CURRICULUM ON MILITARY SUBJECTS

Strand M6: Maps and Navigation

Level 11

This Strand is composed of the following components:

A. Map Reading
B. Navigation Tools and Activities
C. Advanced Land Navigation

LEADERS KNOW THE WAY

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C. Advanced Land Navigation

Objectives

DESIRED OUTCOME (Self-Mastery)
Cadets will be able to successfully negotiate a Land Navigation Course using map reading, compass, and land navigation skills.

C1. Use Intersection, Resection, and Modified Resection to locate a point on a topographic map.
C2. Put all your map reading and compass skills together to complete a land navigation course.
C3. Design a Land Navigation Course for your Battalion or Brigade
C4. Advanced Land Navigation Sports and Activities

A) Identify the key characteristics of and the various skills required for advanced land navigation sports and activities.
B) Know the steps to take if you get lost in the wilderness.

C5. Use a GPS to call in a 9-line MEDEVAC and navigate to a waypoint.

C1. Advanced Map Reading Techniques

A few advanced map reading techniques that we didn't cover in the map reading course are Intersection, Resection, and Modified Resection.

Intersection is a way to locate an unknown position on the ground by determining where azimuths from two or three known positions on the ground intersect.

Resection is the method of locating one's position on a map by determining the grid azimuth to at least two (three is better) well defined locations that can be pinpointed on the map.

Modified Resection is the method of locating one's position on the map when the person is located on a linear feature on the ground, such as a road, canal, or stream.

Intersection

Intersection: Map & Compass Method

(1) Orient the map using the compass.
(2) Locate and mark your position on the map,
(3) Determine the magnetic azimuth to the unknown position using the compass.
(4) Convert the magnetic azimuth to grid azimuth.
(5) Draw a line on the map from your position on this grid azimuth.
(6) Move to a second known point and repeat steps 1, 2, 3, 4, and 5.
(7) The location of the unknown position is where the lines cross on the map. Determine the grid coordinates to the desired accuracy.

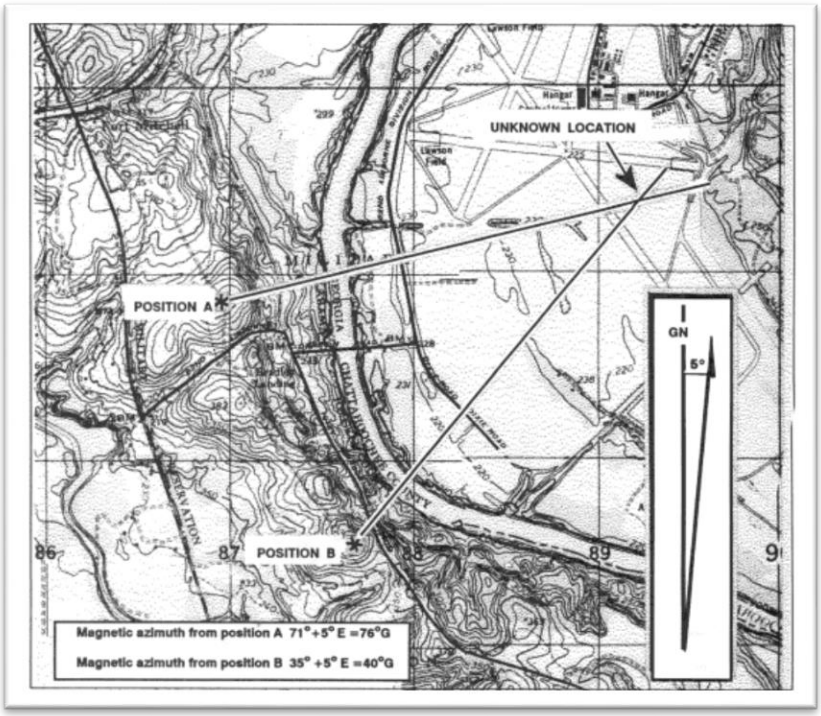

Figure 1 Intersection: Map & Compass Method

Intersection: Straight Edge Method (This method is used when you don't have a compass)

(1) Orient the map on a flat surface by the terrain association method.
(2) Locate and mark your position on the map.
(3) Lay a straight edge on the map with one end at the user's position (A) as a pivot point; then, rotate the straightedge until the unknown point is sighted along the edge.
(4) Draw a line along the straight edge
(5) Repeat the above steps at position (B) and check for accuracy.
(6) The intersection of the lines on the map is the location of the unknown point (C). Determine the grid coordinates to the desired accuracy.

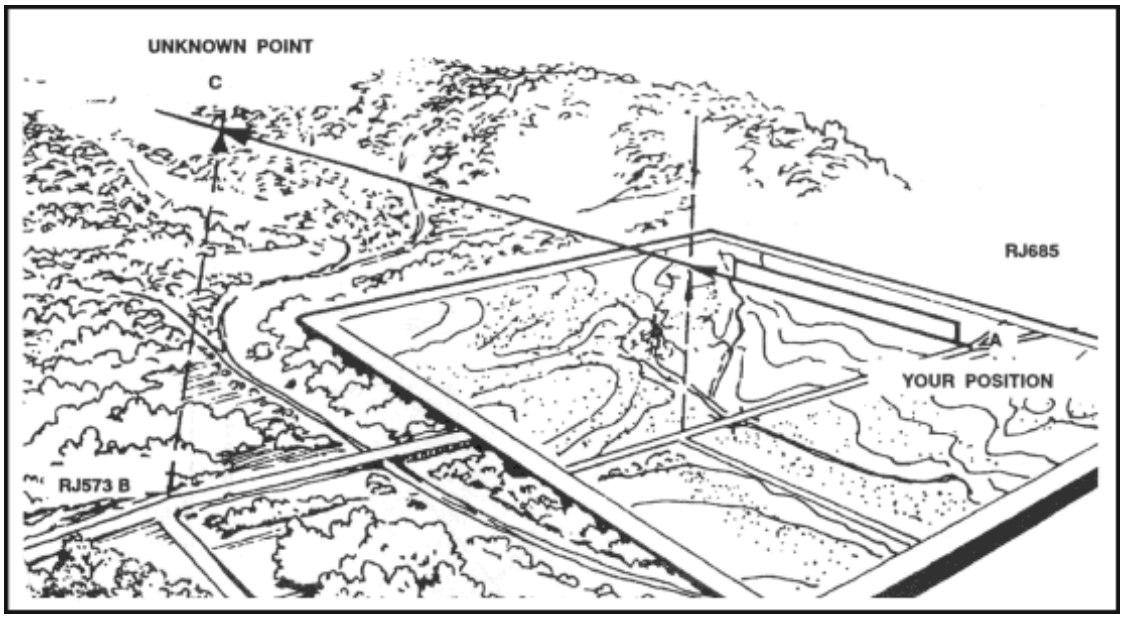

Figure 2 Intersection: Straight Edge Method

Resection (Also known as Triangulation)

Again, Resection is the method of locating one's position on a map by determining the grid azimuth to at least two (three is better) well defined locations that can be pinpointed on the map.

- Start by locating three points on the ground that you can positively identify on the map.
- Determine the grid azimuths from your position to these terrain features.

(1) Orient the map using the compass.
(2) Identify two or three known distant locations on the ground and mark them on the map.
(3) Measure the magnetic azimuth to one of the known positions from your location using a compass.
(4) Convert the magnetic azimuth to a grid azimuth.
(5) Convert the grid azimuth to a back azimuth. Using a protractor, draw a line for the back azimuth on the map from the known position back toward your unknown position.

(6) Repeat 3, 4, and 5 for a second position and a third position, if desired.
(7) The intersection of the lines is your location. Determine the grid coordinates to the desired accuracy.

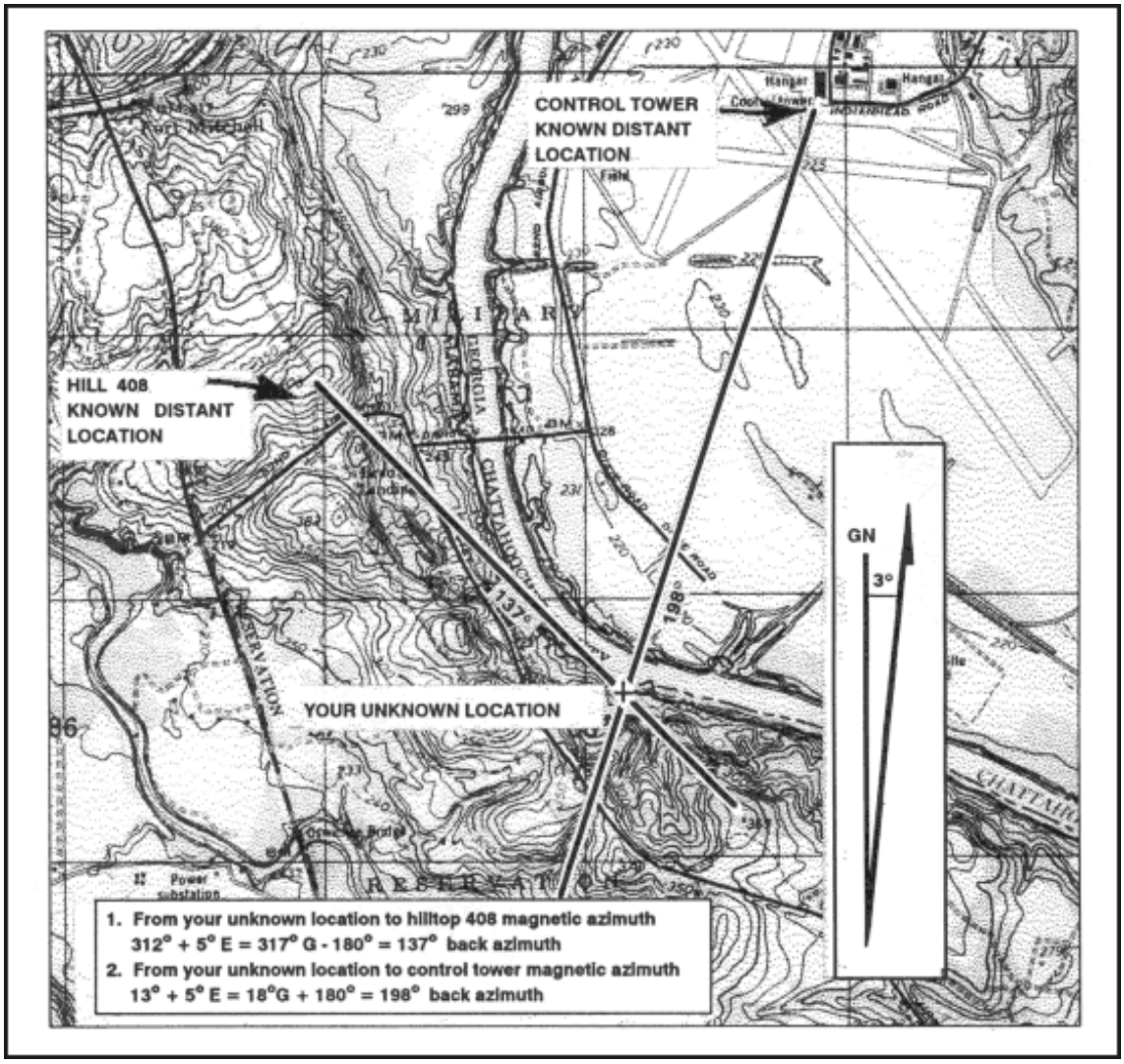

Figure 3 Resection (Triangulation)

Determining a Back Azimuth:

- Remember – a back azimuth is 180° from an azimuth.
- Simply add or subtract 180 degrees to or from your azimuth.
- If your azimuth is more than 180°, subtract.
- If your azimuth is less than 180°, add.
- The back azimuth has to be between 0° and 360°
- In addition to using it in a resection, a back azimuth is also used to give a helicopter a bearing (back azimuth) to your location. It is also used on an out-and-back course where your return course covers the same ground as your outbound course.

Resection Using the Straight Edge Method (No Compass)

1. Orient the map to the ground.
2. Locate at least two known positions on the ground and mark them on the map.
3. Lay a straight edge with one end at the first known position as a pivot point, then rotate the straight edge toward yourself until you sight the known position along the edge.
4. Draw a line along the straight edge.
5. Repeat procedures 1 thru 4 for the next known position.
6. The intersection of lines is the location of your position.

Again, check for accuracy, you may use a third position.

Modified Resection

Modified resection is the method of locating one's position on the map when the person is located on a linear feature on the ground, such as a road, canal, or stream.

1. Orient the map using a compass or by terrain association.
2. Find a distant point that can be identified on the ground and on the map.
3. Determine the magnetic azimuth from your location to the distant known point.
4. Convert the magnetic azimuth to a grid azimuth.
5. Convert the grid azimuth to a back azimuth. Using a protractor, draw a line for the back azimuth on the map from the known position back toward your unknown position.
6. The location of the user is where the line crosses the linear feature. Determine the grid coordinates to the desired accuracy.

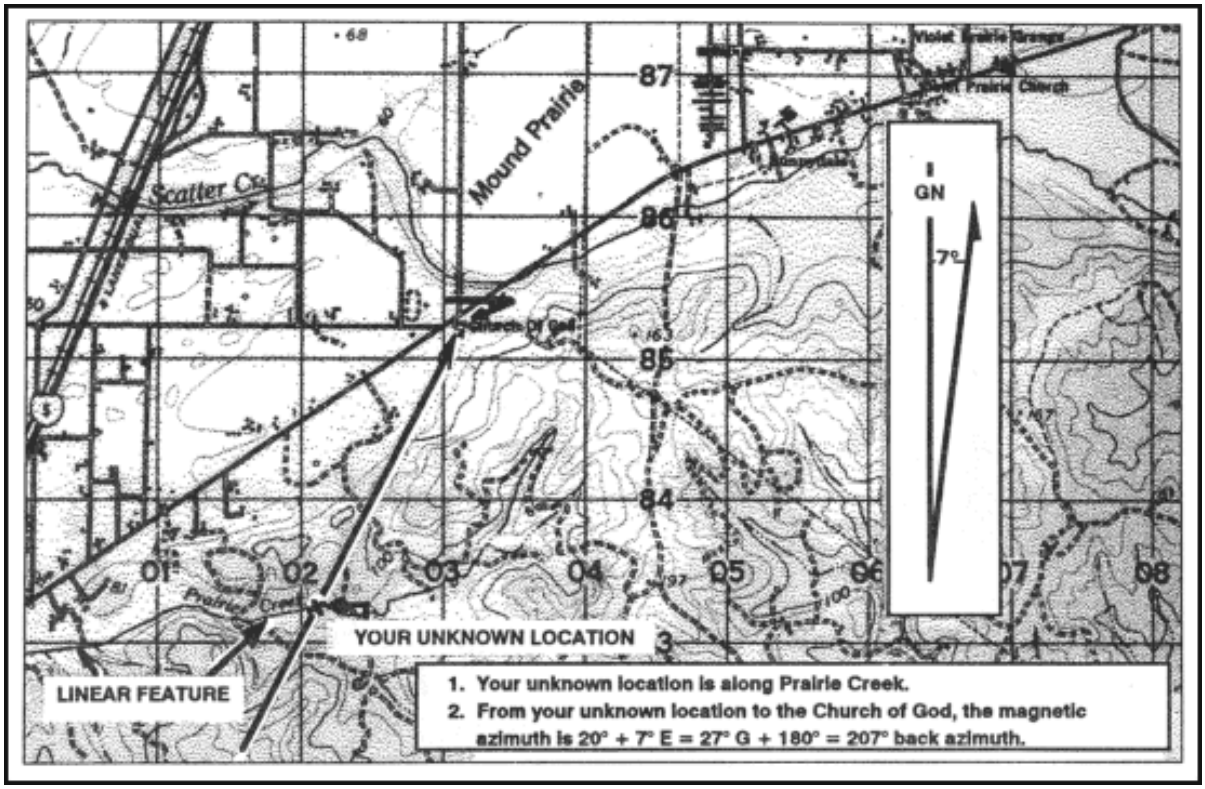

Figure 4 Modified Resection(Biangulation)

C2. Land Navigation (Land Nav)

A true Land Nav Course will put most of your knowledge about map reading and compass use together. Courses are, of course, different, and may challenge you in different ways. The differences might include what skills they require you to demonstrate, the terrain, and the distance between points.

A Land Nav Course may require you to do any of the following:

- Plot a grid coordinate and grid azimuth on a map
- Convert between magnetic & grid azimuths
- Receive a distance and direction to travel from a known point (polar coordinate)
- Travel to a given grid coordinate
- Locate a terrain feature on map & ground
- Use your knowledge of colors, symbols, contour lines & terrain features to read your map
- Use terrain association to orient your map to the ground
- Measure distance and/or keep a pace count
- Use a compass
- Move around an obstacle

Plot a grid coordinate and grid azimuth on a map
Example: Starting point is GE08651264. Point 1 is on a grid azimuth of 74° from the starting point, at 375 meters.

- Plot GE08651264
- Plot grid azimuth of 74°
- Measure 375 meters on map scale
- Plot 375 meters along 74° line and figure out if there's a terrain feature you should look for at the next point
- Look at terrain features and figure out your best route
- Move out to that point

Movement Between Points

- You can go cross country, using compass and pace count
- You can look at your map to see if there's a road or trail, etc. that will be easier
- If you take a road, you need to keep reading your map to ensure you know where you are
- This technique is similar to Orienteering, and you can use those skills to be successful

Example: Move to GE08931241.

- Plot GE08931241 on your map

- Determine where it is in relation to where you are currently, what terrain is nearby, and the best way to get to that point
- Once you have a plan, move out!

Azimuths
Example: Move on a magnetic azimuth of 210° for 550 meters to get to your next point.

- Convert magnetic to grid azimuth
- Plot the grid azimuth on your map from your current position
- Figure out what terrain feature is at that point
- Determine the best way to get there, and move out!

C3. Designing a Land Nav Course for your Cadet Corps Unit

What is your challenge? You may have been tasked to develop a Land Nav Course for your unit's bivouac. You may just want to give your cadets more of a challenge and practice Land Nav in your local area. Either way, YOU CAN design your own Land Nav Course!

You may not need to design your own course. Don't reinvent the wheel unless you have to! Check in your area to see if there's an Orienteering Club or established courses you could convert to land nav. Army and Marine bases probably have Land Nav Courses. You could go there. If not, don't despair – design your own!

- Determine a location. Local/County or State Park nearby? Bivouac site? Military base?
- Get a map. Go on line!
- Plot key terrain features as your points
- Build your Control markers
- Design a scorecard that works for your course
- Decide what skills you want cadets to practice
- Develop enough different routes between various points so that cadets aren't just following each other between points
- Unlike Orienteering, teams on a Land Nav Course don't follow the same route.
- You might create 10 points on your course, but any given team will only go to 4 or 5 of them.
- The key is to make the routes logical and challenging, and to spread out teams on the same route so later teams don't catch up with earlier teams on the same route
- You also need to keep fairness in mind in designing the routes. The overall course should be about the same length for each team, though individual legs may be shorter or longer.
- You should run the course with some advanced cadets before you put your cadets on it

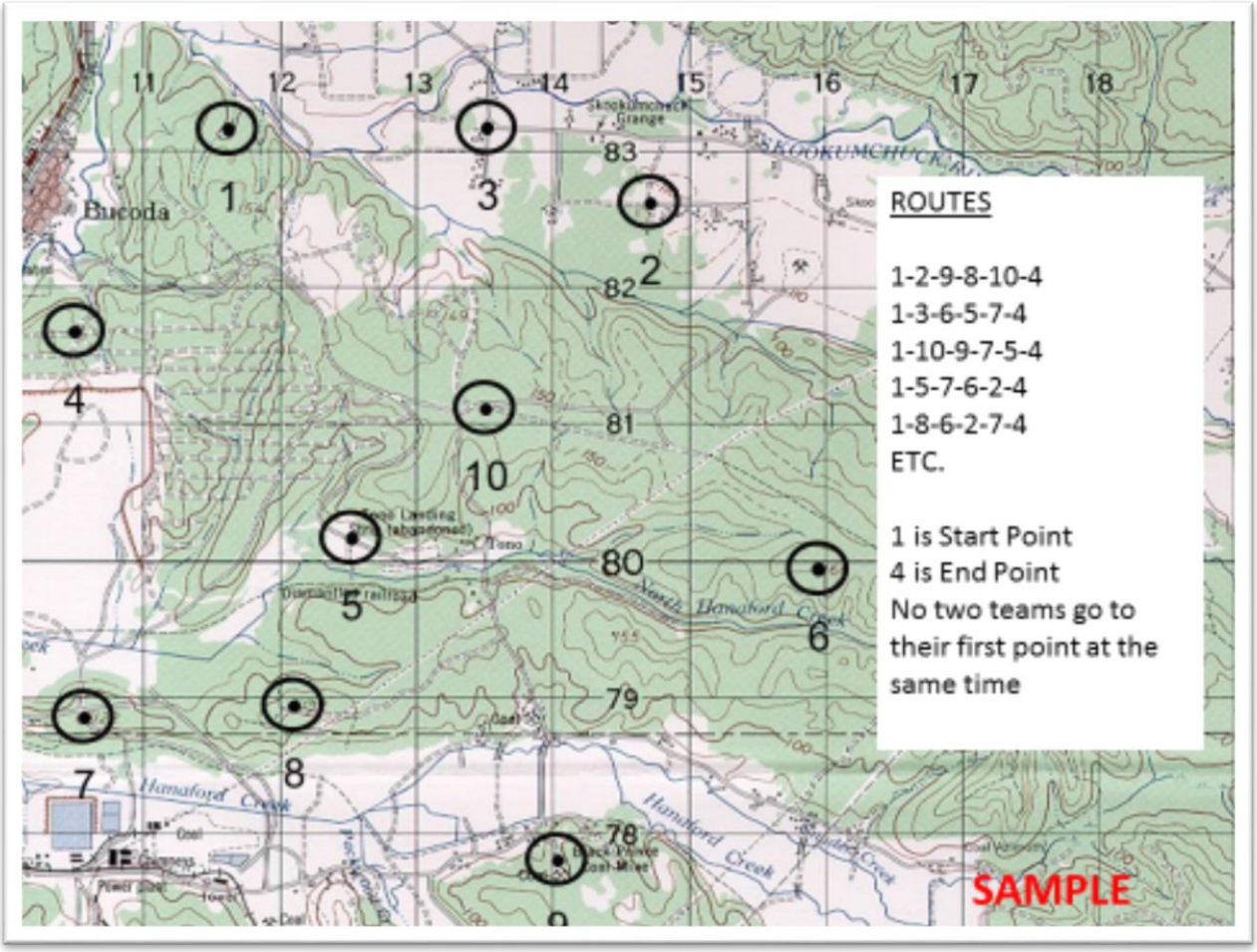

Figure 5 Sample Land Nav Course

At each point, you can have a card with instructions (for each team) to the next point. Instructions can challenge different skills: some might give magnetic direction + distance, some might give a grid coordinate, some might give grid direction and distance they have to plot on their map, etc. Usually you number the Control Marker, and the team just has to write down the number of the point they found.

Once you have the course planned:

- Write a simple OPLAN using CR 3-13
- Who – What – When – Where – Why
  - Our brigade is running a Land Nav Course at X Park on (date) as part of the X Brigade Bivouac
- Come up with rewards for winners (maybe a local veteran's organization could sponsor this)
- Don't forget your Risk Assessment!

C4. Advanced Land Navigation Sports / Activities

Adventure Racing

https://www.youtube.com/watch?v=occW94DgWT4

-The races can last a few hours or several days and can cover 10 - 100 miles or more!
-Just completing a race is often considered a victory.
-Emphasis that is placed on teamwork, rather than individual achievement.
-Adventure Racing offers an easy **crossover** for cyclist, runners and water sport enthusiasts
- 2-5 person teams
-Teams that can navigate well can beat more fit teams.
-Changing Disciplines:
--Cross-country running
--Orienteering and hiking
--Canoeing
--**Rappelling**
--Mountain biking

(USARA, 2017)

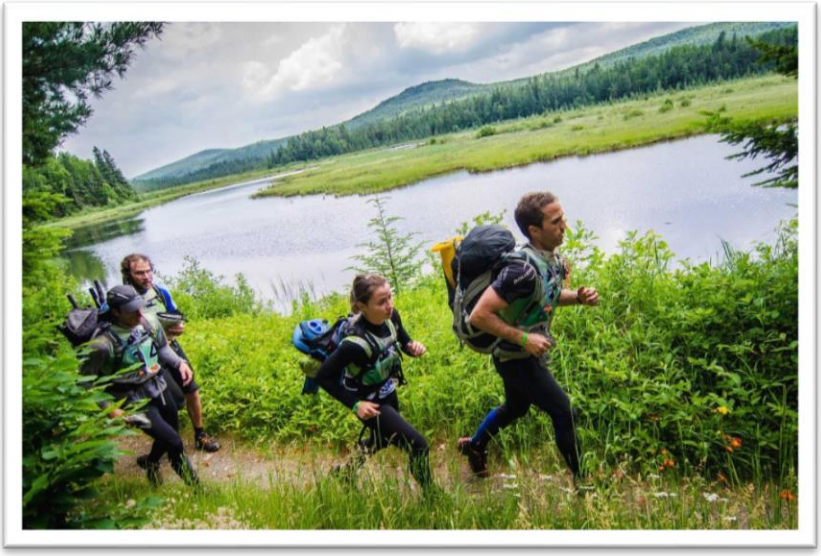

Figure 6 Adventure Racing

Rogaining

https://www.bing.com/videos/search?q=rogaining&&view=detail&mid=31D34F69D7ED9194A31D31D34F69D7ED9194A31D&FORM=VRDGAR

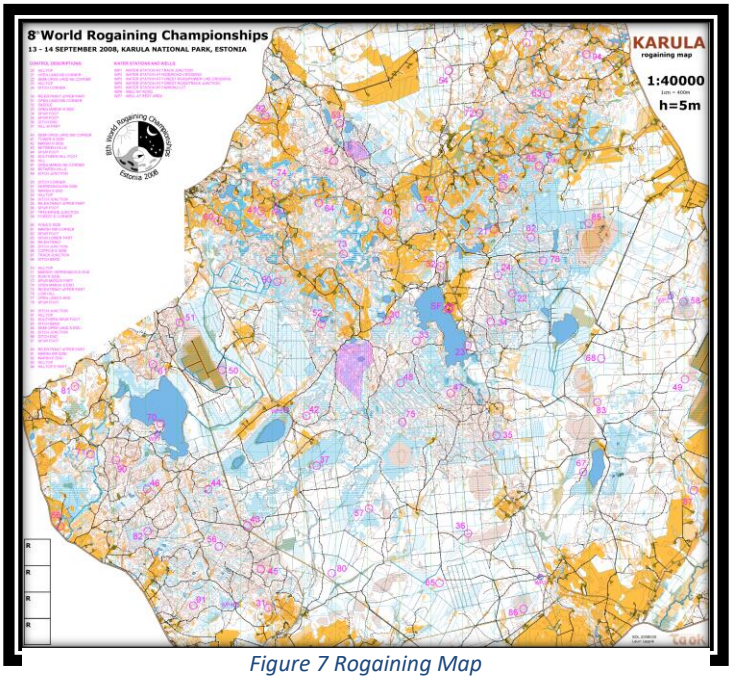

Figure 7 Rogaining Map

Rogaining is an orienteering sport of long distance cross-country navigation. It involves:
-Route planning
-Navigation between checkpoints using a variety of map types.
-Teams of 2–5 people
-Teams choose which checkpoints to visit within a time limit to maximize scores
-Features teamwork, endurance, competition, and an appreciation for the natural environment.
-Championship rogaines are 24 hours long, but rogaines can be as short as two hours.

(Wikipedia, The Free Encyclopedia, 2017)

Ski Orienteering

https://youtu.be/oUqaQicP8PU

Ski orienteering (SkiO) is a cross-country skiing endurance winter racing sport and one of the four orienteering disciplines recognized by the International Olympic Federation. A successful ski orienteer combines high physical endurance, strength, and excellent technical skiing skills with the ability to navigate and make the best route choices while skiing at a high speed.

Standard orienteering maps are used, but with special green overprinting of trails and tracks to indicate their navigability in snow; other symbols indicate whether any roads are snow-covered or clear. Navigation tactics is like mountain bike orienteering. Standard skate-skiing equipment is used, along with a map holder attached to the chest.
(Wikipedia, The Free Encyclopedia, 2017)

Figure 8 Ski Orienteering

Figure 9 Urban Orienteering

Urban Orienteering

-Orienteering in a city environment
-Association to man-made environment
-Typically, shorter distance

https://www.bing.com/videos/search?q=urban+orienteering&&view=detail&mid=44E85A7A583EC8FD9E4944E85A7A583EC8FD9E49&FORM=VRDGAR

Backpacking Navigation and What to Do if You Get Lost

Backpacking Navigation #1 - Staying Found - CleverHiker.com (9m 13sec YouTube Video)
https://www.youtube.com/watch?v=ZkGVLk2iVhI

Figure 10 Backpacking

- Practice your skills
- Give a friend your detailed itinerary
- **Pay Attention** to your map, to terrain, to time, to elevation, and to the trail
    - Use main landmarks
    - Pay close attention to trail junction signs
    - Avg hiker covers 2-3 miles per hour
    - Pay attention to elevation changes
    - Watch the trail
- **Stop** the moment things don't look right
    - Take a few minutes to look around
    - Don't be afraid to walk back the way you came
    - Be a detective not a victim
    - When was the last time you were "On Trail"
    - Don't bushwack off a trail
    - If completely lost, stay calm despite adrenaline level climb-DON'T RUN
        - Sit down eat, drink, and study the map
        - If Dark is coming, set up shelter and stay the night
        - 2 choices: Stay and wait, or walk yourself out
            - Generally, stay and wait is better, UNLESS no one knows where you are

- If walking out, walk towards the nearest road-head away from mountains and head downstream if following rivers

Backpacking Navigation #2 - Map, Compass & GPS - CleverHiker.com (13m 05sec YouTube Video)
https://www.youtube.com/watch?v=oAb6nC3slR4

- Map and Compass is essential on a hike
- Practice your skills and be prepared
- Map
    - Guidebook maps are good for planning, but not for navigation
    - Topographical map is best
        - Contour Lines
        - Terrain Features
        - Trails are often displayed on maps
        - Shaded areas = vegetation
        - Scale, Legend, Distances on trails
        - Declination
- Compass
    - Needle, Bezel, Orienting Line, Index lines, Direction of travel arrow
    - Taking a bearing
    - Line location / Triangulation
- GPS
    - Use to get your immediate present position
    - Use to navigate to waypoints
    - Use to track your hike
    - Battery-dependent
    - Can lose signal in dense brush or deep valleys
    - Always bring a map/compass as backup

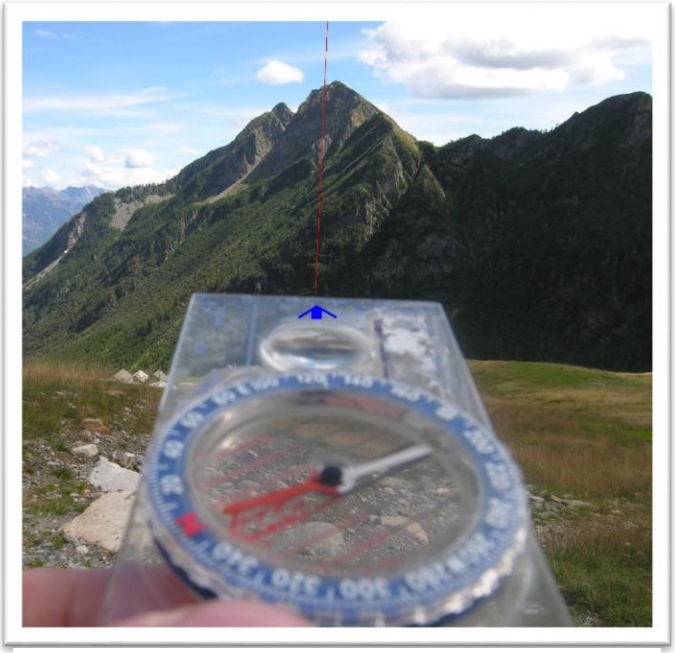

Figure 11 Line Location / Resection

C5. Calling a 9-Line Medevac (Medical Evacuation)

The US Army uses a 9-Line Medevac request for ground forces to communicate a request for medical evacuation. This procedure is covered here in Land Navigation so that Cadets will be able to identify their present position at all times, and be able to accurately call in the location of the pick-up site. This skill may be practiced in both Survival and Medical training. Core to success on line 1, is to understand who may be picking them up and to be able to convert grid coordinates into Lat/Long and the reverse.

<u>9 Line MEDEVAC Request</u>

Line 1. Location of the pick-up site.

Note: Grid Coordinates (US Army) or Latitude/Longitude (US Air Force / US Coast Guard / US Navy / Civilian)

Line 2. Radio frequency, call sign, and suffix.

Line 3. Number of patients by precedence:
A - Urgent
B - Urgent Surgical
C - Priority
D - Routine
E - Convenience

Line 4. Special equipment required:
A - None
B - Hoist
C - Extraction equipment
D - Ventilator

Line 5. Number of patients:
A - Litter
B – Ambulatory

Line 6. Security at pick-up site:
~~N - No enemy troops in area~~
~~P - Possible enemy troops in area (approach with caution)~~

~~E - Enemy troops in area (approach with caution)~~
~~X - Enemy troops in area (armed escort required)~~
*** In peacetime - number and types of wounds, injuries, and illnesses**

Line 7. Method of marking pick-up site:
A - Panels
B - Pyrotechnic signal
C - Smoke signal
D - None
E - Other

Line 8. Patient nationality and status:
A - US Military
B - US Civilian
C - Non-US Military
D - Non-US Civilian
~~E - EPW~~

Line 9. NBC Contamination:
~~N - Nuclear~~
~~B - Biological~~
~~C - Chemical~~
*** In peacetime - terrain description of pick-up site**

MEDEVAC REQUEST FORM GTA 08-01-004

LINE	ITEM	EVACUATION REQUEST MESSAGE
1	Location of Pickup Site.	
2	Radio Frequ., Call Sign, & Suffix.	
3	No. of Patients by Precedence.	
4	Special Equipment Required.	
5	Number of Patients by Type.	
6	Security of Pickup Site (Wartime).	
6	Number and Type of Wound, Injury, or Illness (Peacetime).	
7	Method of Marking Pickup Site.	
8	Patient Nationality and Status.	
9	NBC Contamination (Wartime).	
9	Terrain Description (Peacetime).	

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Figure 12 MEDEVAC Request (9-Line Format)

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USARA. (2017, 05 09). *USARA*. Retrieved from USARA: http://www.usara.com/default.aspx?ReturnUrl=%2f

Wikipedia, The Free Encyclopedia. (2017, 05 09). *Rogaining*. Retrieved from Wikipedia.com: https://en.wikipedia.org/wiki/Rogaining

Wikipedia, The Free Encyclopedia. (2017, 05 09). *Ski-Orienteering*. Retrieved from Wikipedia.com: https://en.wikipedia.org/wiki/Ski-orienteering