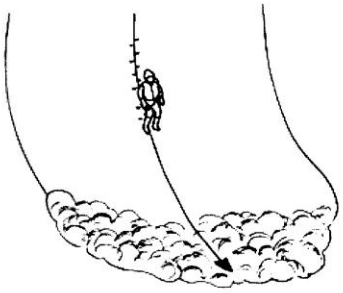
Transceiver Search (Finding a Signal)

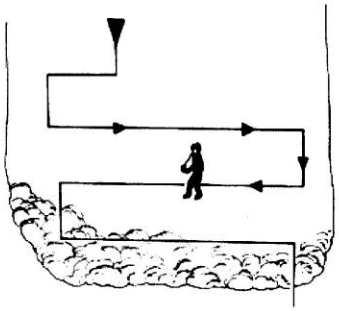
Single Searcher on a Small Slide

Depending upon the size of the avalanche debris and the number of searchers available, various search patterns may be used in deploying searchers. If the slide path and avalanche debris is confined in a narrow area (typically less than 40 metres wide) a single searcher can search by moving down the slide path and onto the debris in a straight line in the middle of the slope.



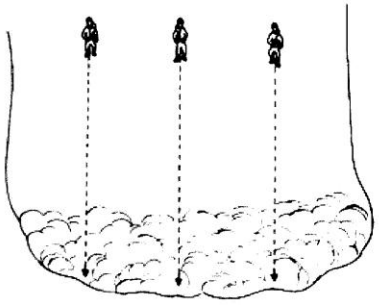
Single Searcher on a Large Slide

If there is only a single searcher and the slide path and debris covers a larger area, the searcher must zigzag down the slope, all the while ensuring that they never get more than about 20 metres away from the last track that they searched along. If the spacing between the zigzags is too large, the signal may be missed and the search will started have to be again, wasting valuable time.



Several Searchers on a Small Slide

If there are several people searching on a smaller avalanche, the searchers can line up along the top of the slope and space themselves out evenly. The searchers should not be more than about 20 metres apart. They proceed directly down the slide path until a signal is heard

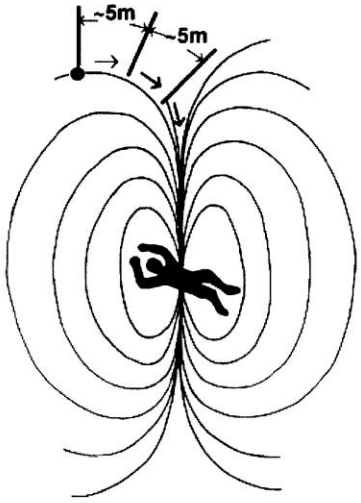


Several Searchers on a Large Slide

If the slide path is large and the group size is not sufficient to allow reasonable spacing between group members, then a combination of the two techniques just discussed may be required.

Transceiver Search (Following the Signal)

Induction Line Method



Learning the Induction-line technique is a practical skill and it should be practiced several times a season or, better still, at the beginning of each outing.

In addition, at the beginning of each trip and at critical points thereafter, avalanche transceivers should be checked to ensure adequate transmit and receive range as well as to ensure that the batteries have not died.

The field of induction lines has a three dimensional shape. A cross section looks somewhat like an apple cut in two but with layers like you see in an onion, as shown in the 2 dimensional diagram.

An advanced version of the Induction-line technique has the person stop to re-orientate the beacon after moving 10 percent of the distance setting currently set on the transceiver.

For example, if the setting you are on is the 80 metre range, the distance you move is 8 metres. If the setting you are on is the 15 metre range, you only move a distance of 1.5 metres before scanning again.

This adaptation has the advantage of recognizing that you will likely have to turn more often and more dramatically the closer you get to the buried subject.

In addition you are less likely to move too far and walk past the subject using this modification.

Some digital beacons actually give a distance reading for how far you are from the subject and/or lights that direct you which way you should turn to find the best signal.

The distance shown is not the actual distance but rather the distance along the "flux line".

Avalanche

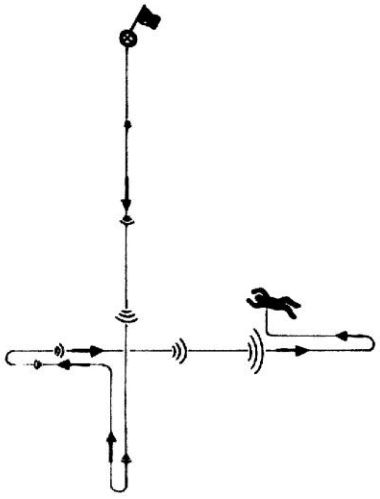
Grid Pattern Method

The grid method of transceiver search has now largely been replaced by the induction method discussed above.

Grid searching is usually slower and requires the searcher to cover more terrain before being able to pinpoint the final location.

The procedure used in the grid method is still useful when it comes to the pinpoint part of the search.

When you have homed in to the general site of burial and the volume control is turned down to the lowest possible setting, but a signal is still audible, do a grid search



Pinpoint and Recovery

Once a searcher is using the lowest receive setting on his / her transceiver, the most experienced searcher who is readily available should quickly pinpoint its location.

Less experienced searchers should assist or continue the search for other victims.

Some points to keep in mind when pinpointing

- Particularly if using transceivers with loudspeakers, only one person should home in and pinpoint the signal.
- When homing in on the victim's location, move as quickly as possible and turn the volume of your transceiver down whenever possible.
- When pinpointing the final location, use a logical pattern (e.g. grid method) and slow down so as not to miss the strongest point.
- Mark the area where the signal is strongest.
- Probe the marked area using a logical pattern.
- When the victim is hit with the probe, DO NOT REMOVE THE PROBE.
- Notify the rescue leader of the hit.
- Note the approximate depth of the victim.
- Begin rescue digging.

Avalanche

Secondary Search Procedures

If a transceiver search is unsuccessful, secondary procedures must be used:

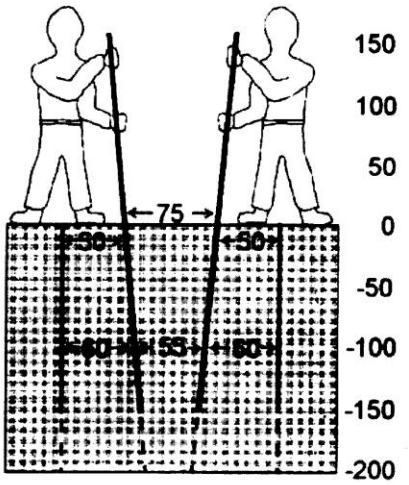
- Continue with initial search procedures.
- Probe around likely burial areas (for example, around trees, around rocks, on benches, in gullies, in deep deposits) in the victim's known or suspected line of travel.
- If probing around found items or in likely areas of burial is unsuccessful, an organized probe line may be useful if there are enough searchers to set one up. (A probe line needs at least 6 searchers to be efficient. If there are not enough searchers, continue with probing of likely areas.)
- Probe likely areas of burial.
- Mark probed areas.
- Consider going for help:
    - Safety of those going out
    - How many will be left to continue searching
    - Time before rescues arrive
    - Survival chances of victim in that time
- If going for help, write an 'Incident Report'
- Continue searching, but make provisions for feeding, sheltering, and safety of searchers is an extended search is anticipated.

Probing

Probing - The "Three Hole per Step" Technique

If a transceiver search is unsuccessful, a probe line can be set up. Recent Research (Auger and Jamieson, 1997) indicates that the three hole per step technique illustrated is the most efficient means of probing and can be effective even with relatively small numbers of probers.
To set up the probe line

- Establish the most likely area of burial.
- Line up searchers in a straight line, spaced approximately 1.5 metres apart (wrist to wrist).
- Searchers probe three times, once front of the sternum, then reaching and right about 50 cm on either of the middle hole.
- Searchers take one step forward (~70cm) and repeat the process.



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Probing - The Fine Probe (25cm x 25cm)

Once again, as noted above, the 3 hole per step technique has distinct advantages, particularly where a small group of rescuers must search a large area.

When a protracted time has passed without success (many hours or even days) and the rescue team leader feels the hope of finding a buried avalanche victim alive has diminished to near zero, an alternative probing technique may sometimes be employed.

The "fine probe" technique has a higher probability of detection (near 100%) than the coarse probe technique.

Due to the fact that it uses a much closer spacing, the amount of time and manpower required to search a giver area is greater and can take as much as five times as long to probe a given area given the same manpower.

In terms of hopes of live recovery, current search theory dictates that it is likely better in most cases to use the 3 hole per step or coarse probe techniques and cover a given area twice or even three times rather than resort to fine probing during the early stages of a rescue attempt.

Diagrams and text from the Canadian Avalanche Association web site.

Digging Out & Providing 1st Aid For An Avalanche Victim

- Digging for a victim is tiring and often takes longer than the search, so it is important to be as efficient as possible. Here are some tips that make the recovery process easier and faster.
- If the victim is deeply buried, begin digging well away from the probe. As a rule of thumb, the hole required to expose the victim will be at least the square of the depth (that is, if a victim is buried 2 metres deep, the hole required will be at least 2m by 2m).
- Dig on the downhill side of the probe and throw snow downhill.
- Too many people get in each others way and hamper efficient digging.
- Diggers should be rotated often (every few minutes if possible). As soon as one begins to tire or slow down someone fresh should take over.
- Deep holes may require tiers with diggers on each tier moving snow from the bottom to the surface.
- **When the victim is found**
    - Uncover the head and chest as fast as possible
    - Clear the mouth and airway
    - If the victim is not breathing, start artificial respiration
    - If blood circulation has stopped start Cardiopulmonary Resuscitation (CPR)
    - Continue the CPR until a doctor arrives (no breaks, it must be continuous)
    - Do as much as you can of the above prior to the victim being fully dug out
    - Attend to their other 1st Aid needs as well if possible
    - Prevent further cooling
    - Move to a safer location if required (further avalanche or rock fall hazard)
    - Watch and take care of the victim very carefully

Leading a Group Off Piste

Going off piste with a group of skiers that you are responsible for is quite an undertaking. There are many more hazards than you are exposed to on piste.

Hazards

- Getting lost
- Falling over cliffs
- Breaking through the snow and falling into water
- Colliding into rocks and trees
- Setting off an avalanche that sweeps others down the mountain
- Being caught in an avalanche
- Snow that is very difficult to ski
- No help immediately available
- No shelter for your group whilst they wait for help

Experience Required

- Good navigator in difficult conditions
- Have a good understanding of snow and how it changes
- Understand the effects of weather
- Able to deal with emergencies
- Leadership skills

You need to be constantly **observing**, watching for changes and seeking new information such as

- Where have avalanches occurred
- Where is the good snow for skiing
- Where is the bad snow to avoid
- Is the weather changing
- How are your skiers coping with the snow
- Are members of the group getting tired
- Are people enjoying the runs
- Is the condition of the snow changing
- What is above, could rock, ice or snow fall on top of your group
- Who is below you, are your movements a risk to them
- Where are the terrain traps

Keeping control of the group is vitally important so people don't get lost, expose themselves or others to more danger and so that the rare commodity of untracked snow is not trashed.

Control of the group

- Descend by a series of pitches, stopping to regroup and appraise the route in front
- Brief the group about the plan
- Ski one at a time so only one person is exposed to a serious hazard at a time
    - The next skier does not start until the skier in front is in a safe and protected area
- Ski with an agreed spacing between skiers to minimise the risk where there is a small risk
    - Emphasise the spacing must be maintained
- Describe a corridor that everyone must ski within
    - Between 2 sets of tracks
    - Between 1 set of tracks and a natural feature such as a forest edge
    - Only in the corridor made by the leaders track
- Dictate the speed
    - No overtaking
    - Keep the spacing

Mountain Awareness

To travel safely, with the most enjoyment, you need to be aware of the environment that you are operating in.

Safety, enjoyment and learning are often referred to within the field off instructing, coaching and guiding.

Safety

- Seeing
  - The weather change
  - Avalanches old and new
  - Changes in the snow pack
- Understanding what you see
  - It's going to get stormy
  - I am on a similar aspect of slope
  - These roller balls often happen before single point avalanches
- Acting upon what you see
  - We'll finish early
  - Lets go onto a different aspect
  - If we go higher onto a northerly aspect it will be colder

Enjoyment

- Knowing what surrounds you
  - Locating the best snow
  - Getting the best view
  - Being in an environment surrounded by familiar things
- Knowing how it works
  - This will only be good in the morning
  - It will cloud over as the day warms up, so enjoy the view whilst you can
  - This is here because

Learning

- Being able to answer the questions of your clients
  - Every day we see these birds, what are they called
  - Why is the snow better here
  - I saw these animal tracks yesterday, what animal would be up here
  - Why do we not ski over there
  - This rock is really sharp, what is it
  - What happens here in the summer time
  - These trees are well spaced, what sort are they
  - Why are we going down
  - There is a beautiful purple flower over here, what is it

Do you just take the thrill of skiing from the mountain? Is it just a place to take from?
What do you give the mountain, noise, food scraps, litter and disturbance?

Or

Do you acknowledge that the mountains are a home for many animals, birds and plants.
That the mountains are a valuable water, mineral and scenic resource.
And you are just one of many visitors that come for many different reasons to the mountains.

How can you protect and respect what is vital for others if you are not aware of what is there and how your actions impact upon the fragile balance in the mountains?

Skinning

Information about travelling uphill is included here as on this course the art of skinning is introduced, so that you can use it as a means of travel for your own personal experiences and in preparation for attending the European Mountain Safety module.

Travelling uphill brings new challenges, not least having equipment that works

Equipment

- Ski mountaineering bindings
- Skins
  - Fixed only at the tip of the ski, or
  - Fixed at the tip and tail of the ski
  - Shaped or parallel sided
  - As wide as the narrowest part of the ski
  - Sticky enough so they are difficult to separate in a warm room
- Ski crampons, also known as Harscheissen

Technique

- Drag / slide the ski over the snow, do not walk and lift the ski
- Get some glide where possible
- On steeper ground
  - Set the skin, by pulling slightly back on the ski just before you stand on it
  - Stand tall, do not lean forward
- Keep the ski as flat as possible to get maximum grip
- Kick turns
  - Uphill
  - Downhill (several different ways)

Line

- Try to even out the changes in angle of the slope
- Avoid kick turns, go for
  - Longer curving turns
  - Step turns
- If you have to do kick turns
  - Make a turning platform
  - Bash down the snow on the uphill side of the turning spot
  - Avoid doing them above cliffs and steep drops
  - Avoid doing them just below a sharp steepening above the turning spot
  - Avoid doing them under a hazard from above
- Keep away from avalanche prone slopes
- Keep to snow that is deep to avoid rocks cutting the skins

Pace

- Make it sustainable
- Move at a speed that avoids getting excessively sweaty
- Spread people out so they do not bunch up and loose rhythm at kick turns
- Step out of the trail to let others pass