

## **Basic Mountaineering Course 2004:**

### **The Mountain Environment**

- I. Routefinding and Travel
  - A. Definitions
    1. Orientation: The science of determining your exact position on the earth.
    2. Navigation: The science of determining the location of your objective and of keeping yourself pointed in the right direction all the way from your starting point to the destination.
    3. Routefinding: The art of locating and following a route that is appropriate to the abilities and equipment of the team.
  - B. Trip Preparation
    1. Area Information from Maps, Guidebooks and Experienced Sources
      - a. If you are new to area, get information from experienced locals
      - b. Each member of the team needs to know wilderness navigation and must keep track of where the team has been, where it is, and where it is going.
      - c. Pre-plan a route after the team assignment has been made, taking into account terrain and hazards. The alpine and/or winter environment can be very severe. Study the map and visualize a route. Verify and modify once on scene.
      - d. Keep a positive, attentive attitude
  - C. The Map
    1. Topographic Maps
      - a. Practice reading basic topographic features: Nearly Flat Area; Gentle Slope; Steep Slope; Cliffs; Gully or Couloir; Ridge; Summit; Cirque or Bowl, Saddle, Pass or Col
    2. Routefinding with the Map
      - a. Once on scene, orient the map, go over the proposed route, and

compare the actual terrain.

- b. While in route, compare landmarks to map
- c. Regularly update team's position on map with time reference.
- d. Look back regularly.
- e. Mark the route if necessary.
- f. At high points, take advantage of the view.
- g. On the descent, be extra cautious; particularly if it is a different descent route.

#### D. The Compass

##### 1. Uses

- a. Gross bearing - finding your way down the correct side of the mountain – low visibility conditions
- b. Triangulate current location on a map using visible landmarks

#### E. The Altimeter

##### 1. Uses

- a. Track the rate of ascent for the team over known time intervals.
- b. Determine exact position of team utilizing contour lines on map.
- c. Note elevation at changes of direction on long terrain features to easily find them on the descent.
- d. Note weather trends.

##### 2. As with any good friend, you've got to accept them despite their bad habits.

- a. Calibrate whenever possible.

#### F. The GPS

##### 1. Works in most weather conditions

##### 2. Uses

- a. Current position
- b. Waypoints
  - Mark trail forks, river crossings, ridgeline locations, such as the entrance to a couloir

#### G. Wilderness Routefinding

1. The art of locating and following a route that is appropriate to the abilities and equipment of the team.
2. Terrain types vary greatly by mountain range. It is an art that is sharpened and defined through practice in a particular range. There can be different considerations when visiting an unfamiliar range.
3. Alpine Terrain Features

#### H. Approach Observations

1. Study any technical climbing routes from a distance, looking for gross patterns, making a mental map of ridges, cliffs, snowfields, and glaciers, as well as angle of inclination.
2. Look from different angles if possible.
3. The presence of snow *can* indicate moderate slopes of less than 50 degrees; however, ice can give the elusion of snow.
4. Look for climbing hazards, such as rockfall or avalanche zones. If you must pass through these zones, travel in the cold hours of night or very early morning, when it is most stable.
5. “Climb with your eyes.” Constantly evaluate hazards and look for continuous routes. Also, note emergency campsites, water, etc.

#### I. Walking

1. Pace
  - a. Most common mistake is walking too fast. Don’t let anything external (teammates, “the victim”) increase the pace that is appropriate for you with your pack on the terrain that day.
    - If you cannot sustain the pace hour after hour, you are going too fast.
  - b. The other mistake is hiking too slow. Your body complains long before it is hurt. A *degree* of suffering is inevitable.
  - c. Vary your pace depending on the terrain. Plod slowly and methodically up steep slopes.
2. The Rest Step
  - a. As you take a breath, swing a leg forward. Exhale as you place it on the ground, but keep all of your weight on the back leg, straight and

locked at the knee so that bone, not muscle, supports the weight.

Increase the number of breathes between steps if needed.

- b. Make it a regular sequence and deep, controlled breathing.

3. Rests

- a. Shakedown break after the first half-hour.
- b. Short, infrequent breaks during the first part of the day, when your body is fresh. Stand or lean against a tree or rock.
- c. Later, take longer sitting breaks to relax muscles.
- d. Eat and drink during these breaks.

4. Downhill and Side-Hill

- a. Downhill can be very difficult on your toes, knees, and back. The whole-body jolting can also cause headaches.
- b. Tricks to ease your way downhill:
  - Tighten boot laces to reduce foot movement inside boots.
  - Maintain a pace that is slower than is urged by gravity.
  - Bend your knees to cushion shock.
  - Place feet lightly as if already sore. This will tire your upper leg muscles, which will require rest breaks.
  - Avoid side-hilling if at all possible. If it is useful, try to keep it as short as possible, working in switchbacks and any flat terrain.

5. Etiquette

- a. Avoid walking too close.
- b. Avoid following too far back.
- c. Take a look back before you release branches.
- d. Step aside when you stop briefly, stepping above those passing, if possible.
- e. As permission to pass
- f. Step aside on the way downhill to let a party of uphill hikers continue forward without breaking their pace.
- g. Set a pace that everyone in the party can maintain.

J. Trails

1. Trail Finding
  - a. Follow a trail if it heads the way you want to go.
  - b. If there is no trail, try to choose a course that a trail would follow if there were one.
2. Sound Trail Practices
  - a. Walk in a single file to protect trail-side vegetation.
  - b. Stay on the trail even if it’s muddy, snow-covered or rutted.
  - c. Help save vegetation and prevent erosion by not cutting switchbacks.
  - d. Select resilient areas instead of fragile vegetation for rest breaks.
  - e. Guard against damage to stream banks.
  - f. Leave trail-less areas free of cairns and flagging unless they were already there. If you need to mark the route, remove the markers on your way down.
  - g. Choose talus instead of fragile meadows for cross-country travel.

K. Brush

1. When you must cross it:
  - a. Choose the shortest route across the area.
  - b. Use fallen trees as elevated walkways.
  - c. Push and pull the bushes apart, sometimes by stepping on lower limbs and lifting higher ones to make a passageway.
  - d. On steep terrain, use strong shrubs as handholds.
2. Brush can be dangerous
  - a. Can be slippery
  - b. Can obscure cliffs, boulders, and ravines.
3. Some tips to avoid brush.
  - a. Use trails as much as possible.
  - b. Consider traveling when snow covers brush.
  - c. Avoid avalanche tracks. When climbing a valley wall, stay in the trees between avalanche tracks.
  - d. Aim for the heaviest timber. Brush is thinnest under big trees.

- e. Travel on talus or scree and remnants of snow.
- f. Consider traveling on ridges and ridge spurs.
- g. Consider climbing directly to timberline to take a high route above the brush.
- h. Consider traveling up the stream channel.
- i. Look for game trails.

L. Talus

- 1. If it is a loose talus slope, be ready to quickly jump to another rock if the one you step on moves.
- 2. Be cautious of setting off rock avalanches.
- 3. When moving a group up a loose talus slope:
  - a. Try to stay out of the fall line of the other climbers.
  - b. Be ready to shout “Rock” if one is dislodged.
  - c. Keep close together so a rock set off by one climber can’t gain dangerous momentum by the time it reaches other team members.
  - d. Permit only one climber to move at a time through an particularly dangerous area, while the rest stay in a protected spot.
- 4. Scree slopes are difficult to walk up, but can be a great timesaver going down, with a little practice.
  - a. Screeing - Shuffle to get a small slide of scree going and ride it down in a standing glissade.

M. Snow

- 1. Can be a blessing in early spring when talus and brush are covered by consolidated snow and snow bridges provide an easy way over streams.
- 2. As the snow melts, these bridges become less and less stable.
  - a. Watch for depressions in the snow and variations in color or texture, and listen for the sound of running water. Water emerging at the foot of a snowfield gives a clue as to the possible hazard. Probe with ice axe or trekking poles.
- 3. Snow next to logs and boulders often covers holes. Probe or step wide off logs and rocks.

N. Streams

1. Finding the Crossing

- a. Try to get a distant overall view of the river, such as from a ridge before dropping into a valley.
- b. In deep forest, there's a good chance of finding a fallen tree to cross.
- c. If a river is fed by snow, early morning is the time of minimum flow.

2. Making the Crossing

- a. Trekking poles and ice axes are extremely helpful.
- b. Foot logs and boulders have advantages.
- c. If you must cross in the water, unfasten pack waste and chest straps, only keep downstream shoulder strap on, use a single trekking pole on the upstream hand.
  - If the water is placid and stones are smooth, cross in bare feet.
  - In tougher conditions, wear boots, but put socks and insoles in your pack.
- d. Any swift stream boiling above your knees can be dangerous.
- e. Two people can move together in two ways:
  - Take turns securing the other as that person moves to a solid stance.
  - Both people hold onto a pole that is parallel to the stream flow. The upstream member breaks the force of the current. If someone slips, they hold onto the pole while the other keeps the pole steady.
- f. Ropes can be dangerous in stream crossings. A taut handline can be helpful, but belaying someone across a river holds the danger that the person could be held by the belay and trapped under water.

O. The Ice Axe

1. Multi-purpose tool:

- a. Third leg during stream crossings and talus hopping.
- b. Use as balance point going up steep trails and as a brake going down.
- c. Can be used for self-belay and self-arrest on both snow and dirt.

2. Probably the most dangerous implement in mountaineering.

- a. Cover sharp points and edges with guards when axe is not in use.
  - b. Remove guards on any slippery terrain, including mud, needles, grass, and snow.
  - c. To carry the axe while walking along a trail, hold the shaft at the balance point, with the spike forward, and the head to the rear with the pick down.
  - d. To use in the cane position, grasp the head, with the spike toward the ground. It is more comfortable to have the pick forward.
3. Axe can provide a false sense of security without sufficient practice.

## II. Weather

### A. Big mountains have storms and winds to match

1. If you get caught on the mountain in a storm, it is often best to wait out storm, due to the risks involved in descending in bad conditions.

### B. Fair weather can poses problems

1. Heat and solar radiation can result in collapsing snow bridges, crevasse movement, increased icfall and avalanche risk.
2. It is often best to climb at night, when temperatures are lowest and snow and ice are most stable.

### C. Clouds

1. Cirrus (Mares’ Tails)
  - a. Can indicate a front bringing precipitation in the next 24 hours
2. Lenticular (Cloud Caps)
  - a. High winds
  - b. Rapidly descending cloud cap signals bad weather is coming
3. Cumulonimbus
  - a. The storm is here.

### D. Altimeter-Barometer

1. Barometer indicates weather trends
2. Elevation and barometric pressure are inversely related.
  - a. Increase in elevation reading when no elevation was gained (such as at camp overnight) means falling barometric pressure, *generally*



- indicating deteriorating weather.
- b. Conversely, a lower elevation reading overnight is due to an increase in barometric pressure, *generally* indicating improved weather.
  3. Other variables include wind, local topography, and the rate of barometric pressure change.