Understanding & Using a Compass

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Half of an effective navigation system is the **map**, the other half is the **compass**. A compass is basically just a magnetized needle that, when allowed to move freely, points in one direction, and that is Magnetic North. This needle gives you a reference point for measuring all other directions.

All compasses do essentially the same thing, but more expensive models offer more features that make them easier to use. One convenient feature is a liquid filled capsule that slows the needle down. A compass with a rectangular base is easier to use with a map than a round compass. Compasses with features such as rotating dials, built in declination settings, and direction of travel arrows simplify compass use. Get the best you can afford.

Before the compass came about, people were still traveling about without the fear of getting lost. This was possible because nature offers many direction finders. Flowers are one of the best indicators of direction. They will face the sun, even when it is dark with overcast. For all of time, they have been tracking the sun, and they remember where it is. Trees will indicate direction by the way they grow. The bark will be thicker and the cracks will be closer together and deeper on the north and west sides, the branches will be thicker on the south and east sides, the roots on the west side will tend to be horizontal while the roots on the east side tend to be nearly vertical. The wood on the north and west sides are noticeably harder than the other sides. This can be tested with a knife or pointed stick. Lastly, more trees tend to lean to the southeast than any other direction. Every area has something unique about it that locals use for navigation.

In early times navigation was a hit or miss method of getting from one place to another because there was no local knowledge. The explorer knew that he didn't know where he was going, so he kept track of landmarks while he went. When he found something of interest to his village he could always find his way back home. While on the return trip he knew where he was going, so he could usually pick a more direct route back. He would kept track of how long it took to get to a good campsite or drinking water, and made note of this by that particular landmark.

When other travelers were met on the trail, which were usually animal trails, they would spend a lot of time trying to find a common landmark so they could determine where each other came from. They were not trying to hide the location of their village, its just difficult to describe landmarks to someone else so that they will know them when they see them. You didn't want to steer the other guy wrong, because the next time you meet him he might steer you wrong. So you can see, navigation depended very much on word-of-mouth, natural direction finders, and landmarks.

Actual distance didn't mean very much to the traveler, he wanted to know how much time was needed to get from one point to the next. When a traveler came into a village and wanted to know "How far" it was to the next village, he would be looking for days, not miles. If this traveler was interested in going to the next village, he would get more travel aids such as; point to the start of the trail, draw me the first landmark very clear, and then draw the next landmarks, are there places to camp at the end of the day, or should I stop sooner, will there be drinking water there or do I get it on the way, what are the dangers that you know of or suspect. He would also find out what the weather was like this time of year in this location. After he checked with two or three other people he would set off knowing that he had the best information he could get.

Some of the landmarks were not very clear, so to make sure you were looking at the right landmark, other things were drawn in that could be seen at the same time. This was the start of early mapping.

These maps were a great idea if they went to where you were going. If there were three villages, A,B,C, and you were at A, but wanted to get to C, but the map you were given was for A to B. You would now have to choose between going to B first and hoping that there was a map at B showing how to get to C, or hoping that the secondary landmarks that are shown on the A to B map are the correct landmarks that you need to get to C.

As you can see there was a need to make land navigation more exact and easier to use. There were the natural direction finders, but a better way was needed to record and follow directions. About 2500 B.C., some clever Chinese fellow discovered that a piece of a certain ore, when put on a piece of wood and floated on water, would turn until one end of it would always point in a direction that was half way between sunrise and sunset. He also knew this was the direction everyone knew was South. If one end always pointed south, then the other end had to be pointing North.

Now that north and south are known, pointing half way between them will give you East to the right, and West to the left. Now he had the Cardinal compass bearings. Once this was known, it was easy to half the distance between north and east to get North/East, and then half it again to get North/North/East. Now there were 16 exact directions that could be marked down or followed. Things were getting better for the traveler all the time. Now, when he drew his map, he didn't have to draw the landmarks so well, because he could put a compass bearing to find it.

There was a drawback to this compass. An extra pack had to be carried, and care had to be taken not to break the clay or wood pot. Every time it was to be used, it had to be unpacked. The pot had to be filled with water, the chunk of lodestone was put on the stick, and it had to be watched to make sure it stayed away from the sides of the pot so that it could turn freely. This had to be done every time the direction was to be checked.

Someone found that the rock, stick and water could be done away with. All that was needed was to magnetize a strip of steel, tie a piece of string in the middle, and it would do the same thing. So the end that didn't point south was marked NORTH. This was going to make the compass a lot better to use, until it was tried outside. The slightest air movement pushed the needle around, and the slightest movement gave it the jitters. The air movement had to be kept away from the needle. A nice looking case was made to put the magnetic needle in, and all around the outside were marked the cardinal and all the in-between bearings. Since this was the age of the Renaissance, the case was fancied up. Someone noted that it looked like a rose, and the name stuck. Now all the compass bearings together are called the "Compass Rose". Now he had a good usable compass, and it came to be known as an "Air Compass", or "Standard Compass". The standard compass gave the traveler a very useful tool, but it still had the jitters.

Somebody found that if a copper lining was to be put close to the swing of the needle, it would produce an electrical current that would stop the swing quickly. This type of compass is called the "Induction Dampened" compass. But the most effective method, used in most modern compasses, is to fill the housing with a liquid. This liquid slows down the jiggling of the needle and brings it to rest quickly. These are called "Liquid Filled" compasses. From here the compass evolved into a reliable, compact, "Watch Case" compass. Then in the early 1930's, a fellow in Sweden made it user friendly by making the compass so that the housing could revolve on a transparent base plate. This allowed the compass to be used as a Protractor or Direction Finder, which took the guess work out of direction finding. This type is called the "Orienteering" compass, and has made travel by map and compass accurate and easy to do.

At about the same time as the compass was being born the astrologers in Babylon had plotted a circle to map the stars. Their circle was divided into 360°. Astrology, religion and superstition were all overlapped. The number three was considered to be a powerful and Holy number. Twelve constellations had been identified in the heavens. Each of these constellations took up 30° of the sky. They reasoned that if 12 signs, each 30° wide, took one year to repeat itself, then there had to be 360° in a circle and there had to be 360 days in a year. A few hundred years

later they discovered their mistake, so to balance the year, five nether days were put between the old year and the new. Since these days didn't exist, no work or trade could take place. The easiest way to handle this was to party for five days.

The French were responsible for the name given to this direction-finding machine. They took the Latin word "compassere", which means "to step around", and shortened it to the word we know today.

Some other imaginative person suggested that the 360° of the Babylon circle be put on the bezel instead of the 32 points. Because of this, the compass today shows 360 different directions or Bearings instead of just the 32 of the old-fashioned "Compass Rose". So, the compass went from a floated stone, to an air compass, to an induction dampened compass, to a liquid filled compass, to a watch case compass, to an orienteering compass and to the many types and shapes we use today.

This ends the history part of the compass. Now we will lay hands on a compass, to see what all the parts are, and to expose the mysteries that seem to surround the compass.

I will be using the SYLVA TYPE 15. The reason I use this compass is easy. It's the cheapest compass I could find that had all the features that I needed.

The compass is made up of three main parts, with other parts or lines that are part of them. They are; THE BASE, THE HOUSING, and THE LID.

On most compasses this is a rectangle made of clear plastic. It will have scales on both sides. Some will have map scales on them, but most will have inches on one side and centimeters on the other. It will also have one or two lines that run parallel with the sides. These lines are used to line up two points on a map that are close together. You will find that when you try to line up two points, that are close together on the map, that it will be easier to use one of these lines instead of the edge of the compass, because the edge of the plastic base will distort the location of one or both of the points. The chance for error is far greater on two points close together than they are for two points that are several inches apart. The base will also have 3 bumps or legs on the bottom so that it will sit steadier on a map. Some also have a small magnifying section for reading small print on a map. There will also be a line at the front that will be cut deeper than the rest of the lines, this is called the "Index Mark". There will be a similar line at the back called a "Back Bearing Index".

THE HOUSING OR "BEZEL RING" OR "AZIMUTH DIAL

This is the part that contains the "liquid" that the "needle" is in. You will also find the 360° marked along with the "cardinal" heading. Inside the "housing" you will find several things. There will be

several parallel lines running north and south that move with the "housing" when rotated. These are called "meridian" lines. There will also be an arrow parallel with these lines and it points north. This arrow is called the "orienteering arrow". If you have a compass that has a "declination" adjustment, there will be a screw to adjust the orienteering arrow and another scale that reads 0° to 90° on either side of north. You will learn about declination a little later.

THE "COVER" OR "LID"

On the inside of the "lid" there is a mirror. Down the centre of this mirror there is a line, this line is called the "direction of travel" line. On compasses without a "lid", this line is an extension of the "index" line. The "lid" is the same width as the "base" so that you can plot a longer straight line on a map. Also on the "lid" there will be some type of a sight to aim your compass with.

Most of the lines on the compass are put there for use with a map. We will be using only three of these lines for now, the "direction of travel" line, the "index mark", and the "back bearing mark". Along with these three lines we will be using the "orienteering arrow" "lid" "sight" "mirror" and the "magnetic needle".

Now that you have heard the names, look for them and say them to yourself. In short, get friendly with your compass because you will have to learn to trust it in the outdoors.

I would like you to play around with your compass, practice holding the compass at about eye level and about half arm's length away, practice lining up the "orienteering arrow" with the "magnetic" arrow, **NOT THE OTHER WAY AROUND**.

You will find that when you look in the mirror, to try and line up the orienteering arrow with the magnetic needle, that you won't always be able to center the orienteering arrow under the needle. When the needle is pointed at or away from you, you will be able to centre the orienteering arrow easily. But when the needle is pointing right or left, you will have to average the space at the north and south end of the needle.

Also practice lining up the "direction of travel" line with the "index" and "back bearing" lines and any object in the room. You will have to play with the mirror angle, height and distance of the compass to be able to see all three lines at the same time. With a little practice you will be able to do this quickly. Once you can do that, then combine the two. "Sight" an object, "orient" the "needle" and congratulations you've "shot" your first "bearing". You do a lot of things at the same time when you "take a bearing".

What you are doing is; holding the compass at eye level and reasonably level, while "sighting" your "target" and lining up the "direction of travel" line and "index" and "back bearing" lines and rotating the "housing" to line up the "orienteering arrow" with the "needle". It will take awhile,

because every time you rotate the housing you will loose alignment with the target. "Taking" or Shooting" a bearing is a learned skill, so the more you do it the easier it becomes.

Your first few bearings could be off by as much as 20°, but with practice you will get that down to 2°, which is as good as you can practically get for land use.

To use the compass as a protractor, place the compass on the map. With the edge of the base, align the points which define the direction to be measured. If a bearing from point A to point B is desired, then the direction of travel line must be pointed from A to B. Hold the compass in place while rotating the housing to make the compass meridian lines parallel to the north/south lines on the map. Make sure the orienteering arrow is pointing to the top of the map. The bearing for A to B is read at the index line. If bearing from B to A is wanted, then the compass has to be turned so that the direction of travel line is pointed from B to A.

Compasses are marked in several very different ways:

- The Quadrant Compass is marked 0° - 90° four times.
- The Military Compass is marked 0 - 6400. (in mils)
- The Azimuth Compass is marked in 0° - 360°.

The Quadrant compasses have a scale divided into four segments of 90° each and are used primarily by surveyors for establishing base lines and datum lines.

The Military compass reads in mil's. They wanted to be able to shoot a small target.

The Azimuth compass measures an angle clockwise from the north. Thus, the dial on an azimuth compass is marked in degrees proceeding clockwise from the north. True North is 0° or 360° east is 90° south is 180° and west is 270°.

Of these compasses, the azimuth compass is best suited for outdoor activities.

Fundamentally a compass allows you to do two things: it allows you to travel in a known direction, and secondly it can tell you what direction an unknown direction is.

The functions of a compass are:

- to maintain a straight line of travel, such as following a bearing;
- to orient a map, which is just lining up the map with the land to make landmark identification easier;
- to tell direction, such as taking a bearing from a map;
- to locate your position by taking several bearings and plotting them on a map;
- to plan a route, by using your compass as a protractor.

The compass does not point to True North, it points to Magnetic North. The angle that is formed by the difference between Magnetic North and True North has several names. The names tend to relate to the magnetic distractions near the compass and to the speed at which the angle changes in relation to your motion. On foot this angle is called declination, because there are usually few magnetic distractions and the distance that can be covered on foot in one or two days won't be enough for the angle to change a noticeable amount. At sea this angle is called deviation because the boat itself is a magnetic distraction and you can travel far enough in one day to put your compass out a considerable amount. In the air it is called variation because the air gap between the plane and the earth, the plane itself, temperature, and air pressure will influence a magnetic compass minute by minute enough to get you lost.

Declination is the difference in degrees between Magnetic North and True North. In North America, the line of 0° declination runs from Hudson Bay, across Lake Michigan, and down to Georgia. Along this line True North and Magnetic North are in the same direction. From any point

west of this zero line, the magnetic needle points east of True North. This is easterly declination. From any point east of this line, the compass points west of True North. This is westerly declination. The coast of B.C. has a declination of about 22° east. Newfoundland has a declination of about 22° west. Earlier we were told that east is 90° from north. Vancouver and Thunder Bay are very close to the same latitude, so Thunder Bay is due east of Vancouver. However, if you were standing in Vancouver, and you could see all the way over to Thunder Bay, your compass would give you a bearing of only 68° which is north of east. But, if you were standing in Thunder Bay, taking a bearing of Vancouver, you would get a bearing of due west or 270°. How come? Vancouver and Thunder Bay are about the same latitude, but Thunder Bay is on or near the line of 0° declination while Vancouver is about 22° west of north or 22° easterly declination.

A compass, when used properly, is almost always right. Most wrong bearings are caused by fatigue, confusion, hunger, dehydration, or lack of time. So if you are sure you did it right, trust it. The two most common mistakes, when taking a bearing, are to use the wrong end of the orienting arrow, or the wrong orientation of the direction-of-travel line. If you are on a marked trail and you want to know where you are along that trail, only one bearing is needed to locate your position.

If you want to make sure that you're on the right trail, then you will have to take, at the very least, two bearings to mark your location.

Navigators know how amazingly different the country looks on the return trip. They frequently glance over their shoulder towards camp, not because they wish they had never left camp but because they hope to get back. When the route is complex, and particularly if a late return is anticipated, they will find a small note book valuable for entering travel times, landmarks and compass bearings as navigational aids. The mechanics of navigation by map and compass are quite simple once the elementary principles of compass and orientation are mastered, which is what you are learning today.

Once you have mastered navigation, there is no such thing as being lost, only varying degrees of uncertainty about your position. So having learned HUMILITY, be prepared to handle the situation in which the uncertainty of position becomes too great to allow an easy and fast return. In other words, don't make your time table so tight that you will be late if you make a wrong turn. Give yourself some extra time so that friends and loved ones don't have to worry.

When position or bearing are uncertain, particularly on a return trip, when weary, or with the approach of nightfall, the FIRST RULE is "STOP". If your last certain landmark or bearing is one hour or less behind you, you might save a lot of time by going back there. The more the uncertainty, the more vital caution becomes. The temptation to plunge hopefully forward is strong, and errors increase with each step. If you can reliably approximate your present position, it may be best to move ahead cautiously, alert for landmarks. But if you have to say "maybe" to any condition of approximating your position, then go back or camp for the night. History reveals the significant fact that a party of two or more, even if the greenest of novices rarely gets dangerously lost or confused. It's the unintentionally lone person, overwhelmed by a sense of human fragility and the immensity of the wilderness, who throws away his life.

Fear in the face of nature is no sign of cowardice, but rather is a healthy reaction. It is entirely proper, when lost and alone, TO TREAT EVERY STEP AS A LIFE OR DEATH MATTER. Route finding is not a science, it's an art. Some travelers have the gift and some do not, but all must learn the use of the tools and all can improve with practice. Using a compass isn't hard but it does take practice. You can't learn by just reading about it.

If you read the story of Hansel and Gretel, you'll recall that Hansel dropped white pebbles as he traveled. He and Gretel easily found their way home by following this trail. But on their second time out, he couldn't get any more white pebbles so he used bread crumbs. He had the right

idea, but he used the wrong thing for marking, because the birds ate them up. So when they tried to go back they ended up getting lost.

Most countryside offers plenty of "pebbles" to follow - peaks or ridges, streams, drainages, meadows, clear-cuts, roads and trails. Following these is mainly a matter of learning to observe. Look in all directions. In particular, turn around often to see the same perspective you'll have on the return trip. Be aware of time as well as distance.

Observation of nature's pebbles left along the trail is important, but often it isn't enough. Clouds, rain, mist or fog may obscure landmarks. In some areas, various peaks and canyons can seem confusingly similar. In such situations, especially if the country is new to you, additional navigational aids are essential. One of these aids is what you have been learning about, the compass. The other is what you are going to learn about, the map.

If you have taken a compass course and have carefully read through this material, you will be able to use a compass, if you want to, and you practice. Some aspects of the compass were left out or left unclear, because they are only needed when used with a map.

You will need to take a map course to be able to use map and compass together.