

NAVIGATION LESSONS

The following four articles were sequentially published in the October, November, December 2006 and January 2007 editions of The News of the Melbourne Bushwalkers Inc; and have been reproduced for your interest.

LESSON 1: THE EASY WAY TO NAVIGATE

Think you can't navigate or it's all beyond you? Bearings make your head spin? Here's a simple three step process that will have you navigating effectively in five minutes. Grab your 1:25,000 scale map and your compass and away we go.

This is what you do.

1. Set the compass dial to minus 12 degrees (or 348 degrees which is the same)
2. Place the edge of the compass along one of the North-South grid lines on your map. Hold the compass down firmly with the thumb of the hand holding the map so that map and compass are stuck together as one unit.
3. Rotate map and compass together until the red end of the compass needle is inside the hollow arrow on the dial

That's all there is to it. Your map is now oriented, which means that the direction of things around you on the ground are the same as the direction of those things on the map from your location on the map. It's all lined up. The track you are standing on runs in the same direction on the map as it does on the ground. You can see on the map which direction you want to go. Simply head in that same direction on the ground under your feet.

Orienting the map like this I regard as the single most important and effective navigation technique. You can navigate anywhere simply by orienting your map repeatedly. I often navigate by walking with my compass held on my map and repeatedly and quickly orienting them so I can easily identify the features around me. No need to take bearings. Simply remember to set the dial to minus the magnetic variation which in most of our Victorian walking areas is 12 degrees.

This works because you have made the magnetic north on the map line up with magnetic north on the ground (which is what the red end of your compass needle points to)

Bearings are useful in featureless terrain or fog but not essential. The rest of navigation is interpreting what you see on the map (contours etc) and correlating that with what you see on the ground around you. This of course only makes sense if the map is oriented and comes with practice, for which rogaining and orienteering are very good.

LESSON 2: WHICH NORTH IS NORTH

Here's a quick quiz question. Which of the following options is north?

1. The point where polar explorers aim to stick their national flag?
2. What the red end of the compass needle points to?
3. The direction of the up and down grid lines on contour or topographical map?
4. The direction of the vertical edge of a contour map?

Answer: The answer is all of the above. There are in fact three norths. (Options 1 & 4 are the same)

The first is True or Geographical North. The earth spins on its axis and the North and South Geographical Poles are where the axis meets the surface and their location never changes. It is also where polar explorers hope to plant their flags and have their pictures taken. True north is the direction to the north geographical pole from wherever you are.

The second is Magnetic North. The earth is partially molten inside and movement of the molten core sets up a magnetic field with a north and south magnetic pole. The red end of the compass needle always points to the north magnetic pole. Unfortunately the north magnetic pole doesn't coincide with the Geographical pole. The north magnetic pole is somewhere in northern Canada and wanders around over time. Its position slowly changes.

Map makers have long had a problem trying to depict the curved surface of the earth on a flat map. The edges of topographical maps are normally along lines of latitude (the lines parallel to the equator which run east-west) and longitude (the lines joining the true north and south poles which run north-south) but these lines are not always parallel and straight. The lines of longitude converge as you approach the poles and the lines of latitude get more and more curvy as you approach the poles. To overcome the problem so that we can measure compass bearings, the map makers superimpose a rectangular grid (lines spaced 1 km apart on the 1:25, 1:50 and 1:100,000 scale maps that we use for bushwalking) so that all the lines are parallel, not converging or curving. This causes other problems which we don't need to concern ourselves with. This brings us to the third north which is Grid North, the direction of the up and down grid lines on the map. Compare the direction of the grid lines to the direction of the edge of the map. In the Alps around Howitt and Hotham they are almost the same, but at Marysville they differ by 0.8 degrees and in the Brisbane Ranges by 1.7 degrees.

For bushwalking, we can forget about true north. We are only concerned with grid north and the grid lines on the map because they are what we measure bearings (or directions) from, and the direction our compass needle points to (magnetic north). The difference between the two is called the grid magnetic angle. In Victoria magnetic north is always to the east, or clockwise from grid north, and varies from about 12 degrees at Mt Hotham to 11 in most of our day walking areas north and east of Melbourne to 9.5 in the Brisbane Ranges. In WA magnetic north is to the west of grid north!

If you would like to read more about using topographical maps, interpreting contours, using a compass etc, there's an excellent publication called "Map Reading Guide – How to Use Topographical Maps" available to read or download for free from the Geoscience Australia website at http://www.ga.gov.au/image_cache/GA7194.pdf . I found it very good. End of lesson.

LESSON 3: LEARNING NAVIGATION – THE FINISHING TOUCHES

This is the third of a four part miniseries on the basics of navigation – an attempt to de-mystify it and show you how easy it really is. In October, I explained the most important technique in navigation - how you can quickly and easily orient a map and navigate with it. Next was an explanation of the norths; true, grid and magnetic. The remaining skills that you need to be a top notch gun navigator are as follows:

1. Understand contours and be able to interpret them. They are those brown curvy lines on the map drawn through points of equal height above sea level They denote landform features such as hills, valleys, ridges, spurs, saddles (a low point between two higher points on a ridge) and knolls (a bump on a spur). Nobody needs to tell you of course that creeks are blue, vegetation is green and roads are in red and foot tracks are in black. A quick look at a topographical map will soon confirm that.
2. Understand Scale. Every map is a scaled down representation of a piece of the earth. A scale of 1:100,000 means that 1 cm on the map represents 100,000 cm (which is 1 kilometre) on the ground. On a 1:25,000 map, 4 cm represents a km. The scale is always stated on the map and you will also find a scale bar showing how long a km is on the map
3. Understand grid lines and be able to give a six figure grid reference. Grid lines are the up and down and horizontal thin black lines on the map. They are generally 1 km apart on 1:25, 1:50 and 1:100,000 scale maps, which are the ones we mostly use for bushwalking, and they are very useful for estimating distances and specifying a location on the map. We also use the vertical ones to measure directions (or bearings) from using a compass. A six figure grid reference specifies a point to within 100 metres. The first three figures are the two figures at the bottom of the vertical grid lines plus an estimate of the tenths of a grid square to the point you are specifying. These numbers are called the easting because they increase eastward. The last three figures are the northing, the two figures level with the horizontal grid lines plus an estimate of the tenths of the grid square and they increase going northwards. Eastings come first because E comes before N alphabetically! A GPS unit can tell you what your grid reference is if you push all the right buttons and it can see enough satellites.
4. Be able to use a compass to measure grid bearings (directions) on the map and magnetic bearings on the ground and be able to convert from one to the other. This will be the topic of my next and final article next month.

In the meantime, here are two sources on the internet that I encourage you to look up. They will reinforce what you have read here and also have very informative diagrams which my article lacks

- The excellent series of eight navigation articles written by Quentin Tibballs who was our training co-ordinator till recently and which are on our club website at http://www.melbournebushwalkers.org.au/activities/Walks/MBW_training_navigation1.htm
- The also excellent publication produced by Geoscience Australia called “Map Reading Guide – How to use Topographic Maps” freely available to download or read from http://www.ga.gov.au/image_cache/GA7194.pdf

In addition the club will be running a Navigation course in Autumn. This will consist of one theory evening and a practice day in the bush. Stay tuned for the next and final article next month.

LESSON 4: COMPASS CAPERS

This is the last of the 4 part mini-series on the basics of navigation. This one's all about that extremely useful device – the compass, that seems to scare some people. It shouldn't, and I'll attempt to make it your friendly personal assistant. Make sure you have a topographical map and a compass in front of you before reading this next bit otherwise you'll have no idea what I'm talking about.

What is a Bearing? A bearing is simply an angle measured clockwise from north. A full circle is 360 degrees so east is therefore 90 and south is 180 degrees. A grid bearing is therefore an angle (or bearing) clockwise from a N-S grid line. Measure the grid bearing of a direction on the map by placing the edge of the compass along the direction, then rotating the dial (or capsule) so that the parallel black lines inside the dial are parallel to the north-south grid lines and read the bearing at the marker on the dial. Ignore the compass needle because you are dealing with the map, not the ground around you.

Now **how do you know whether the grid or the magnetic bearing is bigger?** That's easy. Remember that in Victoria, magnetic north is always east of north (that is clockwise of or to the right of north) by 10-11 degrees in most of our day walking areas and 12 degrees in most of the Alps. Then imagine a northpoint diagram with a grid north arrow pointing up vertically and the magnetic north arrow pointing a bit to the east or clockwise. The magnetic bearing (or angle going clockwise between magnetic north and our desired direction therefore has to be less than the corresponding grid bearing (in Victoria) by that 10 – 12 degrees. Some people use the acronym GMS or "GrandMa's Socks" for "Grid to Magnetic Subtract" but I can never remember that and find it far easier just to imagine the little northpoint diagram.

So **to walk on a compass bearing**, simply rotate the dial back by the 11 or 12 degrees (the grid-magnetic angle) so that you now have the magnetic bearing set on your compass. Then rotate the whole compass till the red end of the needle (which always points to magnetic north) lines up with the hollow red arrow on the dial. The edge of the compass base is now lined up in the direction (or bearing) you want to go.

For more reinforcement, I refer you again to lesson 7 of the 8 part series on navigation by Quentin Tibballs which is on our club website at

http://www.melbournebushwalkers.org.au/activities/Walks/MBW_training_navigation1.htm and the Map Reading Guide on the web at http://www.ga.gov.au/image_cache/GA7194.pdf

If you have understood these four articles, you know enough to be a competent navigator. All you need to do now is to practice your new skills. The best way to practice is to, when bushwalking, follow the route on the map, orient the map frequently and correlate the features and landforms around you with what is on the map. Take an occasional magnetic bearing just for fun, convert it to grid and see if it points to the right feature on the map. You'll get better and better.

Then consider doing a Rogaine. This is the best way I know of to practice and polish up your skills. See the rogaining website at www.vra.rogaine.asn.au for details.

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