Part I. Paper Road Location

Prior to ground reconnaissance, it is important to investigate possible road locations on the topographic map and aerial photos. This is called a paper road location. First identify control points (any point through which the road must pass, e.g., saddles, stream crossings, benches, landing sites, etc.) and then scale-off trial grade-lines between control points. The procedure will be illustrated using a map scale of 1" - 400' and a 20' contour interval:

1. Determine, using topographic map, the difference in elevation between control points.

2. Determine (roughly) the horizontal distance between control points.

3. Calculate a trial grade percent:

$$\text{Trial grade percent} = \frac{(\text{difference in elevation})(100)}{(\text{horizontal distance})}$$

Example: Elevation difference = 150'
Horizontal distance = 2500'

$$\text{Trial grade percent} = \frac{150(100)}{2500} = 6$$

4. Calculate the horizontal distance needed to cross each contour line

Example: If trial grade percent = 6
At 6% we will need 333' of horizontal distance to cross one contour line.

$$\text{i.e.} \quad \frac{100}{6} = \frac{X}{20} \qquad X = 333'$$

5. Calculate spread on the dividers to cross one contour line.

Example: If 1" = 400', then 0.83" = 333'

$$\text{i.e.} \quad \frac{1}{400} = \frac{x}{333} \qquad x = 0.83$$

6. Set the required spread on the dividers (in this case 0.83") and "walk" dividers up the contour lines, gain one contour line with each turn of the dividers. (Note: If you don't have dividers you can use a compass or 0.1" scale.)

7. Mark your route lightly in pencil; i.e. mark where you cross each contour line.

8. When you get close to next control point see if trial grade "works". If not, adjust trial grade and repeat. For example, if you miss the control point, high or low, adjust your grade percent down or up respectively, erase the first marked line on the map, and repeat.

9. Mark the final line on the topographic map.

10. Once you have a grade line that hits all control points and does not have any excess grade percents, you are ready to check the location by running the gradeline in the field. The map grades merely give you a guideline as to what grades to try in the field.