

Land Navigation:

Justin's Thoughts
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THE COMPONENTS OF LAND NAVIGATION:

Land Navigation essentially consists of two components:

- 1) Orienteering - the science of using map and compass
- 2) Terrain Association - the art of using map and land features

We can teach you some technical skills of Orienteering in the classroom: declinations, reciprocals, triangulations and resections. Almost all Terrain Association skills (with the notable exception of map reading) cannot be taught indoors; it can only be learned experientially, map in hand, eyes on the world.

In Virginia, where most terrain will be 3500' foothills covered in mountain laurel, we will be using Terrain Association almost exclusively to get around. Nevertheless, even the most adept navigator will consult her compass from time to time. Ergo, we'll spend some time inside learning to work with our magnetic needles.

THE JUSTIN THEORY OF LAND NAVIGATION:

- 1) Use Coarse Navigation to find an Attack Point
- 2) Use Fine Navigation to get to your destination from the Attack Point

The goal of this Land Navigation training is:

- 1) To get you to begin to recognize and understand the various processes you will be using in the field.
- 2) To teach you some of the discrete Orienteering techniques and processes that may prove useful in the field.

The overall goal of our land navigation training is to have you all find the One True Path

Land Navigation is the solving of a problem that never goes away. It requires continuous effort, planning, observation, analysis and revision. As with any problem, you have to be able to identify the components given, concoct a possible solution, and check the results with your expectations for correctness.

Always Know:

1. **Where you are.**
2. **Where you are going.**
3. **What you will do if you get "lost."**

Instructions: Finding the One True Path

PREPLANS

PREPLANS help you find the One True Path on the map before trying to follow it in reality. Thinking before you start moving will help you prepare for obstacles and make contingency plans. Here are three techniques:

MAP WALKING - AKA: Where are you going? - Before going anywhere, try to make a plan for the route you are going to take. It's not just a matter of drawing a line on a map, but also trying to identify the key topographical features I am going to encounter along the way. Are you going up or down? On drainages or fingers? Where is your Attack Point? Are there catching or collecting features along the way? How can you find the One True Path, the Path of Least Resistance, before you leave?

Try this now: Find a route from the PLS to footprints found at A675498. Identify an Attack Point to find with Coarse Navigation, and then use Fine Navigation to get you to the destination. Don't just look on the map and see where you are going to go, but try to visualize what kinds of features you will see along the way. Break it up into as many small steps as you can.

CONTINGENCY PLANS - AKA: What will you do if you get lost? - You will get lost. Plan for it. Identify the major catching features that you can navigate if you get lost. In some places, this will be easy. Look at the wooded area at A656523. Rivers, streams, drainages, roads, trails, areas of significant contour change, etc. can all be good catching features to use in a contingency plan.

Try this now: You have left base and can't find your wooded area. What should you do to find your location?

NORTHING - AKA: Where you are - This technique will appear again, but it is the first thing you should do when beginning your task. North your map. This means: orient your map such that it is facing North and then begin to compare your map with the reality ahead of you.

1. Point your compass towards Magnetic North.
2. Adjust for Declination by adding the Declination. You are now facing true North.
3. Line the crosshatches on your map with your compass. Your map is now facing true North.
4. Your map is now oriented to the reality around you. Begin to identify important points along your route and prominent catching features.

CHECKS

CHECKS are the processes used to stay on the One True Path. Here are several.

GUT CHECK - (Frequency - 35.5 seconds): The Gut Check is simply asking yourself, does this feel right? Is this working? Do I know what I think I know?

COMPASS CHECK - (Frequency - 15 minutes or major change of direction): The compass check involves identifying your intended direction and then seeing if you are indeed heading in that direction. You usually do not need to adjust for declination. You sometimes don't need a compass. If it's 1600, and you want to go east and you notice the sun is in your eyes, you need to do some serious thinking. Frequently check to make sure you are going in the general direction you meant to go.

PLAN CHECK - (Frequency - varies by person, 10 mins suggested): You've made a plan; make sure you're following it. You should have expectations of terrain in your head from your preplanning. E.G. (When I come out of the drainage the terrain should level

out. When I am walking along the trail there should be a stream alongside it). If the terrain ever defies your expectation **STOP** and figure out why.

TERRAIN CHECK - (Frequency - 30-60 minutes, whenever any other CHECK fails, when you come over a ridge, around a bend): This is the ultimate art of Terrain Association. Master this, and the One True Path will be yours. Whenever you doubt your location, practice this **CHECK**:

1. Face North. Describe the terrain in front of you in detail.
2. Repeat for East, West and South.
3. Clear your mind.
4. Identify where you think you are on the map.
5. Ask yourself, "If I am where I think I am, what should it look like to the North?" Describe in detail. Repeat for East, West and South.
6. Clear your mind.
7. Ask yourself, did the descriptions I gave for where I SHOULD BE match EXACTLY the descriptions for where I THINK I AM?
8. If the answer is yes, you are where you think you are. Move on.
9. If the answer is no, you are not where you think you are. Find yourself.

NEVER MANIPULATE YOUR REALITY TO FIT YOUR EXPECTATIONS!!!

The most important phase of this check is clearing your mind. If your thoughts of where you should be are clouded by thoughts of where you are, you will find yourself fitting the map to the reality around you and you will get lost every time. The One True Path will open to those with clarity of thought.

CONFIRMATIONS

If your **PREPLAN** was wise and your **CHECKS** true, you will follow the One True Path to your destination. Once you have done so, however, you must be sure. You need to use some **CONFIRMATIONS** to be sure you are in the right place. **CONFIRMATIONS** are also useful when those pesky people at Base ask for your coordinates while eating their Twinkies and smearing ink on their fingers so they look useful.

TERRAIN CHECK: Go ahead and use your terrain check. Particularly pay attention to any catching features that can make your job easy.

RESECTION: We'll go through the details later, but essentially, you take three bearings in reality and find their point of intersection on the map. You are theoretically at the crossing of those bearings.

FEATURE CHECK: If you are think in the Mountain Laurel, your trusty terrain check may not work. This technique may work better. Find some inner linear feature. Drainages are ideal; fingers or ridges can work if they have distinct direction. Here's how it goes:

1. Get in the drainage.
2. Take a bearing of the direction of the drainage. Adjust for declination so you have a true bearing.
3. Write that number down and then forget it.
4. Look on your map. Take a bearing of the drainage on your map. Remember this number.
5. If the numbers are the same, you have found a drainage going the same direction as the one where you think you are. This is a strong clue, but may not be decisive. **Make sure there are not other parallel drainages in the area.**
6. If their numbers are not the same, you are not where you think you are.

SURROUNDING TERRAIN CHECK: This is a multifaceted technique. You can gather information from the surrounding terrain in a couple ways.

1. Go somewhere nearby and do a second terrain check to double check your original check.
2. Get up high and do a second terrain check or a resection.
3. Do a modified Terrain Check with the question: "If I go 100m further, what will I see? Repeat for all four directions. Check out the surrounding terrain to see if it is what you expected. If it isn't, you may be wrong.

NEVER TRUST ONE PIECE OF INFORMATION: Deception is everywhere. Rocks move compass needles, floods move drainages and people move trails. Do not be swayed by any one fact. The One True Path will be open to those who collect all the necessary information.

FURTHER INSTRUCTION: The Techniques of Orienteering

TAKING A BEARING IN REALITY:

1. **ACKNOWLEDGE THE EXISTENCE OF YOUR MAGNETIC NEEDLE.**
2. Point the end of the compass in the direction of the intended bearing.
3. Swivel the compass bezel until it is aligned with magnetic north. Put Red Fred in the Shed.
4. Read the compass bearing where it says "Read Bearing Here."
5. You now have a bearing in **MAGNETIC** degrees.

TAKING A BEARING ON THE MAP:

1. **DENY THE EXISTENCE OF YOUR MAGNETIC NEEDLE.**
2. Identify the two points you wish to take a bearing between.
3. Using the side of your compass as a straight edge, draw a line connecting them.
4. Place the center of your compass bezel over the starting point aligned with North.
5. Swivel the base of the compass until it is aligned with the drawn line and pointing towards the ending point.
6. Read the bearing where it says "Read Bearing Here"
7. You now have a bearing in **TRUE** degrees.

IMPORTANT NOTE: Every dingle time you relay a bearing to yourself or someone else you should designate a **MAGNETIC** or a **TRUE** bearing. Every written bearing should read either 360M or 360 T.

TAKING A RECIPROCAL:

1. Take a bearing. Identify whether it is **TRUE** or **MAGNETIC**.
2. If the bearing is between 0-180 degrees, add 180.
3. If the bearing is between 181-360 degrees, subtract 180.

4. You now have a reciprocal bearing in the same degrees as the original bearing. That is to say, if you had a TRUE bearing, you now have a TRUE reciprocal bearing.
Find the reciprocals of the two bearings you have just taken.

ADJUSTING FOR DECLINATION:

1. Take a bearing. Identify whether it is **TRUE** or **MAGNETIC**. Remember **TRUE** bearings are taken on maps, **MAGNETIC** bearings are taken on reality.
 2. For **TRUE** bearings, add the declination to get the **MAGNETIC** bearing. When going from map to compass, add.
 3. For **MAGNETIC** bearings, subtract the declination to get the **TRUE** bearing. When going from compass to map, subtract.
- Take the **TRUE** and **MAGNETIC** bearings you have just identified and adjust them both for declination.

DECLINATION MEMORY MNEMONICS:

1. When going from **MAP (true)** to **COMPASS (magnetic)** **ADD** or **MCA**. When going from **COMPASS (magnetic)** to **MAP (true)** **SUBTRACT** or **CMS**. Remember these abbreviations.
2. There is more detail in reality than on the map, so add declination when going from **MAP (true)** to **COMPASS (magnetic)**. There is less detail on the map than in reality, so subtract declination when going from **COMPASS (magnetic)** to **MAP (true)**.

These rules will apply for all the searching you do with BRMRG. If you happen to do land navigation in the west these rules will be reversed.

USING A TRUE BEARING TO PLOT A COURSE IN REALITY:

1. Find your **TRUE** bearing.
2. Adjust for declination by adding the declination. You now have a **MAGNETIC** bearing.
3. **ACKNOWLEDGE THE EXISTENCE OF YOUR MAGNETIC NEEDLE.**
4. Rotate your bezel until the desired bearing is aligned with the "Read Bearing Here" mark.
5. Rotate yourself until the magnetic needle is aligned with north on the bezel. Put Red Fred in the Shed.
6. You are now facing the desired direction of travel. Follow the course as desired.

USING A MAGNETIC BEARING TO PLOT A COURSE ON THE MAP:

1. Find your **MAGNETIC** bearing.
2. Adjust for declination by subtracting the declination. You now have a **TRUE** bearing.
3. **DENY THE EXISTENCE OF YOUR MAGNETIC NEEDLE.**
4. Rotate your bezel until the desired bearing is aligned with the "Read Bearing Here" mark.
5. Mark your starting point on the map with a pencil.
6. Place the center of the bezel over the starting point.
7. Rotate the compass until the North of the bezel is aligned with **TRUE** North. The cross hatches can help.
8. Mark the end of the direction of travel arrow with a pencil point. Remove compass and connect the two points.
9. You now have plotted the course on your map. It can be extended in either direction.

USING A MAGNETIC RECIPROCAL BEARING TO PLOT A COURSE ON A MAP:

1. Take a **MAGNETIC** bearing from your location (whether known or unknown). Usually you will take this bearing to a distant object like a peak or tower.
2. Take the reciprocal of this bearing. You now have a **RECIPROCAL MAGNETIC** bearing.
3. Adjust this bearing for declination. You now have a **RECIPROCAL TRUE BEARING**.
4. **DENY THE EXISTENCE OF YOUR MAGNETIC NEEDLE.**
5. Swivel the bezel until your **RECIPROCAL TRUE BEARING** is located where it says "Read Bearing Here."
6. Identify the distant object on your map.
7. Place the center of your bezel over said object.
8. Rotate the compass until the North on the bezel is aligned with **TRUE** North.
9. Mark the end of the direction of travel arrow with your pencil.
10. Draw a line from the distant object through the pencil mark.
11. You are at some unidentified location along this ray.

THE ORIENTEER'S TRIUMVIRATE: TRIANGULATION, RESECTION, AND MODIFIED RESECTION

TRIANGULATION: Triangulation is the process of taking magnetic bearings from the field and plotting them on a map to see if they cross. The main practical application of triangulation in SAR is when using DF equipment to find an ELT.

RESECTION: Resection can be the salvation of the lost. You use resection when you do not know your present location, but you can identify several major land features nearby. Who is your best friend when you don't know your present location? The **RECIPROCAL!!!** The technique you'll use is taking several magnetic bearings to identified locations and then plotting them on the map as **TRUE RECIPROCAL** bearings. You are where the bearings cross.

MODIFIED RESECTION: You use a modified resection when you know you are on a linear feature (a road or ridge) but you don't know exactly where. Like the resection, you need to be able to identify distant objects, but this time only two.

WHY YOU SHOULD NEVER TRUST ONE PIECE OF INFORMATION: THE "NEW" WAY TO LAND NAV: GPS

One piece of technology that is becoming more prevalent in search and rescue is the use of the global positioning system. Some of the SAR teams in the ASRC have group GPS units and many individual members have one as part of their personal gear. GPS gives very accurate coordinates in either latitude or longitude or UTM. The most important time to use GPS is when doing one of your confirmations or if you come to a point where accurate coordinates will be needed at a later time. The prime example of this would be a clue. With a GPS, base will be able to send a team that follows up the clue exactly where the clue is. You should write down the GPS coordinates even if you don't have a map to translate GPS coordinates into ASRC grid coordinates.

Remember that while GPS is a very accurate tool you should still never trust a single piece of information. If not properly calibrated and operated, GPS readings can be wildly inaccurate. Always use all your information. The map can be out of date, local electric fields can skew your compass, and you can goof up. Be confident in your skills but be open to sources of error in your references, your equipment, and especially yourself.