USING THE MILITARY LENSATIC COMPASS
This presentation is intended as a quick summary, and not a comprehensive resource. If you want to learn Land Navigation in detail, either buy a book; or get someone, who has the knowledge and skills, to teach you in person.
NOTE

To get the ideas across presented on these slides, many figures, pictures, and calculations may not be to scale and may be exaggerated for clarity.
Note:

Prior to being issued any training equipment, you will be required to sign a “statement of liability” agreeing to pay for anything you damage or lose.

All items will be inspected and inventoried prior to your signature and at the end of the training day too.

If you do not intend to sign this statement, then you may be denied training.

* You may use your own equipment.
Any Questions?
and now on with the . . .
LAND NAVIGATION WITH MAP AND LENSATIC COMPASS

Lassen Peak Quadrangle
California
15 Minute Series (Topographic)
LAND NAVIGATION

Why Learn Land Navigation? Training and practicing land navigation on foot provides the following everyday navigation (how not to get lost) benefits:

- **Tracking present location** (Where am I ?)
- **Determining Distance** (How far is it and am I there yet ?)
- **Sense of direction** (Where do I want to go and where am I actually going ?)
- **How to read a topographic map** (Do I understand the map ?)
- **Terrain and map association** (What hill or river am I looking at ?)
- **Spatial skills** (Can I mentally visualize the landscape in 3D ?)
- **Planning safe, practical routes** (Take a long safe route or a short risky route ?)
- **And more Navigational skills**

The best way to learn **LAND NAVIGATION** is to get "dirt time", that is, get out there with a map and compass!

Navigation is not about finding yourself after you are lost (although that’s what happens sometimes); it’s about keeping track of your position as you move away from a known point. As you move you have to remain cognizant of the terrain you are leaving, of the terrain you are passing, and of the terrain that is ahead.

Navigation in the wilderness means knowing your starting point, your destination, and your route to get there.

These skills will allow you to venture farther off the beaten path than you ever thought before.
THIS PRESENTATION IS DIVIDED INTO FOUR PARTS

PART 1  Basic Land Navigation
- The Lensatic Compass  module 1
- The Topographic Map  modules 2, 3, 4,
- The Land and Map Association  modules 5, 6

PART 2  Intermediate Land Navigation
- Making Sense of Direction  module 7
- Tracking Present Location  modules 8, 9, 10, 11
- Determining Travel Distance  modules 12, 13, 14

PART 3  Advance Land Navigation
- Navigation Methods to Stay On Course  module 15
- Additional Skills of Land Navigation  module 16
- Planning to Navigate  module 17

PART 4  Expert Land Navigation
- Navigation in different types of Terrain  module 18
- Night Navigation  module 19
- Sustainment  module 20
Module 1  Lensatic Compass – *parts and features, and how to sight the compass by two different methods.*

Module 2  Topo Map Margin – *what map margin data represents, map care, and how to properly fold a map.*

Module 3  Topo Map Scale – *map sizes and how it affects amount of detail that will be shown.*

Module 4  Topo Map Symbols – *you must understand them; to read and speak map language to others.*

Module 5  Terrain Relief – *shows elevation, indicates terrain features and heights of natural features.*

Module 6  Map Information – *what a protractor is for and how a map provides four kinds of information.*

Module 7  Sense of Direction – *lateral drift, current bearing, obstacles, back azimuth, deliberate offset.*

Module 8  Resection – *locate position with map only. Modified resection is with a map or compass.*

Module 9  Intersection & Triangulation – *two methods to locate position by compass.*

Module 10  Map Speaks Compass Language - *there is no need to orient the map to find your position.*

Module 11  Plotting Position Coordinates – *exact positioning, used to communicate to others with a map.*

Module 12  Route Measure – *mapping straight-line distance, curvature distance, and slope distance.*

Module 13  Pace Count – *using ranger pacing beads and estimating hiking speed.*

Module 14  Travel Distance Estimation – *estimating by 100 meter rule, rule-of-thumb, and by time.*

Module 15  Plan to Navigate – *in a group or alone, equipment, safety, responsibilities, route selection.*

Module 16  Stay on Course – *advance reference points and advance baselines.*

Module 17  Additional Land Navigation Skills – *estimate daylight, conserve energy, blisters, weather insight.*

Module 18  Navigating Different Terrain – *special environments, featureless terrain, visibility, dense foliage.*

Module 19  Night Navigation – *night adaptation, protecting night vision, navigate with lensatic compass.*

Module 20  Sustainment – *maintaining skills, training others, setting up a land navigation course.*
Any Questions?
PART 2
INTERMEDIATE LAND NAVIGATION
MODULE 13

• Determine Travel Distance
  – Pace Count
  – Speed
DETERMINING TRAVEL DISTANCE

DESCRIPTION

Determining travel distance is the most common error encountered while moving. There may be circumstances where you are unable to determine travel distance using your map. It is therefore essential to learn methods by which you can accurately measure, pace, or estimate distances on the ground.

How far is that mountain? An ability to judge distances accurately is not a natural gift, but it is a skill worth developing. Judging distances accurately can help to identify features and avoid wrong assumptions that could lead to trouble; (“We should have reached camp by now… that’s got to be Eagle Mountain, I think?”)

• There are several techniques to **measure distance** on a map.
  – STRAIGHT LINE DISTANCE – measuring from point A to point B on a map (horizontal distance).
  – CURVATURE DISTANCE – measuring a trail or other curved line on a map (horizontal distance).
  – SLOPE DISTANCE – measuring the planned route terrain slope on a map (vertical distance).

• There are several techniques to **determine distance** on the ground.
  – SPEED – estimating your travel speed, how many miles per hour.
  – PACE COUNT – count the number of steps you have taken and translate to ground distance.
  – ESTIMATION – visualizing a set ground distance.
  – TIME – Make it a habit of keeping your map and compass handy and refer to them every hour or so to locate your position (more often in low visibility). Keep track of your starting time, rest breaks and hiking pace. This will also give you an idea of how far you have traveled over a period of time.
DETERMINING TRAVEL DISTANCE

DETERMINE DISTANCE BY SPEED

- Estimating your rate of travel is essential when calculating the amount of time it will take to traverse a route. Especially when a group is hiking at the pace of the slowest group member.
- This data is needed when planning your own trip or a group trip.
- According to the U.S. Army, the following way is a good method to estimate hiking speed.

<table>
<thead>
<tr>
<th>FEMALE</th>
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<th></th>
<th>MALE</th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
<td>STEPS</td>
<td>SPEED</td>
<td></td>
<td>TIME</td>
<td>STEPS</td>
<td>SPEED</td>
<td></td>
</tr>
<tr>
<td>10 SEC</td>
<td>20 - 21</td>
<td>3 MPH</td>
<td></td>
<td>10 SEC</td>
<td>16 - 17</td>
<td>3 MPH</td>
<td></td>
</tr>
<tr>
<td>10 SEC</td>
<td>27 - 28</td>
<td>4 MPH</td>
<td></td>
<td>10 SEC</td>
<td>20 - 21</td>
<td>4 MPH</td>
<td></td>
</tr>
</tbody>
</table>

You also need to factor in elevation gain and loss

ADD ONE HOUR FOR EVERY 1,000 FEET OF ELEVATION CHANGE

Example you hike 4 MPH, on a 4 mile route, with a 2,000 feet elevation gain, takes you 3 hours.

\[1 \text{hr} \ (4 \text{miles} \ / \ 4 \text{mph}) + 2 \text{hrs} \ (1\text{hr per } 1,000 \text{ft} \ [2,000\text{ft}]) = 1 + 2 = 3 \text{ hours}\]
DETERMINING TRAVEL DISTANCE
DETERMINE DISTANCE BY **PACE COUNT**

Why count paces?

While pace counting is an old distance determination technique that is seldom used by trail-bound hikers, it is an **essential** technique used by **off-trail navigators** (with other techniques) who travel cross-country through challenging wilderness. In certain situations, a map and compass alone just aren't enough.

More mistakes are made in orienteering by wrongly estimating distance than from any other reason. While most of us can quickly learn to travel in the right direction, few of us have any idea of how far we have traveled.

Think about it for a moment. Have you ever cut an azimuth through the bush and wondered if you had missed your target, or perhaps not gone far enough, when it did not materialize? Did you continue on another 10 minutes, then 20 minutes, hoping it would appear? Or did you backtrack? You could have eliminated much of the guesswork in this situation by using a technique known as “pace-counting.”

Pace counting with **Ranger Pacing Beads** is well suited for the complicated navigational challenges faced by today's **wilderness navigator**. For example, pace counting is essential for dead reckoning, where azimuth (or direction of travel) data is combined with pacing (or distance traveled) data. With this technique, one can establish his or her position in nondescript terrain, foul weather, or even in complete darkness.

The hardest thing to get a "feel" for is how to adjust your pace-count for weaving back and forth on a route covered with trees, shrubs, and boulders.

The "dead" in dead reckoning is derived from "ded.," an abbreviation of "deduced." It's navigation by logical deduction. It does not necessarily mean it's a deadly form of navigation.
DETERMINING TRAVEL DISTANCE

DETERMINE DISTANCE BY PACE COUNT

- In thick jungle, where landmarks can not always be seen to track your position, PACE COUNT is the best way of measuring distance. It is the only method which lets a navigator know how far he has traveled. With this information, he can estimate where he is at any given time.

- To be accurate, the navigator must practice pacing over different types of terrain. First you have to do some calculations. Measure out exactly 100 meters on three types of ground. Flat easy terrain, rougher terrain with some slope and then steep hill terrain. Then on each measured course count your paces (every time your left foot touches the ground or every 2 steps = 1 pace). You will have 3 different pace counts for different types of terrain. If you wear a pack when in the woods then do your pace testing with the pack and boots on. Once finished MEMORIZE your pace count of all 3 types.

- When using a map and you have a destination that’s 3 km’s away you have an idea how many paces it will take you to travel that distance as an estimate.

- A navigator could make a PERSONAL PACE TABLE like one of these three examples:

<table>
<thead>
<tr>
<th>TERRAIN</th>
<th>METERS</th>
<th>PACES</th>
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</thead>
<tbody>
<tr>
<td>Swamp</td>
<td>100</td>
<td>85</td>
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<tr>
<td>Forest</td>
<td>100</td>
<td>70</td>
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<tr>
<td>Desert</td>
<td>100</td>
<td>115</td>
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<td>Snow</td>
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<td>115</td>
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<td>Jungle</td>
<td>100</td>
<td>125</td>
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<tr>
<td>Prairie</td>
<td>100</td>
<td>65</td>
</tr>
<tr>
<td>Hills</td>
<td>100</td>
<td>95</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>TERRAIN</th>
<th>METERS</th>
<th>PACES</th>
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</thead>
<tbody>
<tr>
<td>Sand</td>
<td>100</td>
<td>115</td>
</tr>
<tr>
<td>Gravel</td>
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<td>Flat</td>
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<td>Thick brush</td>
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<tr>
<td>Up hill</td>
<td>100</td>
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<tr>
<td>Down hill</td>
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| Flat easy terrain            | 100 meters | 65 paces |
| Rougher terrain with some slope | 100 meters | 75 paces |
| Steep hill terrain           | 100 meters | 95 paces |
DETERMINING TRAVEL DISTANCE

DETERMINE DISTANCE BY PACE COUNT

RANGER PACECOUNTER™
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Attach the RANGER PACECOUNTER™ by passing the loop end through your top button hole or LCE and pulling the beaded end through the exposed loop. Pull both sets of beads as far up as possible. After pacing off 100 meters, for example 65 paces with your left foot, pull down the first bead from the line with nine. Continue this until all nine beads are down. After the next 100 meters pull down a bead from the line with four and reset the nine beads. This marks 1 kilometer. When all the beads are pulled down at (at 4900 meters) pace off another 100 meters, pull all the beads up to mark 5 kilometers, and start again. With practice you can be sure of your pace count day or night.

Tested and proven at Fort Benning and Fort Bragg.

MADE IN USA
### PART 2 Intermediate Land Navigation

**Module 13 Pace Count**

**DETERMINING TRAVEL DISTANCE**

**DETERMINE DISTANCE BY PACE COUNT**

<table>
<thead>
<tr>
<th>0 meters</th>
<th>100 meters</th>
<th>200 meters</th>
<th>900 meters</th>
<th>1000 meters (1 kilometer)</th>
<th>1100 meters (1km 100m)</th>
<th>4000 meters (4 kilometer)</th>
<th>4900 meters (4km 900m)</th>
<th>5000 meters (5 kilometers)</th>
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- 1km = 1000 meters (1 kilometer)
- 900m = 900 meters
- 4km = 4000 meters (4 kilometer)
- 4 km = 4900 meters (4km 900m)
- 5 km = 5000 meters (5 kilometers)

**Notes:**

- The diagram shows the number of paces corresponding to different distances.
- The paces are counted in sets of 100, 200, 900, 1000, 1100, 4000, 4900, and 5000 meters.
- The paces are counted from 0 to 100, then from 100 to 200, and so on.

This method helps in estimating the distance traveled during land navigation.
Any Questions?
Prior to being issued any training equipment, you will be required to sign a “statement of liability” agreeing to pay for anything you damage or lose.

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If you do not intend to sign this statement, then you may be denied training.

* You may use your own equipment.
Now it is time for the following . . .

- Written exam
- Hands-on / Outdoors exam
THE END OF
LAND NAVIGATION
PRESENTATION
PART 2
Module 13
Pace Count & Speed