ACT Rogaining Association
INCORPORATED

Introduction to Navigation

Contents

1. Introduction

These notes have been extracted from the ACT Rogaine Association Navigation and Rogaining Skills workshop course notes. They are designed to help familiarise you with some of the basics of navigating with a map and compass.

What is rogaining?

Rogaining is the sport of long distance cross-country navigation. Rogaines are generally day and night events in which teams of two to five members travel entirely on foot/bicycle/skis or canoe around checkpoints, navigating by map and compass. Teams normally select their own order of visiting checkpoints. Events range in duration from 2-3 hours to 24 hours. Teamwork, endurance and an appreciation of the natural environment are features of the sport.

If you are new to rogaining you may also like to have a look at the Victorian booklet "Which Way's North?" This can be downloaded from the Victorian Rogaining website at: http://vra.rogaine.asn.au/ Have a look under the Getting Started tab at the top of the web page. While this publication now has a few dated elements, this covers most elements of rogaining and also has a good checklist for gear to take.

2. Basic navigation in theory

This section has been adapted from notes by Nikki Taws and Anthony Scott for orienteering training.

2.1 Map scale

Rogaining maps can vary in scale. The most common scale used by ACTRA is 1:25000. This means that 1 cm on the map is equivalent to 25,000 cm on the ground (or 250 metres). A scale of 1:10,000 (common size of orienteering maps) means, 1 cm on the map is equivalent to 10,000 cm on the ground (or 100 metres). So if you travel 100 metres along the ground, you will move 1cm on your map.

The maps will have even spaced north lines, often spaced at one kilometre intervals, and these can be handy for estimating distance on the map.

2.2 Map Preparation

Most events use maps that have been especially prepared for that event. Most maps are based on government topographical maps. A few are prepared from orienteering maps.

All maps have a legend that provides a description of all the symbols and colours used on the map.

2.3 North lines.

Nearly all maps made specifically for rogaining events only have magnetic north lines marked on the map.

On a standard topographical map the vertical parallel lines show grid north. In order to determine magnetic north, declination needs to be accounted for. Please see the declination section of these notes (section 11) for more detail. This can be handy when you are generally out in the bush with a regular

topographic map. The workshop will not go into working out declination, although your coach can teach you how to account for declination if you ask.

2.4 Introduction to contours

What are contours?

Contours connect points of equal height (land elevation). They show the shape of the landscape. Being able to match the flow of the ground with the contours is one of the most valuable skills to master in map-based navigation.

The contour interval shows the height difference vertically between the contour lines. Normally on topographic maps the contour interval is 10 metres but can be 20 metres in steeper areas or 5 metres in very flat areas. Form lines (broken brown lines, generally only found on orienteering maps) are used to indicate contour shape or height for features under 10 metres high.

The contour lines are the only "imaginary" symbols on the map - all other symbols represent identifiable features on the ground.

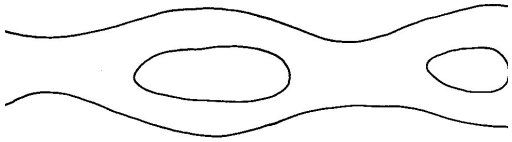
Some Important Land Forms

(a) Knoll

This is a hill top and is shown by a loop contour or several concentric loop contours depending on how high the hill is. Some examples are shown below.

Small Knoll roughly circular

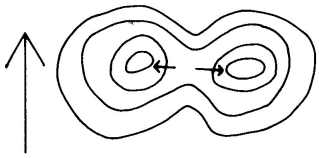
Steep hill, circular



Two elongated, flattish knolls along a a long, generally flat ridge

(b) Saddle

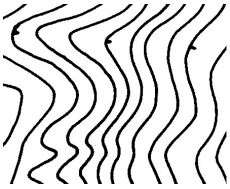
Named after a horse rider's saddle, it is a low point between two knolls. It looks up to higher ground on two sides, and looks down on to lower ground on the other two sides.



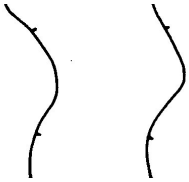
A saddle, between higher ground to the east and west, and lower ground to the north and south.

(c) Steep and Flat Terrain

Contour lines close together indicate steep terrain; contour lines a long way apart indicate flatter terrain.



Steep Hillside
(tags point downhill)

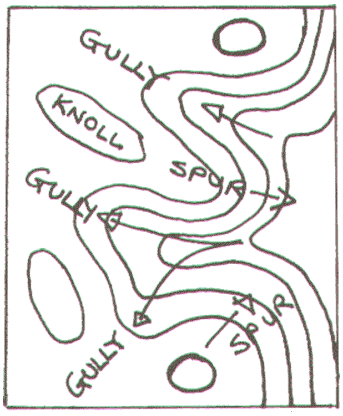


Much flatter land
(tags point downhill)

d) Gullies and Spurs

A gully is a small valley, usually where water runs in wet weather. A spur is a sloping ridge jutting out from the side of a hill. In most Australian terrain, hillsides have been eroded to form a series of gullies separated by spurs. Every bend in a contour indicates either a gully or spur. It is crucial to be able to tell which of the two it is.

(e) How to distinguish between a gully and a spur



Find the highest point (the knoll)
SPURS point away from the knoll and downhill
GULLIES point towards the knoll and uphill.
On many topographic maps gullies can be picked by the blue lines denoting watercourses.

(f) How to know which way is uphill and downhill?

It is not always easy to tell! Topographic maps have a thicker "index" contour, usually every 100 m, that have heights marked that you can match up to work out up and down. Alternatively, locate a high point or a low point, and follow the contours from there.

Here are some hints:

1. Watercourses flow in land lower than that immediately surrounding them.
2. Water flows downhill. Watercourses get larger and join each other as they flow down to lower country.
3. Look for closed loop contours indicating hill tops. The land immediately surrounding is lower.

Interpreting spurs and gullies is best learned in the terrain with a map. It can also be reinforced by means of suitable theoretical exercises.

2.5 How do you navigate?

How do you get to each control?

- Firstly use your map and compass to check the **direction** and the approximate **distance** to the next control.

- Then look for a simple '**route choice**'. Look for simple 'line features' that you can follow, such as large tracks, fences (if marked) and watercourses. You can go any way you like, straight across the countryside or by a track to the left or right. The challenge is to decide which way is the best. Going straight is the shortest distance, but it can often be faster (and safer navigation) to follow a track or other line features.

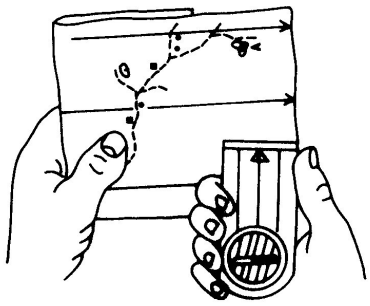
- **Cross-checking the map with the topography**. After planning your route choice, check your direction again and start heading towards the next control. Look ahead, and then to the left and right, identify features and check the gradient of the contours around you that might be mapped. Then look at the map and cross-check. This is how you check that you are going the right way.

- **Control description**; Check your control description so that you know what feature you are looking for. Is the control on a spur or gully? Finally, as you arrive at the control, check that you all "punch" your navlight scoring tags.

2.6 Orientating the map

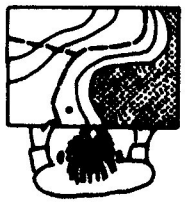
To make it easier to relate the map to the ground, it should be turned around so that it always faces the same way as the ground it represents. This is called orientating your map.

Place the compass on the map. Turn the map until the magnetic north needle in the compass lines up with the magnetic north lines on the map; it is now facing the same way as the ground.



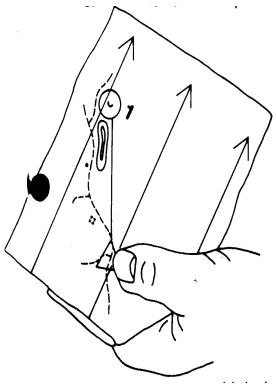
How often do most rogainers check that the map is oriented? Generally every time a significant change of direction is made, and every time a new linear feature (especially a track) is crossed.

Check that the track lies in the direction shown on the map. If not, STOP. If the features marked on the map don't match the terrain, something is wrong. Early recognition of an error will save a lot of time and energy.



2.7 Keeping track of where you are

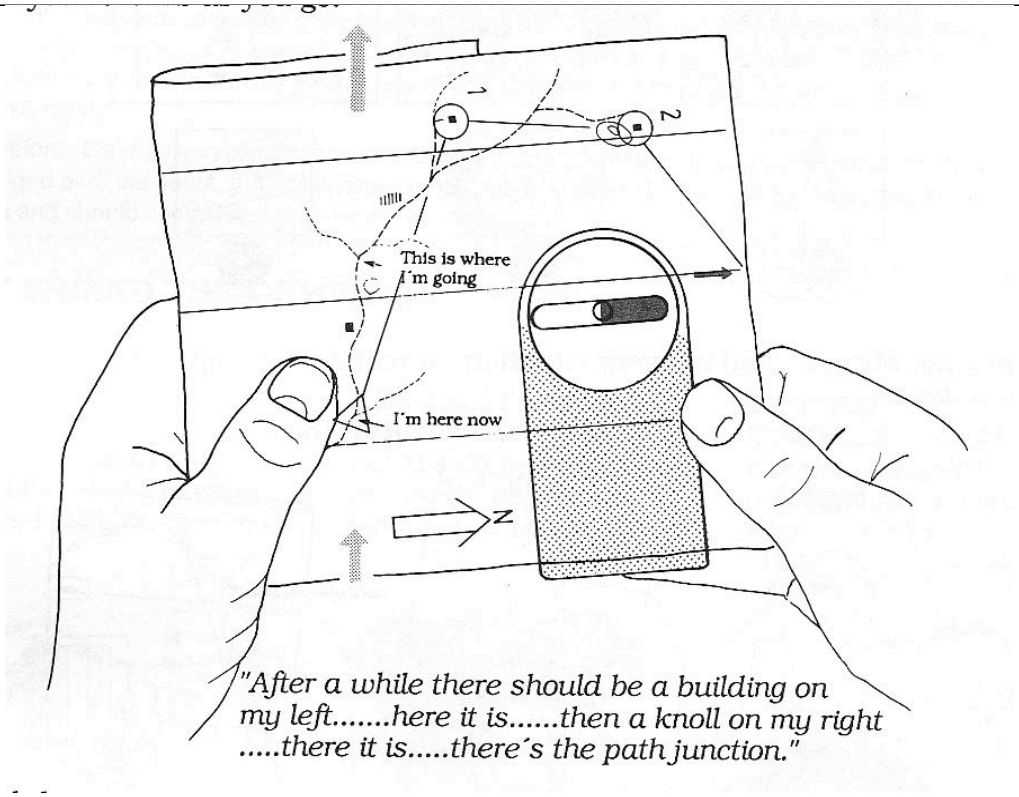
It is important that you keep track of where you are at all times. Many people find it helpful to keep the map open in your hand and your thumb near where you are. Most people prefer to keep their map orientated to north using their compass so that your direction of progress is upward on the map. The map will usually need to be folded (or rolled) to keep it manageable.



2.8 Planning each control leg: Handrails, simple plans and catching features

Planning the route choice

1. Before you leave any control make a **simple plan.**
2. Orient your map before moving off.
3. Look for any **simple linear features** (or **handrails** e.g. watercourse, roads) you can follow or large point features (eg. knolls) you can pass.
4. Also look for any **catching features** behind the control that might help guide you in, or prevent you from going too far.



2.9 Cross-checking

How do you keep track of where you are??? By **cross checking** the map with the landscape around you.

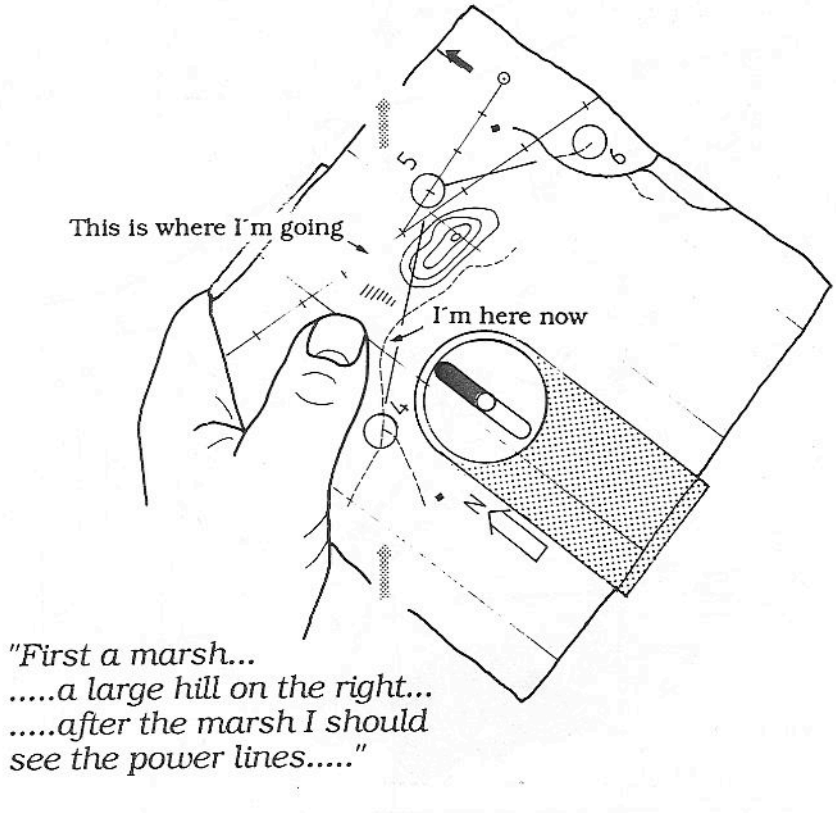
Cross-checking routine.

1) As you do each leg, check **your map is always orientated to north and then check which direction you are going.**

2) Carefully thumb the map, and **cross-check the features on the map with the features around you in the forest**. When you cross-check, look ahead into the distance, and ALSO to the left and right. But don't just look; you must also process all the information you see, by thinking about how it should look on the map, and then checking the map.

3) When you cross-check, the most important thing to do is check the **shape of the landscape** around you with the **contours** on the map. The contours are your most important navigational aid.

4) When you approach the control, slow down and watch the map and the landscape even more carefully. Take your time, and guide yourself into the control by scanning the terrain all around and cross-checking this detail with your map.



2.10 Relocation routine.

If the features around you don't match up with the features on the map, or your direction seems wrong, **STOP! Orientate your map. Then have a careful look around you** (all around you, even behind). If you stop immediately, you'll probably be only slightly off your chosen route and will be able to correct your position very easily.

If it is not obvious where you are, **look carefully at the contours**, (the slope and shape of the land) and any major features that you can see. Try to pick these up on the map. Then confirm your position by looking for other detail ("*if I'm on this spur, there should be a flat section and then a steep gully on my left… and there they are!")*.

Another trick is **to retrace on the map where you have come from.** Think about the last time you were in total contact with the map, and try to work out where you might have gone. Look around the landscape and see if this makes, sense.

If nothing fits and you have no idea where you are, proceed to a feature that you can recognise or in a direction where there is a major handrail such as a river or road. Once you relocate, make a careful plan to the control and navigate carefully and safely. Take your time and remain calm. Everyone has to use the relocation routine at some time, and often many times.

3. Night Navigation

It is even more important to know where you are at night because you can't see features. It is also much harder to relocate at night.

At night, or in any other conditions of reduced visibility such as fog, much greater care is required to maintain map contact. Conservative techniques should be used such as following major handrails, even if it means further to travel. Detours to well-defined features to positively locate your position will add considerably to your confidence.

Most people tend to pace count more at night or keep a good track of estimated time for the anticipated distance/terrain until the next control. Pace counting is counting the number of steps you take and equating that to distance (you will have an opportunity to work out how many steps you take every 100 m during the workshop).

Rogainers also tend to rely more heavily on their compass during the night. A technique that is sometimes used to prevent people going off their bearing is to use a team member walking approximately 15 -20m in front as the spotting point. If the person in front starts to walk to the left of where the bearing is pointing the back person might call "drifting left" or something to the like.

4. Declination

If you are using a regular topographic map with a compass you will need to account for magnetic declination.

What is Magnetic Declination?

Magnetic declination is the difference between true north (the axis around which the earth rotates) and magnetic north (the direction the needle of a compass will point).

Magnetic north is determined by the earth's magnetic field and is not the same as true (or geographic) north. The location of the magnetic north pole changes slowly over time, but it is currently in northern Canada (approximately 700 km from the true north pole). Maps are based on the geographic North Pole because it does not change over time, so north is always at the top of a map.

However, if you were walk a straight line following the direction your compass needle indicates as north, you would find that you didn't go from south to north on the map.

How far your path varied from true north depends on where you started from; the angle between a straight north-south line and the line you walked is the magnetic declination in the area you were walking.

Where is the declination on your map?

Fortunately, magnetic declination has been measured around the world and the amount of declination for your map is written near the legend.

There will be three arrows on the map, one pointing to Grid North (GN), one to True North (TN) and one to Magnetic North (MN). Labelled is the Grid-Magnetic angle (e.g. 13.7. This is your declination for the year in which the map was made).

True North is what most people think of when defining "North". Grid North is the north lines on a topographic map. Because topographic maps are drawn on a sheet of flat paper the Grid North ignores the curvature of the Earth so will be slightly off True North. Normally we do not need to be too

concerned however, because we only need to know the difference between Magnetic North and Grid North. Very occasionally where two topographic maps are put together for a rogaine, the Grid North's will vary on the two map parts of the map, so the declination will also vary between the two parts of the map. Details about this will be in the course setter's notes.

Below the arrows will be the year in which the map was made and the amount that the magnetic north moves each year (e.g. 0.1 degrees per year). This is important to include if your map is very old as some topographic maps are.

How do I adjust my bearing for declination?

You need to subtract or add the declination to the bearing you have worked out on the map, say 060. If the declination is 13 degrees East, you need to subtract 13 degrees from your bearing. This makes the bearing you should walk on your compass 047. The easy way to remember is if the magnetic north arrow on your map is east; turn your compass dial east by the amount of declination from the original bearing.

Easy way to remember declination:
Magnetic east, magnetic least (-);
magnetic west, magnetic best (+).

In Australia, magnetic north is usually east of true north, except for around Perth. Therefore, you will most likely need to **subtract** the magnetic declination when determining a bearing to walk on from the map unless you are rogaining near Perth or overseas.