MOUNTAIN NAVIGATION FOR RUNNERS

By Martin Bagness

INTRODUCTION

This book is written for competitors in fell races, adventure races and mountain marathons, and for anyone who enjoys making lightweight trips into the mountains armed with a map, compass and running shoes.

The British fell racing calendar is crammed with a variety of events, with winning times varying between ten minutes and five hours. Many of the longer races require the use of some navigation skills, and even if the route is well-known beforehand and there are other runners around, things can get very much harder when the mist comes down and the field becomes scattered.

Mountain Marathons have grown steadily in popularity since the first Karrimor was held in 1968. Far from being an offshoot of fell running or orienteering, mountain marathons are now firmly established as a sport in their own right. For a huge following of enthusiasts, mountain marathons represent the highlight of the running season.

Adventure Races have no fixed format, but usually involve a combination of activities such as trail running, mountain biking and canoeing. There is very often a navigation element.

Everyone, from beginner to expert, can improve their results by improving their navigation, but skilful navigation can be enjoyable in itself. Read this book, and hopefully the thrill of successful navigation will be added to all the other pleasures of running on the fells and moors and in the mountains.

USING THIS HANDBOOK

The techniques described in this handbook have been taken from a variety of sources. Some have arisen from the author's own experiences, whilst some have been gleaned from conversations with other enthusiastic fell runners and mountain marathoners. Others have been borrowed from the sport of orienteering.

The first chapters are written with the beginner in mind, however they contain a number of hints that may be new even to the expert. It is not necessary to use every method of navigation described here, instead it is better to pick and choose between the various techniques, with the aim of developing a personal style of navigation most suited to yourself and to the kind of races you take part in.

Navigation is a practical skill. As such you can only learn so much about it from a book. The only way to really improve your navigation is to go out running and practise the techniques described here, either during a training session or in a race.

1. THE MAP

Maps are the tools of the trade! This chapter describes those maps most commonly used in British fell races and mountain marathons: Ordnance Survey (or OS) maps at scales of 1:50000 and 1:25000, and Harvey maps at 1:25000. Apart from having different scales, these maps all use different symbols and a different style of mapping to show the ground. Each of them has its advantages and disadvantages for the runner.

ORDNANCE SURVEY 1:50000

The most recent 1:50000 series is called the Landranger and covers the whole of Scotland, Wales and England in 204 sheets.

SCALE: 2 centimetres on the map equal 1 kilometre on the ground. (Or, if you prefer, 1.25 inches equals 1 mile). As on the other maps described here, grid lines are exactly 1 kilometre apart.

CONTOUR INTERVAL: Contours are at a vertical interval of 10 metres, with Index Contours, (the thicker lines) at 50 metres.

ADVANTAGES: Give a good, clear picture of the overall shape of the ground, especially the patterns of the major hills and valleys. Each sheet covers a large area, so it is good value for money!

DISADVANTAGES: In order to show a large area of ground on a single of paper, a great deal of fine detail has been omitted. This makes it difficult to navigate to a small feature, and in fact the 1:50000 scale on its own is unsuitable for competitions involving fine navigation.

MAP HINTS:

-Fences and walls are only shown where they follow a forest boundary.
-Only the largest paths and streams are shown.
-Marshy ground is never shown in the mountains.
-Rocky ground is only sometimes shown.

-Crags are either shown as outcrops or as cliffs; outcrops are too vaguely shown to help with navigation, whereas cliffs tend to be large and obvious.
-The use of 10 metre contours at this scale means that sections of contour line are often omitted for clarity on very steep slopes.

ORDNANCE SURVEY 1:25000

Scotland, Wales and England are covered by the Explorer series (orange covers). All the major mountain marathons are occasionally held on 1:25000 maps.

SCALE: 4 centimetres on the map equal 1 kilometre on the ground (or 2.5 inches equal 1 mile).

CONTOUR INTERVAL: Contours are at a vertical interval of 10 metres, with Index Contours at 50m.

ADVANTAGES: A great deal of detail can be shown at 1:25000, making it possible to map read very accurately.

DISADVANTAGES: The contour lines are finely drawn, making them difficult to see during a race. A clutter of symbols showing different types of rocky ground and vegetation obscure the contours and make it hard to gain an overall picture of the shape of the ground. Pathfinder sheets cover too small an area for most races, whereas Outdoor Leisure sheets are too large and awkward to fold!

MAP HINTS:
-All walls and fences are shown. Sheepfolds are shown.
-The smallest streams, ponds and footpaths are shown, however these are not always reliable.
-As a rough guide, streams shown with a double line are uncrossable when in flood. This can be useful in Scotland where a wee spot of rain can turn the smallest burns into raging torrents
-County and Constituency boundaries could possibly be mistaken for footpaths, although they are drawn with a much heavier line.
- Access Land (either designated by the CROW Act of 2000, or other open access land) is shown in pale yellow.

HARVEY 1:25000

The "Harvey Mountain Map" series covers selected mountain areas throughout Great Britain. Used for most mountain marathons. Sometimes specially printed at 1:40000 (2.5cm equals 1km).

SCALE: 4 centimetres on the map equals 1 kilometre on the ground (Or 2.5 inches equal 1 mile).

CONTOUR INTERVAL: Contours are at a vertical interval of 15 metres, with Index Contours at 75 metres. Extra contours or "form-lines", drawn as dashed lines, are sometimes mapped at 7.5 metres to show additional information.

ADVANTAGES: Especially made for leisure use and show all the features of use to a runner or walker, whereas OS maps serve many other purposes, and show political, historical and geographical information which is of little use to the runner. Drawn using line widths and colours which are easy to read during a competition. Generally up to date and consistent. Printed on semi-waterproof paper.

DISADVANTAGES: It may take a while to get used to Harvey maps, especially for long-time users of OS maps.

MAP HINTS:
-Fences and walls are only shown on the open fell, not within farmland.
-Fields are shown as yellow, rough pasture as pale yellow.
-Paths, streams, ponds, marshes and peat hags are well shown.
-Individual boulders and sheepfolds are usually shown.
-Areas of complex detail are well shown by the accurate contours.
-Forest is shown as light green, dense forest as dark green.
-Firebreaks are well mapped.
-Contour lines are drawn in grey where they cross rocky ground.
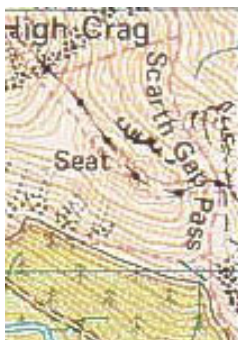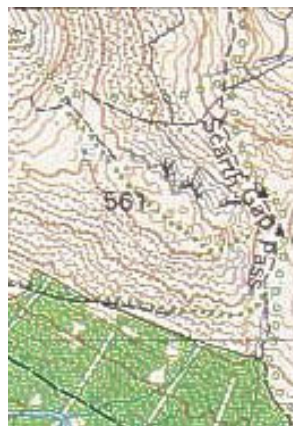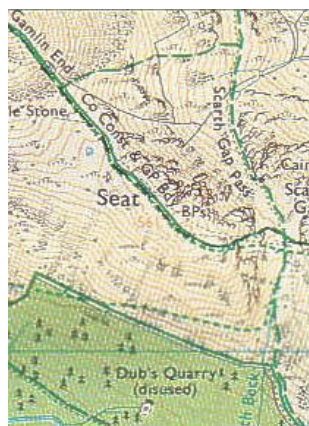
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Left to right: OS 1:50000, OS 1:25000, Harvey 1:25000 (not to scale)   2

2. USING THE MAP: THE BASICS
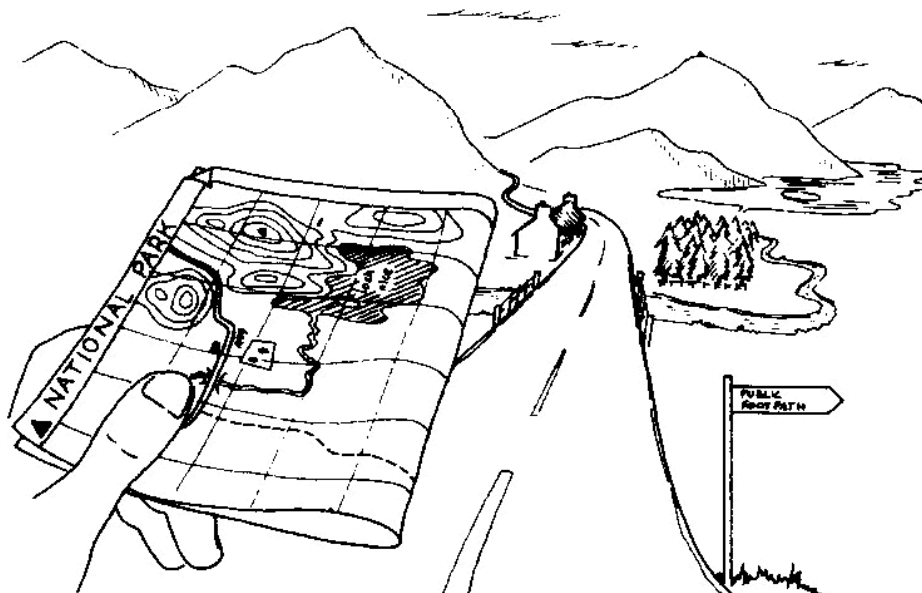
SETTING THE MAP WITH THE GROUND

The first principle of map reading! When looking at the map always make sure that it is lined up, or orientated, with the features on the ground. To do this, turn the map so that a feature on the map is aligned in the same direction as the same feature on the ground. This means that if you are running east, say, then the eastern side of the map will be furthest away from you. Setting the map automatically gets things "round the right way", and makes it easier to understand the map information. (The map can also be set with the compass. This is explained later).

THUMBING THE MAP

The second principle of map reading! Keep your thumb right next to where you are on the map. You will have to fold the map to a fairly small size in order to do this. In this way you will be able to focus on the right part of the map at a glance. With practice it will be possible to read the map without stopping running.

CARRYING THE MAP

During mountain marathons or navigation fell races, a good map-reader will hold the map in their hand for virtually the whole of a race, in order to constantly refer to it. The only time the map should be shoved into a pocket is when you need to use both hands.
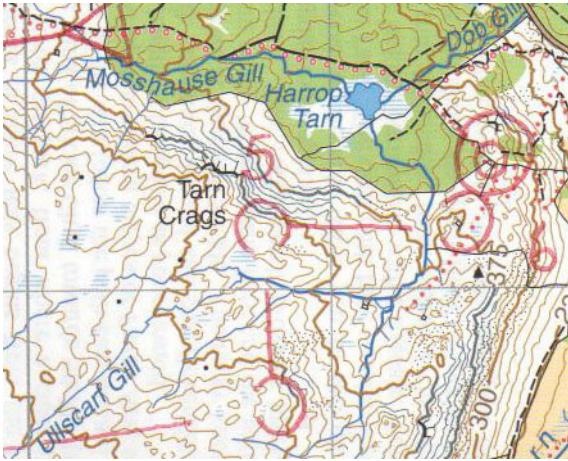

The two basics of map reading: setting the map with the ground, and thumbing the map.

3. COPYING DOWN A COURSE

USING MASTER MAPS

Before a competition you may have to copy down the course from a master map. The best way of marking the site of a checkpoint (or control, as they are sometimes called) onto a map is with a circle of about 6 to 10mm in diameter. The checkpoint feature should be at the centre of the circle. Care should be taken to avoid obscuring any map detail. If you have to visit the checkpoints in a certain order it is best to number them on the map in that order. Joining the circles with straight lines also helps you remember which order to visit them in, and sometimes makes it easier when choosing between possible routes. A triangle is usually used to mark the start, and a double circle to mark the finish. Everyone, at some time or other, has made the disastrous mistake of copying a checkpoint in the wrong place, so it is always worth double-checking at the master maps.

A course copied from a master map. The lines and circles have been broken in places to avoid obscuring map detail. A triangle has been used to show the start, and a double circle the finish.

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PLOTTING GRID REFERENCES

It is more usual to receive your course in the form of grid references. These are almost always given as six figures, written, for example, as 668218 or 668/218. The first three figures locate the position of the checkpoint along a west-east axis, the second three figures along a south-north axis. The illustration shows you how to plot a grid reference.

The point that you plot marks the south western corner of a 100 metre square; the checkpoint will lie within this square. A properly planned course will have checkpoints sited on features shown on the map, accompanied by a written description of each site, so there should be a feature matching the written description. Again, mark the checkpoints with circles, number them in order and link them with straight lines. Double check everything and, if you are running as a pair, get your partner to check as well.
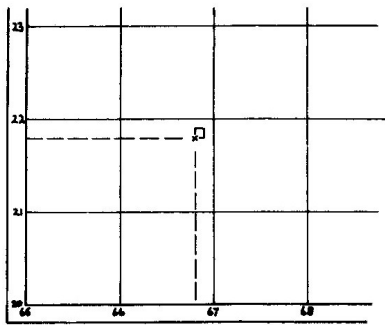
plotting a point from the grid reference 668218. 668 refers to its position on the E/W axis, and 218 to the N/S axis. The point lies within a 100 m square to the NE of the intersection of 668 and 218.

Below: course descriptions from the Saunders Lakeland Mountain Marathon 2002, at Pooley Bridge. The Scafell course was the longest pairs course; the Carrock Fell was a short / middle length course. These descriptions were given to competitors just after they started. The courses can be plotted for grid reference practice on the Harvey Lakeland East sheet.

Examples of old courses are given on many event websites.

SLMM 2002   POOLEY BRIDGE
SCAFELL DAY 1 25KM
VISIT THE CHECKPOINTS IN THE ORDER GIVEN

START	472226	GATE	
1	117	472201	BETWEEN KNOLLS
2	115	482166	RUIN
3	110	467139	N.W. RUIN
4	106	433139	RIDGE, 615M LEVEL
5	111	418149	ANGLETARN PIKES, E. SUMMIT
6	102	402182	BIRK FELL SUMMIT
7	103	415183	REENTRANT ON HIGH DODD
8	104	426172	CRAG TOP ON BEDA HEAD
9	119	429163	GATE ON BRIDLEWAY

FOLLOW TAPES 1KM TO FINISH AT 437169

SLMM 2002   POOLEY BRIDGE
CARROCK FELL DAY 1 17KM
VISIT THE CHECKPOINTS IN THE ORDER GIVEN

START	472226	GATE	
1	120	490236	POND
2	118	492215	LARGE SHAKE HOLE
3	113	458208	W. CAIRN
4	107	452181	SHEEPFOLD
5	122	475169	S.W. POND
6	114	472162	SMALL REENTRANT, lower part
7	101	440170	GATE

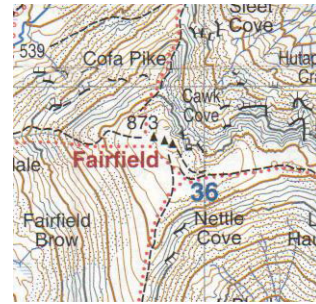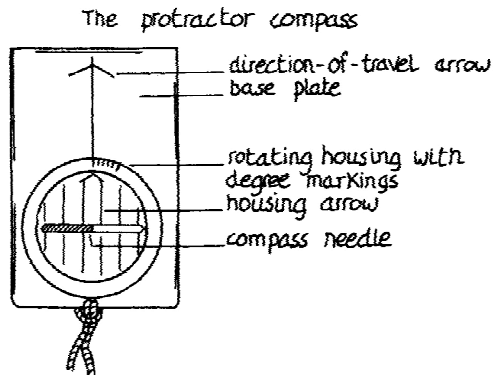**FOLLOW TAPES 300M TO FINISH AT 437169**

CHECKPOINT MARKERS

Checkpoints in fell races are almost always manned. Competitors log through each checkpoint either by having their race number taken or with an electronic system such as Sport Ident (more below). Keep your eyes open for a person or a group of people, often shouting encouragement or mild abuse! Checkpoints in mountain marathons are usually marked with standard orienteering-type markers. These are 3-sided 'kites' of orange and white nylon, about 30cm square. Competitors usually log through using Sport Ident. Checkpoints are often manned and the marshals' tent is usually a lot more obvious than the marker! Despite this it is always safer to assume that the checkpoint you are looking for will not be manned.

Sport Ident is the most commonly used electronic timing system. Runners carry a small chip ('or dibber'), which is inserted (or 'dibbed') into a control box at start, finish and each checkpoint. The chip is downloaded at the finish to provide a printout of total time, plus split times for each checkpoint.
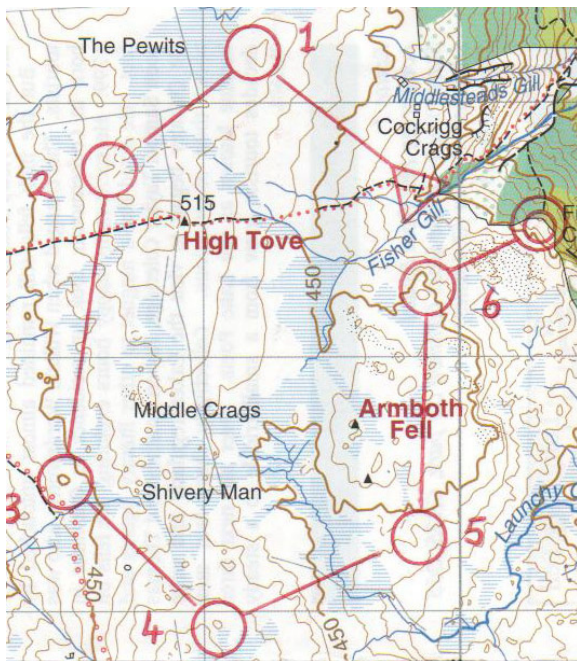
4. THE COMPASS

Navigation is essentially a combination of map and compass. On featureless moor or in the mist the compass assumes a vital role and the map may be of only limited use. In clear weather, in well-defined terrain, it may be possible to navigate by map reading alone, however the compass should still be used as a back up. It is easy to learn the simple procedures involved in using a compass - much easier than it is to learn to read a map. Yet the majority of mistakes that people make are caused by ignoring the compass. The compass is always right, except in the most exceptional circumstances, whereas a lot can, and does, go wrong with map reading. Three methods of using the compass are described below.


The protractor compass
direction-of-travel arrow
base plate
rotating housing with degree markings
housing arrow
compass needle

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The summit of Fairfield in the Lake District. In bad weather the compass may be the only way of finding the correct descent.

©Copyright Harvey Maps

High on the boggy watershed between Thirlmere and Watendlath in the Lake District. The terrain is vague with many small, similar looking features. The compass plays a vital role in this sort of area, especially in the mist.
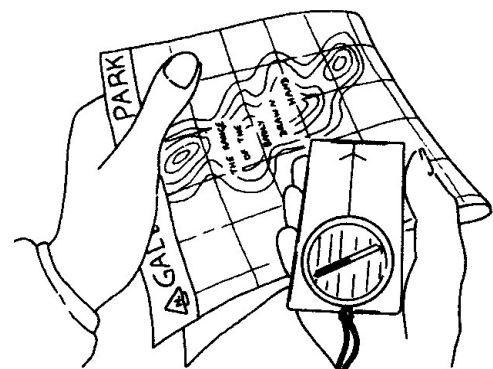
The map set with the compass

SETTING THE MAP WITH THE COMPASS

This simple technique helps with map reading and at the same time tells you which direction to run in. Earlier on it was explained how to set the map with the ground (the first principle of map reading) by lining up the map with visible features on the ground. The map can also be set with the compass, by turning the map until the north lines (meridians) are aligned with the needle of the compass. An imaginary line on the map, drawn between you and your destination, will be pointing in the direction you need to follow.

Although this is a simple technique it can be used in almost every situation, and some competitors rarely bother with more complicated methods of using a compass, such as taking a bearing.

TAKING A BEARING

At first, taking a bearing may seem a complex process. It is best practiced before trying it out in a competition. It is most useful when a high level of accuracy is needed, for example in thick mist or when trying to locate a small feature, especially when the map is of little help. The three-stage method of taking a bearing using a protractor-type compass is shown in the diagram.

The accuracy of your bearing depends on the care you take in making sightings from the compass, once the compass has been set. Hold the compass as level and as steady as possible. Sight along the direction arrow of the compass and choose an object such as a tree or a rock to serve as a marker that you can run towards. This object should be as far away as possible - it may even be, say, an object on the horizon, well beyond your destination. In thick mist, in forest terrain, or at night it may be hard to see very far ahead, and there may be no alternative but to take frequent, careful sightings. In extremely low visibility you may have to keep sending your partner ahead to act as a marker (if you are on your own then you are in trouble!) It is possible, with some practice, to both set the compass and take sightings without stopping running, although this is only to be recommended when it is absolutely vital to save seconds, for example in a short, fast race. Ensure that the compass is held level and steady when taking a sighting on the move. Hold the compass in a level position for a few seconds before looking at it, to give the needle time to settle.
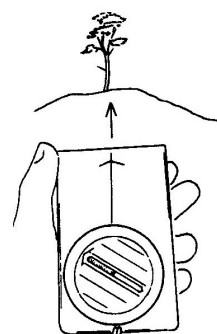
The three stages of taking a compass bearing:
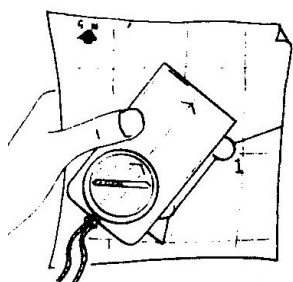
1. align the edge of the compass with the leg on the map
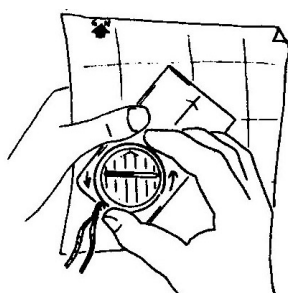
2. rotate the housing until the housing arrow is aligned with the north lines on the map

3. hold the compass level and steady. Turn the whole compass and yourself until the north needle is aligned with the housing arrow. Make a sighting.

When a high level of accuracy is required, 1 degree should be added to the bearing to allow for magnetic variation, however an adjustment so small is unlikely to make any difference in most practical situations.

RUNNING ON "THE NEEDLE"

This is a way of saving time when using the compass. If you wish to run due north or due south then there is no need to set the compass as all you need to do is follow the compass needle, (remembering that the red end points north and the white end points south!). You can use the same principle to run due east or west.

TYPES OF COMPASS

The modern protractor-type compass (as illustrated in the earlier diagram) is ideal for all types of navigation. For fell racing, when the compass is only used occasionally and is usually carried in a pocket or a bumbag, a compact model is most suitable. For mountain marathons it may be worth investing in a larger fast-setting model. The "thumb-compass" is an alternative to the protractor-type compass, and, you've guessed it, it is-worn on the thumb! It is held on the map at all times, keeping the map permanently set whilst showing the direction of travel, in exactly the same way that is described in the previous section on setting the map with the compass. Some models feature a rotating housing which enables you to take bearings in the same way that you would with a protractor compass. Thumb compasses require the map to be folded to a small size, which is awkward in many mountain marathons when the map comes in the form of a large, laminated sheet.
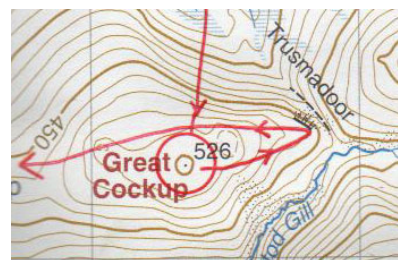
TRUST THE COMPASS

The only time that the compass fails to do its job of pointing to the north is when you are crossing magnetic rocks, as occur in the Cuillins of Skye, or when you are standing very close to a metal object such as a steel gate or a mountain bike. These situations are very rare, and it is a safe assumption that "the compass is always right." If you are following a

bearing then stick to it, even if the map seems to suggest otherwise. It rarely pays off to ignore the compass and follow a hunch; there is little evidence that human beings possess an inbuilt sense of direction!
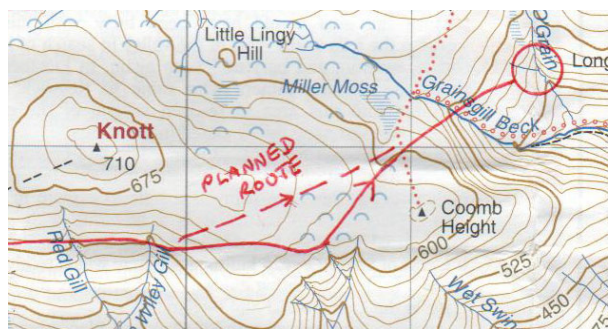
A mistake that was nipped in the bud. Ten times KIMM Elite winner Mark Seddon describes his route from the 1992 Capricorn: "Conditions were misty. Instead of crossing the main shoulder of Knott I crossed a lower ridge running south. A glance at the compass told me the deep valley in front of me was running the wrong way to be Grainsgill. I was able to relocate and continue with the loss of 2-3 minutes. If I had descended into the wrong valley the mistake would have been very costly". What started as a compass error was skilfully minimised.

The 180 degree error. A disastrous mistake easily made by following the compass the wrong way round. Check that the compass is round the right way when you place it on the map to take a bearing, also that it is the north end of the needle, not the south, that is aligned with the arrow on the base plate.

5. DISTANCE ESTIMATION

This section deals with methods of estimating how far you have run. It has already been explained how the compass gives an accurate and reliable measure of direction. Unfortunately there is no handy instrument that gives a similar measure of distance. Knowing how far you have run is more a matter of estimation than of accurate measurement.

PACE COUNTING

Pace counting is a method of estimating the distance you have covered by keeping a mental count of the number of paces you have used. It is perhaps best to mention straight away that pace counting is not everyone's cup of tea. Many successful competitors never use pace counting because they find that counting in their head takes away the feeling of fun and freedom that they get when running in the hills. If you feel the same then skip the rest of this section! Pace counting is not a vital part of mountain navigation in the same way that the compass is, and you can take it or leave it. Pace counting is most useful when it is not possible to tell how far you have run by reading the features on the map. This may be because the terrain is especially featureless; for example vague, rounded moorland, or because visibility is drastically reduced by thick mist. It is also useful if you are heading for a feature, say a stream, and you suspect that there may be other unmapped streams before you get there. Pace counting is often used together with an accurate compass bearing.

Pace counting is a simple technique to learn; all you need to know is how many paces you use to cover 100 metres. You can work this out by running over a measured distance of fell-terrain at your normal race pace. Most people count double-paces, i.e. they only count the number of times that one of their feet touches the ground, usually the right foot. When you decide to use pace counting during a competition, you first of all need to measure the distance that you intend to cover on the map, and then work out how many paces you will use to run that distance. For example if you use 40 double-paces to cover 100m and you wish to run for 300m, then you will need to count 120 double-paces.

Some runners stick a homemade pacing scale to the base plate of their compass. This is placed on the map alongside the distance that is to be run. Gradations on the pacing scale give a measure of that distance in terms of the number of paces that the runner will use, thereby saving on mental arithmetic. A different pacing scale is needed for each different map scale. For someone who uses 40 paces per 100m, running on a map scale of 1:25000, each 10 paces will cover 25m, or 1 mm on the pacing scale.
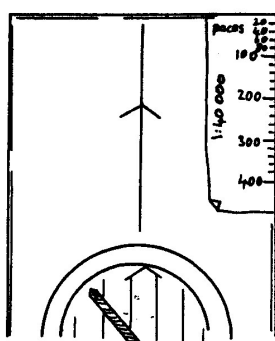
A pacing scale made by someone who uses 40 paces per 100m, for use with a 1:40000 map. Each gradation is for 20 paces, ie 50m, or just over 1mm at 1:40:000.

Perhaps the main plus-point in favour of pace counting is its potential role in mountain safety. It could provide the key to finding the safe way off a difficult mountain by, for example, helping to locate a route between crags, an abseil stake or a descent gully. It can also help the competitive runner to locate a difficult checkpoint, or to recognise a vital feature such as a path en-route to a checkpoint. On the minus-side, however, it should be remembered that pace counting is unreliable or impossible on rough or steep ground. Pace counting is perhaps best used as a last resort measure; a technique that you know how to use yet you only put into practice on those few occasions when compass and map reading do not suffice.

DISTANCE ESTIMATION BY JUDGEMENT

With practice it is possible to become skilled at recognising distances on the ground. Some people are able to look at the ground ahead and identify a feature that they judge to be, say, 100 metres away. It helps if you are, for example, a footballer who can relate 100m to the length of a football pitch, or a track athlete who knows that 100m is about the length of the finish straight. If you wished to cover 400m on the ground then you would have to divide this into four estimated lengths of 100m.

Some people take this method a step further and estimate distance purely by feeling. They look at a distance on the map and set off running until they feel that they have gone far enough. To do this well obviously requires a great deal of practice. It is essential to develop a "feel" for the particular map scale that you are using, and this is only achieved with plenty of experience.

6. ROUTE CHOICE

Choosing a good route is one way in which the crafty tortoise can put one over on the speedy hare. Whether you see it as a fascinating challenge or a necessary evil, route choice is a vital part of mountain navigation. A good course setter will try to keep the runners on their toes by ensuring that there is route choice in almost every leg of the course.

FACTORS IN ROUTE CHOICE

When choosing a route, first of all have a good look at the map to pick out every possible option. It is worth considering even those routes that make a huge detour from the straight line. The best route may even involve setting off in a direction directly away from the checkpoint that you are trying to reach.

For each option you have to consider the distance you will run and weigh it up against any factors that may affect your running speed. These factors may include:
- the height climbed on the route
- how much of the route is on paths or roads
- whether you will have to make any very steep climbs
- the roughness of the terrain underfoot; for example you may expect to be slowed by tussocks and marshes in a valley floor, by bracken and rocks on valley sides, or you may be able to predict fast running on the ridge tops
- the weather, especially the cloud level and wind direction
- obstacles such as crags, forest, lakes or out-of-bounds areas
- how tired you are feeling
- how easy it is to navigate along each route

To complicate things further, the fastest route may not always be the best. A long, level route along paths may be, say, 10 minutes slower, but runners taking that route will arrive at the checkpoint relatively fresh and warm and will have had a chance to plan ahead and eat some food. Runners who followed a quicker route over rugged mountain terrain may reach the checkpoint cold, disorganised and in a state of exhaustion.


agree on each route choice with your partner
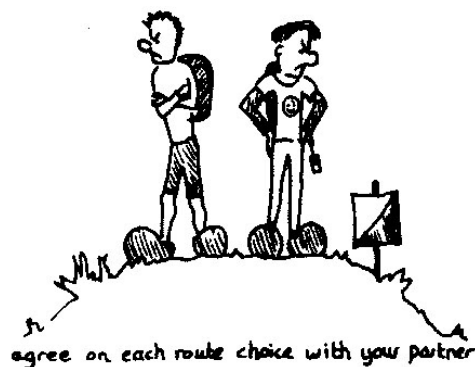
SOME RULES OF THUMB

BOB'S LAW

Bob's Law compares the distance of a particular route with the distance of the straight-line route (see diagrams). It is not especially exact, and mathematically minded readers may wish to make their own refinements.
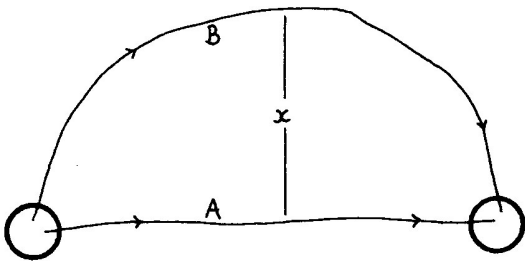
According to Bob's Law, the distance x is roughly the difference between the distance of route A and the distance of route B.
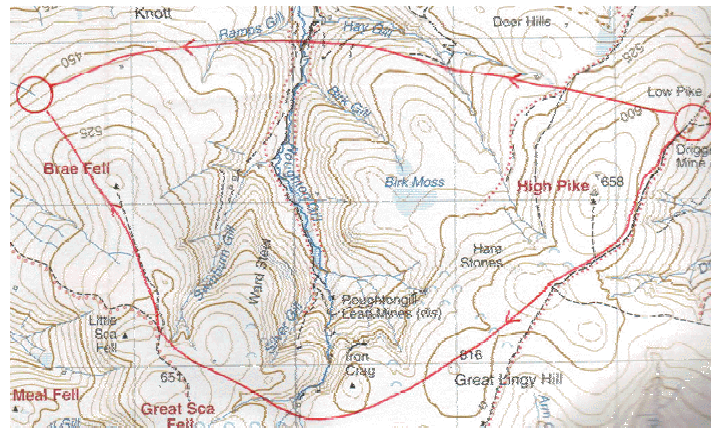
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The distance between the lines of the two routes is about 2km (2 grid lines). So according to Bob's Law the southern route is about 2km longer. However the northern route climbs an extra 10 contours, or 150m, which is equivalent to 1.5km of running (see below). So this route looks the fastest.

ESTIMATING HEIGHT GAIN

A popular way of doing this is to count the number of Index Contours (the thicker brown lines) crossed whilst climbing. The number of Index Contours crossed can be compared for each alternative route. Each Index Contour represents a climb of 50 metres, or 160 feet, on OS maps, and 75 metres, or 240 feet, on Harvey maps.

COMPARING DISTANCE TO HEIGHT GAIN

A rough rule is that 100 metres of ascent is equivalent to 1 kilometre of extra running on the flat. (Though this figure is open to debate!) So a climb of one Index Contour, or 50 metres on an as map, is equivalent to 500m extra running. (Grid lines on Harvey and OS maps are always 1km apart). This rough formula is used in the map example above.

JUDGEMENT BASED ON EXPERIENCE

The above rules of thumb only provide a rough estimate, and do not take into account many factors, not least of which is the time taken to do the sums! If, like the author, you find that performing feats of mental arithmetic takes some of the pleasure out of running, then you will be pleased to learn that judgement and experience are often the best ways of choosing the quickest route! With experience and an open mind, you may see the best route from a single glance at the map. By taking an overview of the whole leg it is sometimes possible to pick out a good natural line, linking sections of fast running and avoiding major climbs. With knowledge of the mountains, especially of the area you are running in, you may be able to predict, say, that there will be deep tussocks on lower ground or heather on the ridges.

MICRO ROUTE-CHOICE

Choosing the best route over the ground immediately in front of you involves looking ahead to spot the best line. It may be possible to avoid marshes, rocks and heather, or to pick up areas of level ground or sheep tracks. This all sounds fairly obvious, but the art of "reading the terrain" is a part of route choice that can only be improved with practice


tussocks in the glens.....scree on the slopes......heather on the ridges.....I'll be choosing a route to the nearest bar!!
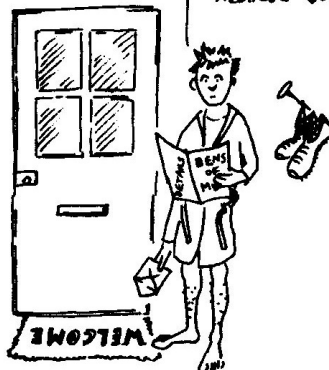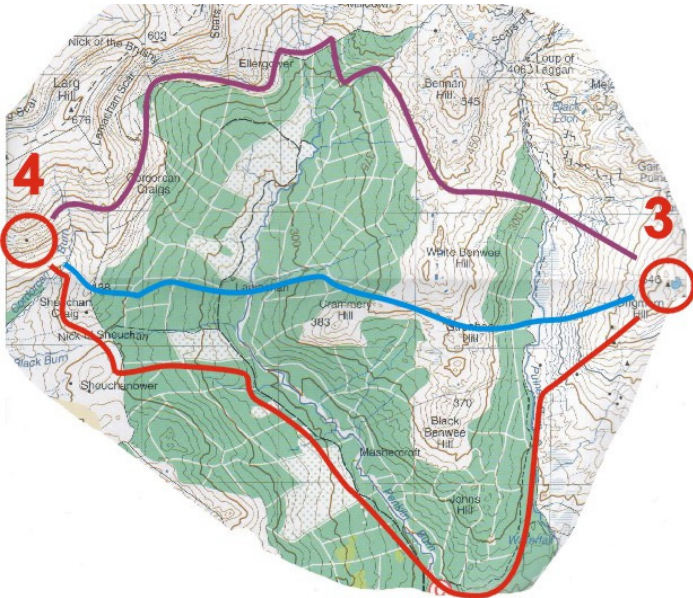
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A leg from the Rock and Run Mountain Marathon 1989 in Galloway, showing alternative routes. Forest terrain presents special route choice problems. Forest tracks offer fast running on level gradients, though they may follow circuitous lines. Rides or firebreaks (the narrow white gaps) can be tussocky or non-existent. The forest itself is likely to be extremely dense. In some cases it may be a better option to leave the forest altogether and take to the surrounding fells. Many OMM areas feature a gnarly forest section – often at the start or finish of the course.
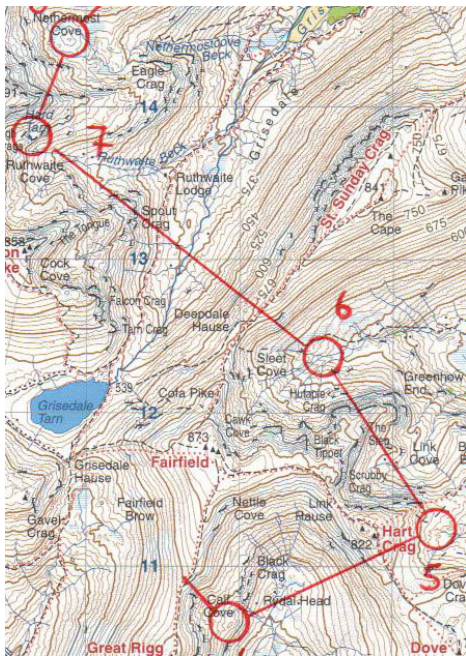
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Navigation with a mountaineering element! Tough legs from the Day 1 Elite course at the Saunders Lakeland Mountain Marathon 2003, crossing steep craggy ground, in and out of the Coves along the eastern flanks of Fairfield and Helvellyn.

Route choice in this terrain involves picking an efficient line with a minimum of climb, where it is possible to keep moving at a reasonable pace, avoiding crags and boulder fields.

A good line can be roughly chosen from the map, then fine-tuned by looking ahead at the terrain.
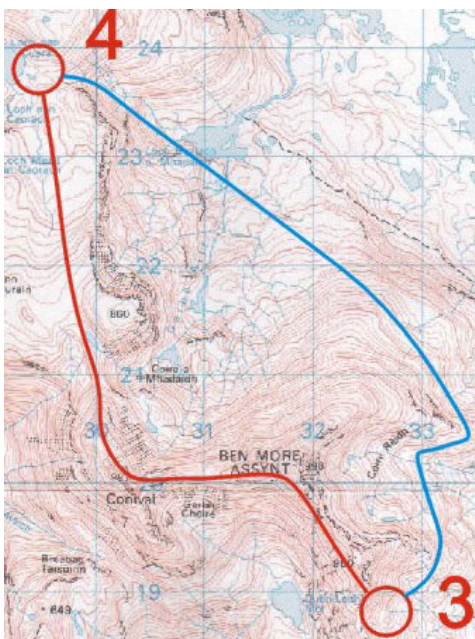
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Route choice from "The Connoisseur's Mountain Marathon" – the Lowe Alpine or LAMM – always held in the Scottish Highlands. This leg is taken from the Day 1 Elite Course, Assynt 2006. The blue line shows the route of winners Alec Keith and Kenny Riddle, who recorded the quickest time – 1.17.02 – on this leg. The red line shows the planner's optimum route. A quick analysis shows that both routes involve about 250-300m ascent (5-6 index contours). Distance is roughly the same. The red route is probably faster underfoot (ridge tops are usually faster in Scotland) and has less contouring, however poor weather conditions on the day resulted in the lower-level, sheltered blue route being the quicker option.

How many Munro-baggers were lured to the summit of Ben More Assynt?

7. ROUTE CHOICE FOR SCORE CLASSES

Score classes are a popular option in several mountain marathons. The OMM offers several score classes of varying lengths. The format is sometimes used in adventure racing. Competitors are given the locations of a large number of checkpoints and must visit as many as possible within a set time limit. Checkpoints may be visited in any order, and each checkpoint has a point value. There are usually heavy point penalties for exceeding the time limit. Some competitors enjoy the additional challenge of deciding in which order to visit the checkpoints. Other competitors prefer score classes because they know how long they are likely to spend out each day. Perhaps the main advantage of score classes is that they offer a wide variety of different routes, and as a result there are few of the "crocodiles" of runners on the same route that are sometimes a feature of mountain marathons.

The Klets Classic Course at the Saunders Lakeland Mountain Marathon has a score format, however although the checkpoints may be visited in any order, they must all be visited in the shortest time.

PREPARATION BEFORE THE EVENT

Before you start, it helps to know how far you are able to run in the allocated time limit. You may be able to work out an approximate figure from the times you have taken in previous events. For example, if you have recently run a 24km course in 8 hours, then in a 6 hour score class you should cover about 18km or, to be on the safe side, say 16km. You should also make allowances for the expected roughness and hilliness of the terrain. It is useful to bear in mind that very few people travel faster than 5km per hour in mountain marathons, and most travel at about 3.5km per hour. When you are planning a route on the start line you should roughly measure its distance, perhaps by using the end of your compass, which may be, say, 2.5km at map scale. So 6 compass widths equals 15km. This need only take a few seconds. It may help to remember that grid lines are 1km apart, and that every tenth grid line is drawn with a thicker line. Some competitors carry a piece of string which, when placed on the map, corresponds to the distance they expect to cover.

CHOOSING A ROUTE

You should not set off from the start before you have planned out, at least in rough, which checkpoints you will visit and in what order. It is worth taking an overview of the whole map, as quite often a good route, following natural lines in the terrain, quickly springs to mind. As with any route choice decision, it is important to consider factors such as height climb and ease of running when choosing the order - the shortest route between check points may not be the quickest. In addition you have to bear in mind the points value carried by each checkpoint; is it worth the gamble of going for a remote higher value checkpoint? Perhaps the best preparation for a score event is to have your brain replaced with a computer!
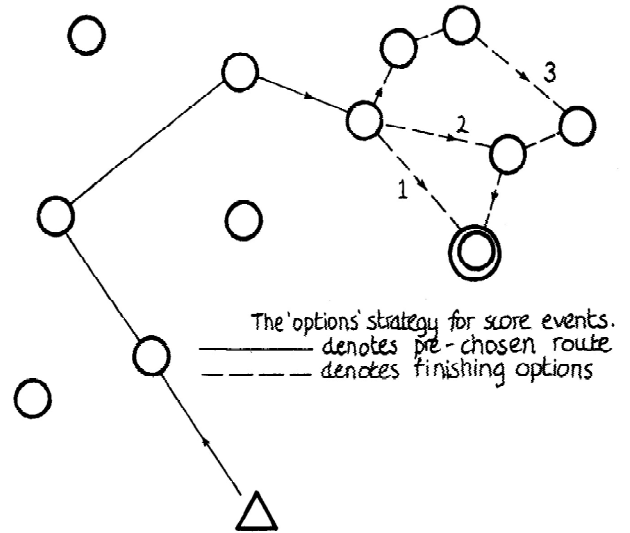
THE "OPTIONS" STRATEGY

The key to success in score classes is to reach the finish at just the right time. If you finish late you will incur heavy penalties, whereas if you finish early you may have missed out on potential points. A popular and effective strategy is to divide your route into two parts before you set off from the start. The first part, about 50% to 75% of the route, involves sticking closely to a pre-chosen plan. During this stage you can forget about the order of visiting the checkpoints, as this has already been decided, and fully concentrate on the navigation required to find each checkpoint. The second part is chosen to include a number of options, which can be taken depending on how much time is left. It is convenient if there is a cluster of low-value checkpoints near the finish, which can be left until last. You can then visit a few, or all, or none of them, depending on how much time is left.
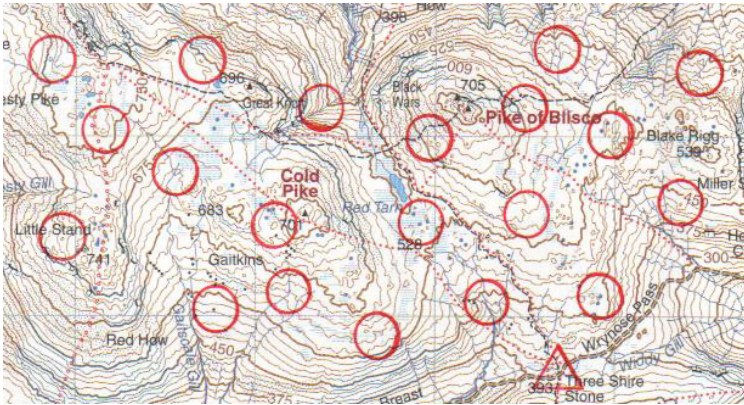
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A classic annual event - The Warrior O-Trial 2003. A score event with a 2hour time limit. 5 runners visited all the controls within the time limit, winner Ed Nash taking 1.47.

The 'options' strategy for score events.
——— denotes pre-chosen route
— — — denotes finishing options

8. ROUGH NAVIGATION

Rough navigation is a term describing those techniques that are used when your aim is to cover a lot of ground as quickly as possible, for example on a long leg when you want to get somewhere close to the next checkpoint without making any unnecessary hesitations on the way there. Nearer the checkpoint it is usually wise to slow down and take more care. The techniques used when near the checkpoint are termed "fine navigation" and are dealt with in the next section.

rough navigation

ROUGH MAP READING

The art of rough navigation lies in simplifying things; in other words just using the largest, most easily recognised features. It is easy to waste time by reading too much of the information on the map. At the start of a leg, look at the map and decide which are the major features that you are likely to follow or cross. They may be streams, walls, ridges, valleys etc. Tick these off as you pass them on the ground. If you happen to run past any small features that tell you exactly where you are then this is a bonus, but it is important not to waste any time by setting out to look for such features. With practice it is possible to master the skill of reading the map without stopping running - but watch out for large cliffs!

ROUGH COMPASS

The use of the compass in rough navigation is to keep you heading in the right direction whilst you map read by the larger features. The compass is vital, as without it you would have to read more from the map in order to navigate and this would slow you down. The compass may be used in any of the ways described earlier in this booklet, for example to take a bearing or for running on the needle. With practice it is possible to take sightings from the compass whilst on the run. This is a useful skill in the hectic atmosphere of a fell race, but is less applicable to Mountain Marathons, where things move at a more genteel pace!
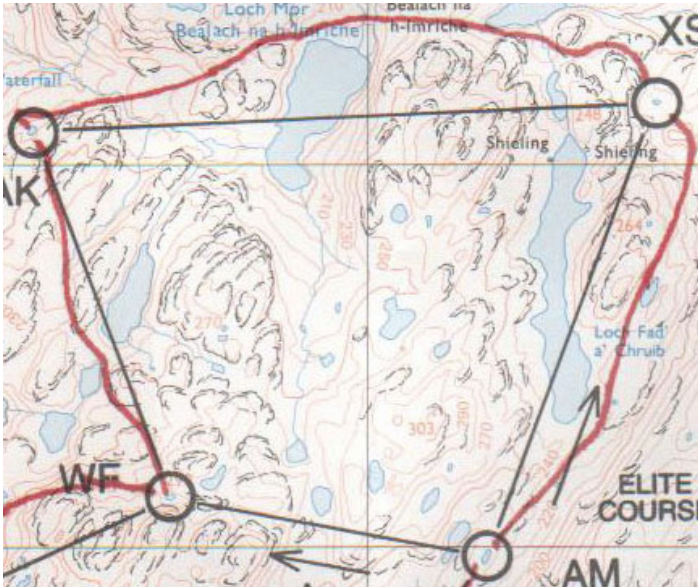
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Was this the best ever Mountain Marathon? The LAMM 96 was held the Isle of Jura. In perfect spring weather, competitors negotiated the mighty Paps Of Jura and coastal features such as raised beaches and rock arches. After 15km, Elite and A runners experienced a surprise boat trip across Loch Tarbert before continuing on the north side of the Loch - an expanse of knolly wilderness littered with small lochans. In this terrain the winners (route shown) used rough navigation skills such as rough compass and ticking off the larger features such as lochans and clearly defined knolls.

Leg 1-2 from the B Course, Day 1 at the Original Mountain Marathon 2006. In atrocious weather and low visibility, Simon Berry and Ian Barnes kept things safe and simple, with a series of straight, well-executed compass bearings to easily identifiable features.

"We smashed it in on the compass".

It would have been possible to save time by contouring in places to avoid climbing over ridges or the summits of hills, but this would have involved running in a curve, which is never easy, even in good conditions.
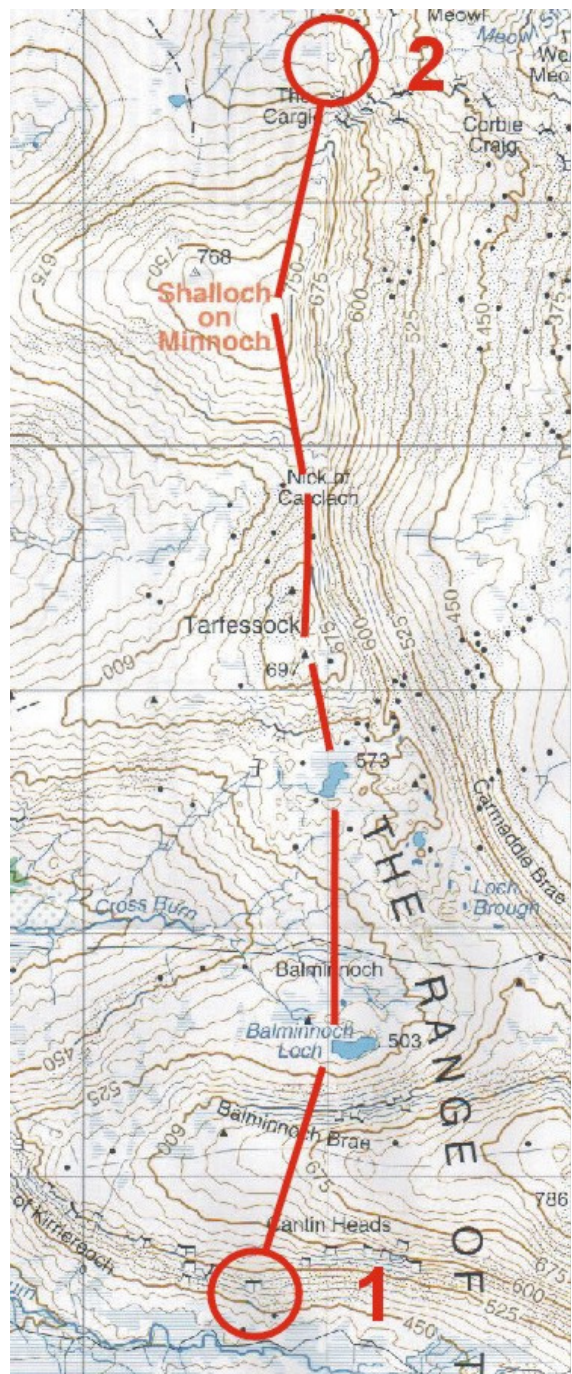
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9. FINE NAVIGATION

The term "fine navigation" describes a combination of techniques which may be used at one of the key parts of a course when it is necessary to navigate with extreme care. Course setters often try to make things difficult by placing a checkpoint in an area of broken, complex terrain, for example amongst the tarns and hummocks of Haystacks in the Lake District, or in the glaciated granite knolls of the Dungeon Hills of Galloway. Assuming that the ground is well represented on the map, this presents a fair challenge, and a canny competitor will always be able to locate the checkpoint without losing time.

Other situations requiring a careful approach occur, for example, when a checkpoint is sited on a small feature in an otherwise featureless area, when a checkpoint is sited in a forest, or when a checkpoint is approached across a steep slope.

IDENTIFYING A DIFFICULT CHECKPOINT

The first stage of fine navigation is to spot potentially difficult parts of the course before you get there. Experience helps in this, however as a general rule anything sited well away from a large feature may be hard to find, especially if the checkpoint feature is itself small, and is located on a steep slope, or in the middle of nowhere, or amidst a mass of other small, similar features.

CHANGING FROM ROUGH TO FINE NAVIGATION

When approaching a difficult checkpoint there will come a time when you feel it is necessary to make the transition from full-steam-ahead rough navigation to careful fine navigation. You may choose a large, obvious feature, or ATTACK POINT, from which to begin fine navigating. This should be as near to the checkpoint as possible, and, as it has to be located using rough navigation techniques, it must be something that you can rely on finding, such as a tarn or trig point. In practice, however, the transition from rough to fine navigation may be gradual, with no definite attack point.

FINE NAVIGATION TECHNIQUES

Having decided that a checkpoint is difficult, you should use every technique available, in combination, in order to find it. Speed is relatively unimportant, so it does not matter if you have to slow down in order to concentrate on the navigation.

SLOWING DOWN

Forcing yourself to slow down in order to find a tricky checkpoint can be the hardest part of fine navigation, especially in the heat of the moment with other runners around you. It takes some discipline to say to yourself "right, this looks hard, now I'm going to slow down and concentrate", but remember that the other runners probably have little idea what they are looking for and could well end up rushing around in the hope of getting lucky! In a mountain marathon they may even be on a different course to you.

FINE COMPASS

The most accurate way to use a compass is to take a bearing (see the previous section on the compass) but make sure that you stand still and take care when taking each sighting. The compass should be used in every fine navigation situation. If the terrain is complex and well mapped then the compass will serve as an important backup to map reading. When heading for a small feature in vague terrain the compass is vital.

FINE MAP READING

The idea behind fine map reading is to maintain "continuous contact" with the map by reading every feature that you pass. This is difficult and takes some practice, as you have to have a good feel for the scale of the map and you have to know how features are likely to be represented on the map. Above all, you should have a good look at the contours on the map and use them to form a mental picture of the shape of the ground. Other features such as crags, streams and marshes are often less reliably mapped but provide useful extra information. The next chapter explains the use of contours in more detail. Having a good mental picture of the ground is especially important when approaching the checkpoint itself. You should know what feature the checkpoint is on, and have an idea of what the ground will look like before, on either side, and beyond the checkpoint.
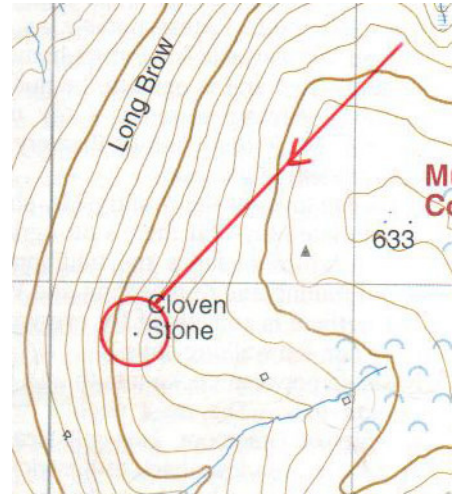
Keep checking the compass when fine map reading. You may lose contact with the map for a while, but by staying on a bearing you will know that you are still on line, and hopefully you will be able to locate your position later on.
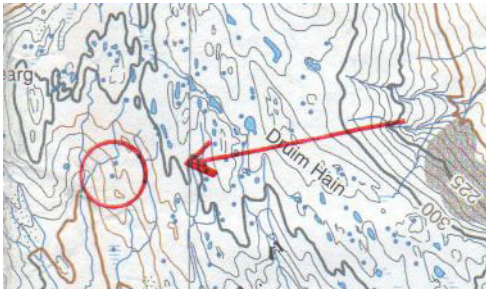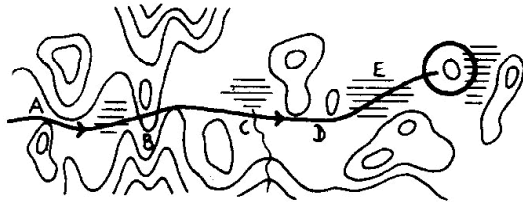
The left hand map shows a tricky checkpoint in an area of small parallel features, with no distinctive landmarks.

The checkpoint on the right is a small boulder in an otherwise featureless area, with a difficult diagonal downhill approach, requiring accurate compass.
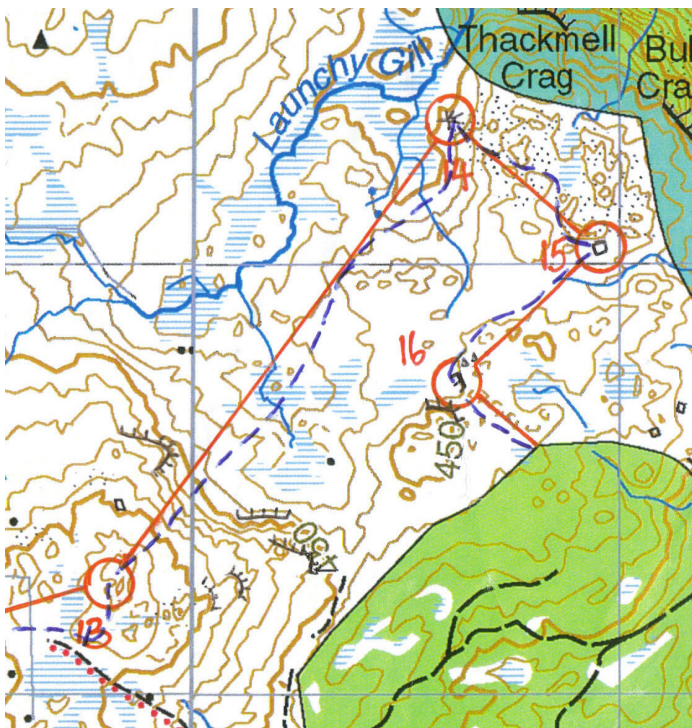

Fine Navigation by Continuous Contact.
Every feature is noted: the pass at A, the ridge at B, the stream at C, the hills at D, and the marsh at E.
The competitor has visualised the terrain as they expect to see it around the checkpoint.

have a mental image of
what lies ahead

Fine navigation from the Warrior O-Trial 2005 at Harrop Tarn. This tough event is held in January each year. British Orienteering Champion Oli Johnson describes his winning route:

" The mist was down and visibility was about 20m so you had to read every feature on the leg and keep direction with the compass.
13-14: steep drop off the hill on a bearing, over the stream then over a flat, marshy area with small hills to the left. Over a flattish spur before dropping into a wide re-entrant. Kept the slope on my left and crossed another stream before contouring along to the rocky outcrop with the control.
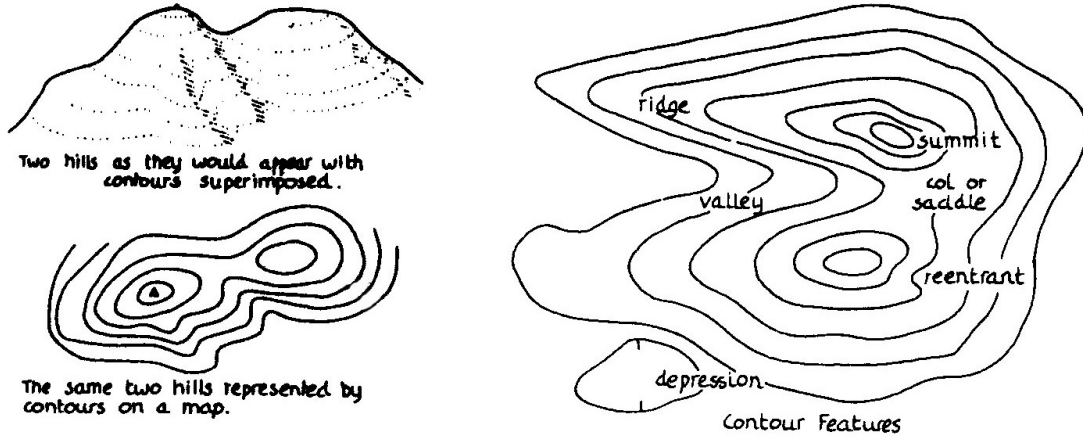*14-15: Climbed up the slope on a compass bearing, went through a saddle, skirted to the left of a bigger hill then skirted to the right of another hill, keeping it on my left until I saw the ruin.*

10. UNDERSTANDING CONTOURS

Understanding contours is the key to successful navigation. Contours show the ground as a complete picture - both the layout of the main hills and valleys, and the intricacies of areas of smaller features. Contours never change or become out-of-date as a map gets older, whereas footpaths alter, streams and marshes vary with the season, and forests are planted or felled. Unfortunately contours are the hardest part of the map to understand, as they require you to imagine a 3-dimensional landscape in your head, based only on the brown squiggles on a piece of paper.

WHAT ARE CONTOURS?

A contour is a line joining points of equal height. Contours show the height, steepness and shape of the ground.

Two hills as they would appear with contours superimposed.

The same two hills represented by contours on a map.

Contour Features

WHAT IS UP AND WHAT IS DOWN?

When you pick up a map of an unfamiliar area for the first time it is easy to confuse ridges with valleys and "ups" with "downs". Before you start racing it is a good idea to get a rough picture of the area in your mind. When working out the ups and downs, remember that Index Contours (the thicker lines) are numbered to show their height above sea level. In addition there are usually streams in the valley floors, tarns lie in hollows and lakes in valley floors. Closed contours encircle summits or higher ground, trig points and cairns are usually sited on summits or ridges, and, on a Harvey map, the tags on crags point downhill.

UNDERSTANDING FINE CONTOUR DETAIL

Course setters love to site checkpoints in areas of lumps, bumps, hillocks and hollows. The summit of Bessyboot in Borrowdale is one such area, as are parts of the Rhinog Mountains in Wales. Far from being a meaningless mess, however, the contours in such areas are usually well mapped. The contours on Harvey maps and modern OS maps have been plotted from air photos and show the ground extremely well. The smallest squiggle in a line will show the position of a tiny hollow or bump on a hillside, and it is quite possible to navigate by features such as these.
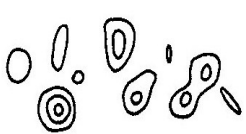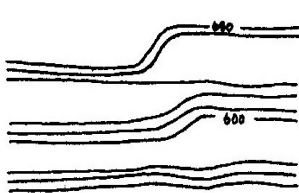

Every knoll has its own shape which can be recognised in the contours on the map.
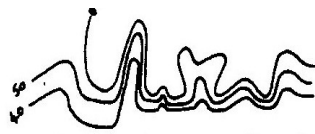
Reentrants (small valleys) are also mapped to show thier shape and size.
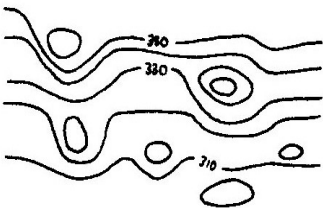
Contours show the relative levels of knolls on a slope.

Terraces on a slope shown by the spacing of the contours.

The only way to learn and get better at using contours is to spend a lot of time on the hills with a map. It helps to get a good "feel for the map", so that you can judge what a 10 metre or a 5 metre contour interval looks like on the ground. When practising with a map you should look at the way In which features are mapped; for example how does a one-contour hill compare in size with a two-contour hill? When is a feature too small to be shown?

16

An area of complex contour detail near Gairloch on the northwest Scottish coast.
This leg tests contour-visualisation – the ability to picture the ground shape. It also tests rough navigation – simplifying the ground shape, then picking a line using the larger knolls and lochans, backed up with rough compass. Fine navigation is required to locate the correct gap in the crags by Sidhean Mor, then to visualise the checkpoint re-entrant running down from the small col.

11. RELOCATION - or what to do when you get lost

Getting lost can be an unpleasant experience - things seem to be going well for a while until you gradually become aware that the map does not quite match the ground - you know you are near the checkpoint but you don't know which way to turn. All the time the clock is ticking, and a growing feeling of frustration and panic makes it hard to keep a cool head. In this situation, which is surely familiar to everyone, it helps to have a ready made plan of action. Certainly any positive strategy is better than running around aimlessly. Relocation is a skill in its own right. Even the best navigators get lost surprisingly often, however many have perfected the art of finding out where they are so that their mistakes cost them very little time.

This section looks at two different plans of action for relocation. These are illustrated by the two flowcharts below. The first of these is for use when you are lost in "mid-leg", in other words when you are still a long way from the next checkpoint. The second strategy is for use when you are lost somewhere close to the next checkpoint.
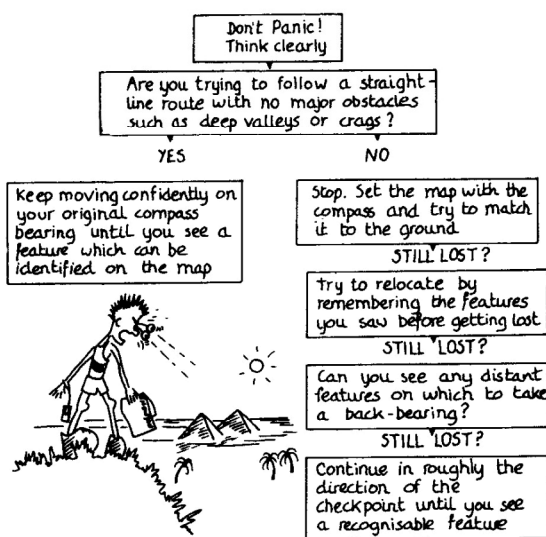
RELOCATION IN MID-LEG
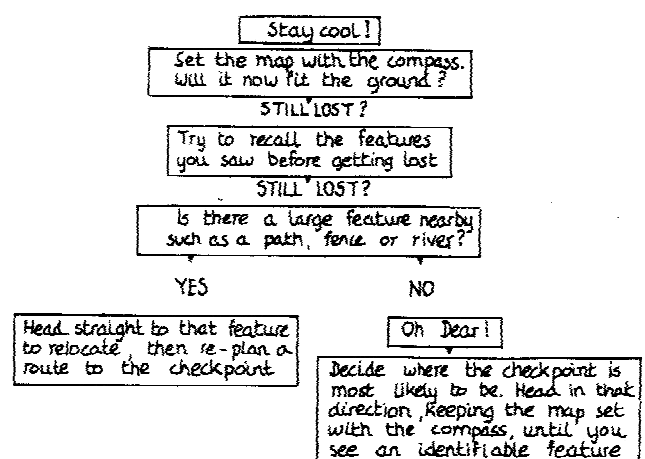
RELOCATION NEAR THE CHECKPOINT
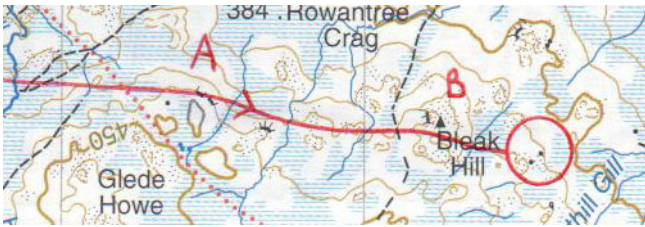
A plan of action - mid-leg relocation above Swindale in the Lake District. The runner had lost track of their position at point A, but pushed on without slowing down, confident in their compass, aware that they would cross a path next to the distinctive summit of Bleak Hill.
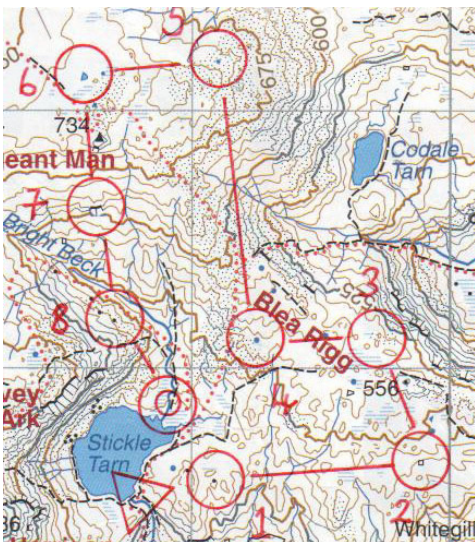
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A parallel error. An initial compass error drew this runner into the wrong stream system. In this situation it is all too easy to "make the map fit". Only a careful check of the compass angle of the streams enabled the runner to relocate

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12. TRAINING FOR IMPROVEMENT

Like any practical skill, navigation is best learned through experience. To become "fluent" with a map is similar to becoming fluent at a language. With a lot of practice you will be able to look at the map and form an instant mental picture of the ground, but before you reach this stage you will have to go through a process of "translation" in your mind. Unfortunately, for many runners there is little opportunity to get out and practice navigation. In the mountain marathon calendar there are only three or four events each year, and for many it is a long drive to the hills to find suitable terrain. For those with the chance, however, it is well worth making the effort to do some technique training, either alone or with some friends. It is hard to improve simply by running in competitions; under the pressure of a race and in the heat of the moment it is all too easy to revert to bad habits. It is better to learn things in the less stressful atmosphere of an informal training session -at the very least its a good excuse to get out for a run!

SOME TRAINING EXERCISES

The following map sections are intended to give some ideas for training exercises.
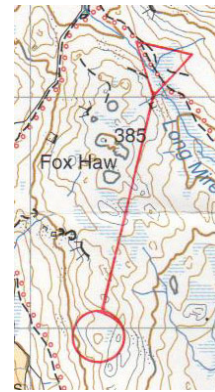

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The left hand map shows a series of short, technical legs in detailed terrain. This exercise is designed to improve fine map reading. The right hand map shows a line exercise. Following the line as closely as possible is excellent training for continuous contact map reading.
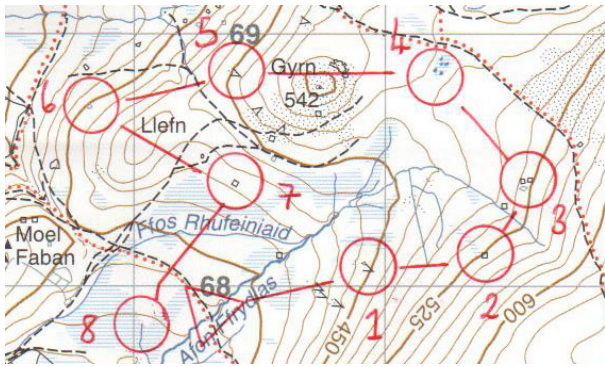
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The left hand map shows a compass exercise – a series of short legs between small features in otherwise featureless terrain. The right hand map shows a mid-leg relocation exercise. A pair of runners use only one map. One runner navigates about halfway, then hands over the map to the other runner who has to complete the leg.

# 13. NAVIGATION IN 'TRADITIONAL' FELL RACES

Most traditional fell races are held over the same course each year, usually with several compulsory checkpoints. After the event has been going for a few years the best route is well known, although many keener runners go out for a pre-race recce in the hope of finding their own personal shortcuts.

These races are not generally thought of as involving navigation, however they can become notoriously tricky in misty weather when it becomes impossible to see any other runners, let alone the way ahead. Things are even harder for the race leader out in front.

RACE NOTES

The difference between success and disaster may hinge on the very simple measure of carrying a small compass with you and having a few bearings written on the back of your hand. You may also want to make a few notes on the course before you start. If there isn't room on the back of your hand then write the notes on a piece of paper and pin it to a wrist band. In the tougher races it is compulsory to carry a map. You can cut a section from an OS or Harvey map, or make a printout from a CD Rom, then highlight the route and scribble on a few key bearings or notes. Alternatively, buy a Race Map (see below).

RACE MAPS

Race Maps are custom made for fell racing. Each map shows the highlighted optimum route for a race, together with annotations and a detailed description on the back. The maps are sealed in a plastic case. Races covered are: Coniston,

Fairfield, Kentmere, Sedbergh Hills, Borrowdale, Three Shires, Langdale and Edale Skyline. Race Maps are available from Kong Running.
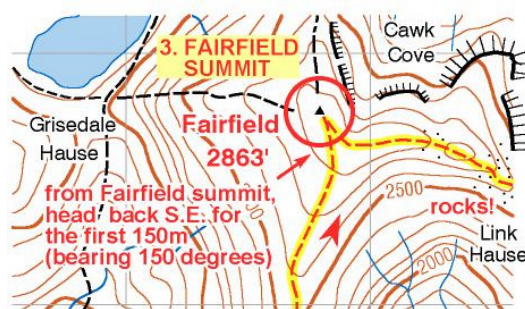
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THE AUTHOR: Martin Bagness was a member of the British Orienteering Team from 1980-1993, winning a relay silver medal at the 1993 World Championships. Since then he has worked as a coach with the National Team. He has planned over 20 mountain marathons, including 12 SLMMs and 5 LAMMs. He lives in Ambleside and runs on the fells several times a week.