Advanced Land Nav for FTMs

Or, How to impress your FTL when s/he's too lazy to navigate for him/herself

KFM, Fall 2004

Based vaguely upon works by JFR, JRD, KEM, the greatly missed SDJ, and many others.

By now it has been permanently engraved in your brain just how crucial land navigation is to our work. To recap for those who were sleeping, if you can't navigate, then you're really going to make everyone's day because now there are multiple subjects. Tonight's class is "advanced" land navigation. Since it's advanced, I'm going to go quickly over the basics we covered earlier in the semester in favor of going a little deeper and allowing a little more practical work on paper.

Land nav consists of two components, terrain association and orienteering. Terrain association is exactly what it sounds like – knowing this drainage from the one over there, and finding both on your map. Orienteering is the technical, mathemagical way of turning the compass and pacing counts into meaningful information on your map. You can learn the paper geometry in the classroom, but it's really dangerous to rely on that in the field. At 2 km (not an unreasonable distance) 2° error in a bearing (not an unreasonable error) converts to 70m off (possibly an unreasonable figure). However, the terrain is not always friendly, so you need to be comfortable with both methods.

Quickie Guide to Land Navigation:

1) Where are you now?
2) Where do you need to go?
3) How are you going to get there?
4) What are you going to do if you get lost?

Without these 4 answers, you had best not leave wherever you are now, which is the first question. Knowing where you are refers largely to the map, and hopefully will not be too challenging since you should know how you got there. If you can't figure this one out, then try scouting the surrounding area for hints. If this doesn't work...well...we'll come back to that in a moment.

Where you need to go will probably be marked on your map for you. It's your job to figure out where that is in relation to yourself. This is the coarse navigation part – roughly how do I get into the right area? How to get there includes this, plus the fine tuned navigation component. Once you're in the right area, how are you going to get exactly to your point? How will you know if you've gone too far, or if you're almost there?

As for what to do if you get lost, this ties back in to the first part of not knowing where you are right now. You should have a "bail out plan" from whenever you last knew where you were and started trying to get to wherever you are now. If you do know where you are now, then be sure to plan a bail out before you leave.

All of the above are known as preplanning, and will help make sure you get wherever you're going with a minimum of errors/embarrassment. You still should be checking yourself the entire time you're in motion – gut checks (does this feel right), plan/terrain checks (have I seen the right features yet and in the right order?), and compass checks (am I going the right way?). This rubric, when used effectively and skillfully doesn't fail – the only error in this system is operator error, so don't let that be you! Practice, practice, practice. That's the way to be good at land nav. This system doesn't have to be restricted to missions and training – try using it the next time you're driving somewhere, or the next time you're walking to class. Make it part of who you are. Who knows – you may well wind up finding a quicker way to get around grounds!

Orienteering

Now, a page and a half later, the stuff you've all been waiting for! Again, I'm going to be assuming your knowledge of the basics of knowing how a compass works relative to a map and the real world.

Triangulation: This is the technique of taking multiple bearings to a stationary object to confirm its location. Generally it's used by teams trying to find a downed aircraft based on its ELT – we'll teach you more on that next semester. The farther apart the bearings are, the more accurate the final location will be. You really should use at least 3 bearings from 3 different points to do this, and the more you use the more accurate you'll be. You will never get three lines in a perfect point, but having a nice, tight, small triangle is generally close enough.

Resection: The opposite of triangulation, this is where you haven't a clue where you are, but know where those nice tall mountains are on your map. It's a great way to establish the first point in that land nav algorithm above (except in Virginia where the trees are usually too dense to see the helpful features, or the helpful features all run together into a ridge, making them unhelpful). Again, at least 3 bearings are required

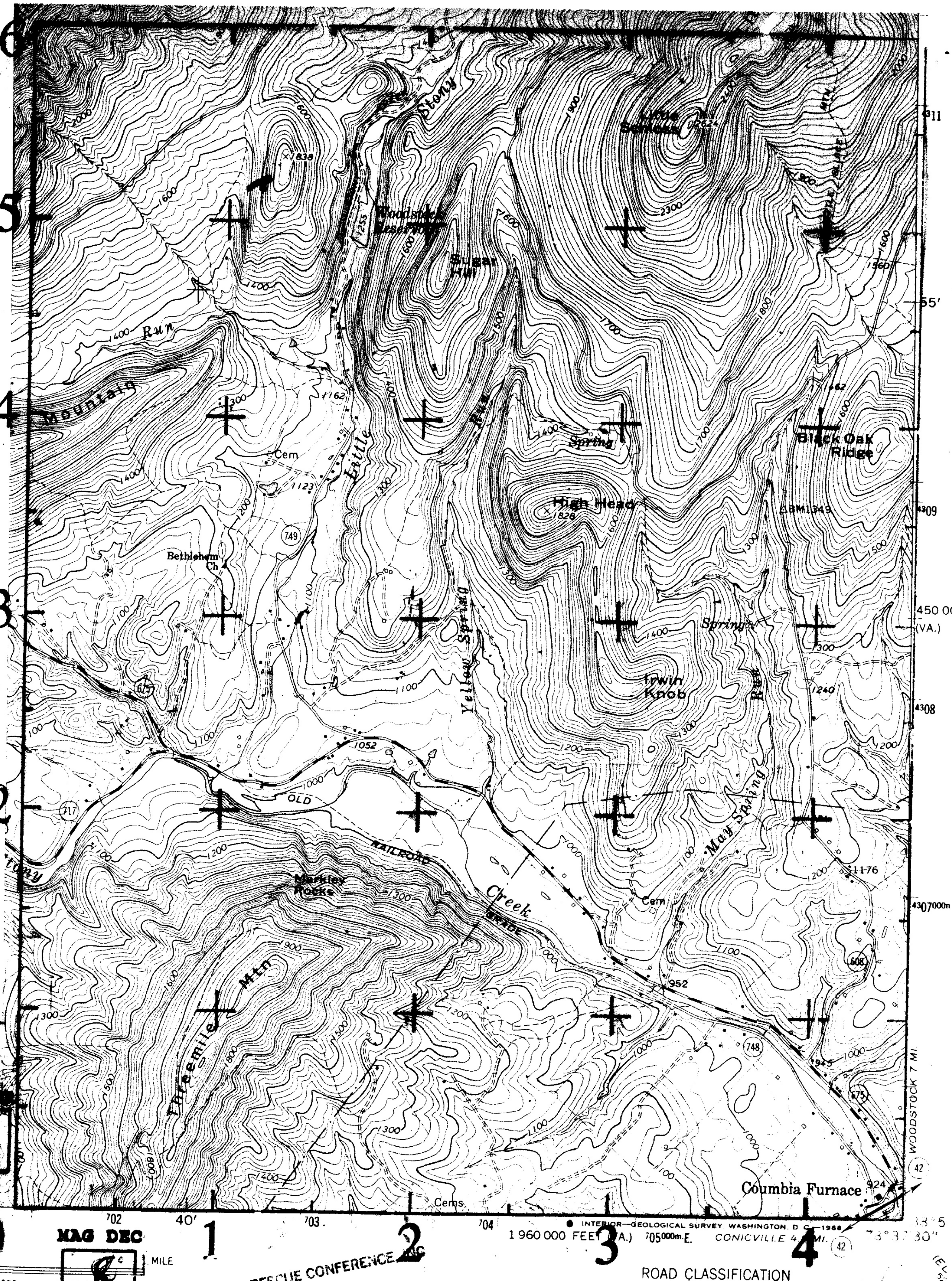
Modified Resection: This is a form of cheating at resection which reduces the number of points/bearings you need. If you are currently on a linear feature, then you really only need 2 points to confirm your location, since you've already got one line – the road.

Pacing: This is bearing's lovely assistant. Pacing, when done correctly, gives you a fairly accurate idea of how far you have traveled. At this weekend's trainings, a rope will be available for you to use to measure your pace count, usually how many paces you take in 50m. The problem with pacing is that, like bearings, its error propagates VERY rapidly over long distances.

Practical Problems

The rest of the class is based upon demonstrating all of these skills as best we can in a classroom environment. The rest is up to you and your ability/willingness to practice!

APPALACHIAN SEARCH & RESCUE CONFERENCE GRID OVERLAY



READ THIS COORDINATE FIRST.

SCALE IS IN 1000 METER UNITS

Problem 1: You've gotten ELT readings from three different peaks at C2635, C3126, and C1312. Where is the ELT located?

C2635 – 218M
C3126 – 293.5M
C1312 - 35M

Find the ASRC grid coordinates of the ELT.

Problem 2: Another plane down. You have teams at C2148, the peak of Sugar Hill, at C3355, the peak of Little Schloss, and one more team on peak of Black Oak Ridge at C4339

C4339 – 309M
C2148 – 109.5M
C3355 – 187.5M

What are the ASRC grid coordinates for the ELT? What altitude is the plane at?

Problem 3: You are somewhere at the foot of Irwin Knob where you can see the two peaks plus the northern peak of Threemile Mountain. You take the following bearings.

East Peak (Irwin Knob): 229.5T
West Peak (Irwin Knob): 224M
North Peak (Threemile): 50.5M

Where are you? What are your ASRC grid coordinates? Why should you know where you are?

Problem 4: Developers have turned the entire area into a giant theme park and you have gotten completely disoriented. The theme park is called TopoLand and all the labels on the map now have giant letters in their appropriate places in reality. You take bearings to the S in Yellow Spring, the M in Markley Rocks, and the B in Bethlehem Church.

B: 337M
M: 178.5M
S: 63T

What are your ASRC grid coordinates.?

Problem 5: You are somewhere along rt 675 and you take a bearing using the 1828' peak at C2636 and get a bearing of 36M. Where are you at? Since the road has bends in it you might be at a number of different points along it. Taking another bearing from the peak at C2927 you get a bearing of 78M.
Now what are your ASRC grid coordinates?

Problem 6: Tommy Lee Jones is hot on your trail, and you hear him barking a list of lots of places to search. He doesn't mention aardvark hills and you know there is a big one to the north. You run back down the mountain and hit rt 608, but you aren't sure where on the road you are. You take bearings to Little Schloss and Black Oak Ridge.

Schloss: 330.5M
Black Oak: 172.5M

What are your ASRC grid coordinates?