Guessing Wind Speed

Let's start with guessing wind speed based on responses of various physical objects to wind speed. In the table below wind speed is shown in knots. A knot is a nautical mile per hour. A nautical mile is the distance separating one minute of latitude and it's equal to about 1.15 statute miles. So one knot is equal to 1.15 mph.

You'll want to commit at least a portion of this list to memory. For example, I use, whitecaps first appear around 7-10 knots. Spray off waves begins in the region of 17-21 knots. Whitecaps everywhere: 22-27 knots. If you need to go beyond my cut off of 33 knots, you can get the full chart from David Burch's book titled Fundamentals of Kayak Navigation. Also, the definitions of "small", "moderate" and "large" waves can be in the eye of the beholder. They look different when viewed from a kayak vs. an ocean liner.

Wind Speed (knots)	Observations at sea	Observations on land
Under 1	Sea like a mirror	Calm; smoke rises vertically
1-3	Ripples, no foam crests	Smoke drifts, vanes do not move
4-6	Small wavelets, glassy crests	Wind felt on face, leaves rustle
7-10	Large wavelets; scattered whitecaps	Leaves, small twigs in constant motion; light flags extend
11-16	Small waves; numerous whitecaps	Dust, leaves and loose paper blow; small branches move.
17-21	Moderate waves; many whitecaps; some spray	Small trees in leaf begin to sway
22-27	Larger waves; whitecaps everywhere; some spray	Larger branches of trees in motion; whistling heard in wires.
28-33	Sea heaps up; white foam begins to be blown in streaks	Whole trees in motion; resistance felt in walking against the wind.
Too Damn Windy	Flying kayaks	Flying cows

Guessing Speed over Water

Here's a little technique that uses some bits of trivia from freshman physics. Two things I remember are: salt water weighs 64# per cubic foot and 60 mph equals 88 ft/second. So, if you too remember this stuff, you can easily derive this technique in your head while paddling along. If not, try to commit this to memory too.

60 mph = 88 ft/sec

6 mph = 8.8 ft/sec

therefore:

6 mph = 17.6 ft / 2 seconds ~ 1 boat length/ 2 seconds

4mph = 17.6 ft / 3 seconds ~ 1 boat length/ 3 seconds

3 mph = 17.6 ft / 4 seconds ~ 1 boat length/ 4 seconds

So, to estimate your speed over water, time how long it takes your boat to pass something floating in the water. Now remember this is speed over water. Speed over ground is an entirely different matter, particularly with wind and current. We'll have a technique for speed over ground later.

Guessing Daylight Left

This one is easy and fun and pretty darn accurate. Let's say you are out paddling and you notice that the sun is getting pretty low. How much daylight do you have left?

For this technique, we are going to judge the angle from the horizon (whatever is going to obscure the sun) to the sun itself. 1 hour of daylight is equal to 15 degrees movement of the sun, and after it sets there is up to 20 min of twilight depending on cloud cover, time of year etc.

I'm going to have you take a few measurements. For A) below, stretch out your arm in front of you holding your palm vertical as if against a wall. Then measure the distance from eye to your hand. The other measurements are just taken off your hand.

Record:

- A. Distance from eye to outstretched hand _____ inches
- B. Width of thumb _____ inches
- C. Width of fist _____ inches (With thumb in air measure distance separating 4 knuckles).
- D. Width of outstretched thumb and forefinger _____ inches (form an L with thumb and forefinger)

Now use these little equations to fill in the blanks.

Thumb = _____ minutes (compute $230 * B/A$)

Fist = _____ minutes (compute $230 * C/A$)

Thumb/finger = _____ minutes (compute $230 * D/A$)

If you don't get around to taking your personal measurements, most of the folks in our navigation class came around 8-10 minutes for thumb, 28 – 30 minutes for the fist and 55-60 minutes for the outstretched thumb and forefinger. So roughly, 10, 30, 60. That's pretty easy to remember.

Now let's try an example. Suppose in the situation described above we extend our arm and find that the sun is a little more than a full fist width above the horizon. In fact, it's about a thumb width more than the full fist. So, we now can estimate that the sun will set in about 40 minutes (30+10) and that we will have a little twilight after that.

$$Y = \text{SQRT}(8000(\text{miles}) * H_0(\text{ft}) / 5280 \text{ ft})$$

$$Y \sim 1.25 * \text{SQRT}(H_0(\text{ft})) \text{ Statute miles} \quad \text{--- this is the equation to remember.}$$

Examples:

1) CN Tower in Toronto is 1815 ft tall.

Lets say we can just see the top of it on the horizon.

$$Y \sim 1.25 * \text{SQRT}(1815)$$

We can do this in our heads.

Guess at sqrt (1815) : 40 = 1600, 50 = 2500, so maybe 42

Therefore our guess is $\sim 1.25 * 42 \sim 52$ miles

Actual distance is 52.4 miles.

2) Russell Station Stacks

Assume stack height is 500 ft. If you paddle this area often, a typo may have the actual height.

From you position, you estimate you can see half of the stack, that is, 250 ft is obscured. How far is it?

$$Y \sim 1.25 * \text{SQRT}(250)$$

$$Y \sim 1.25 * 16$$

$$Y \sim 20 \text{ miles.}$$

3) Suppose you see a sail in the distance, but the hull is obscured. You estimate the deck is about 4 ft high and it is just obscured. Because you are pretty close in this case, you need to add in your eye's height above the water, let's say 2 ft.

$$Y \sim 1.25 * \text{SQRT}(4 + 2)$$

$$Y \sim 1.25 * 2.5$$

$$Y \sim 3 \text{ miles}$$

Conclusion:

So that's it – some simple but very useful techniques for navigating on the water. If you have any questions, feel free to catch me at the shop or send an email to ken@baycreek.com.