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Accidents in the Mountains

Section 1 Types of Accidents and their Characteristics

1. Types of Accidents

Two basic types of accidents occur in the mountains—those due to sudden unpredictable weather changes, and those attributable to human error. Sometimes the cause of an accident is a mixture of both of these factors.

Depending on the mountain, rescue activities sometimes require basic or even highly advanced mountain climbing expertise. On particularly inaccessible cliffs or in other highly difficult locations, even a trained rescue worker must have the appropriate mountain climbing skills and experience.

In this chapter we shall limit our discussion to rescue techniques in mountains suitable for hiking.

Any number of problems may be involved in a mountain accident. The injured person might, for example, be injured, buried, acutely ill, or lost. The principle types of mountain accidents are the following.

(1) slides, slips, vertical falls, or a fallen hiker dangling from a rope;

(2) bad weather;

(3) avalanches;

(4) fatigue and illness;

(5) disorientation;

(6) lightning strikes or falling rock; or

(7) walking, flash flood

2. Characteristics of Accidents

Accidents in the mountains often involve hikers who are unable to come down from a mountain due to 1) injuries suffered in a fall on a steep incline or cliff, or 2) a sudden change in the weather. The principle characteristics of mountain accidents are the following.

(1) Mountain accidents usually occur in areas seldom frequented by people, thus it frequently takes a long time to carry out a rescue operation.

(2) There is little information available concerning the accident. It is often difficult to determine the location or condition of the person requiring rescue.

(3) After an accident is discovered, it often takes a long time often to determine exactly what has happened and decide on a course of action. Accordingly, it is often a long time before rescuers can actually enter the mountains.

(4) It takes time to reach the scene of the accident.

(5) Difficult terrain and changes in weather often prevent rescue operations from proceeding according to plan.

(6) Various special equipment may be required, such as stretchers, ropes, wire rope, winches, and even helicopters.

Section 2 Key Points Concerning Rescue Operations

1. Preparedness

Mountain rescue teams are often responsible for a very large area, so they should make an ongoing effort to study the mountains in their territory as well as the types and locations of accidents that have occurred there in the past. In particular, they should maintain close ties with fire fighters, police, forestry associations, mountain climbing groups, and other local residents who are closely familiar with the mountains.

2. Establishing and operating a field command center

(1) It is necessary to establish a field command center in order to run rescue operations efficiently. A field command center exercises overall control over rescue operations from start to finish. Its primary responsibilities include the following.

a) Gathering information

The field command center must collect the most detailed information possible to aid rescue operations. In addition to studying the intended course of the hikers and interviewing family members in order to find out how the persons requiring rescue entered the mountains and what route they planned to take, the command center must also meet with eye witnesses, and if radio contact with the injured person is possible they should use it to obtain information on the terrain at the accident site, the route by which to reach it, and the physical condition of the injured persons.

b) Ensuring successful communication

The field command center must be sure to use messengers, loudspeakers, and the like to ensure effective communication with rescue workers. The rugged terrain of mountainous regions often makes radio communications difficult. To achieve dependable radio communications, the possibility of establishing a mobile command center to act as a radio relay station should also be considered.

c) Determining a course of action

In addition to coordinating closely with the relevant authorities and other parties within the area of operations, the field command center must determine whether a helicopter is needed, judge the abilities and safety requirements of the rescue team, the time required for the rescue, decide on a route, choose the proper method of communication, etc.

d) Locating rescue workers and equipment

In view of the long time that must be devoted to a rescue operation, reserve rescue workers should be kept on call, and rescue equipment should be stored ready for use.

e) Coordinating operations with other organizations

It is necessary to carry out careful advance coordination with the police, forestry associations, mountain climbing groups, and other organizations to clarify the scope of operations, the path to the injured person, dangerous places, the weather forecast, etc.

f) Food and shelter for rescue workers

Winter rescue operations are hampered by cold temperatures, and each rescue worker must be equipped properly to keep warm. In addition, when a rescue operation is expected to last a long time they must also carry drinking water, canned food, biscuits, and the like.

(2) Duties of the field commander

As the leader the field command center, the field commander must:

a) accurately assess the accident;

b) analyze, discuss, and investigate available information, and transmit it to the rescue team(s);

c) determine an overall course of action, including search methods and search area;

d) inform the rescue team(s) of the course of action that has been selected;

e) keep informed about the activities of all rescue teams, including helicopters;

f) dispatch support teams as necessary;

g) decide when to finish the rescue operation;

h) handle statements to the news media;

i) coordinate operations with other organizations;

j) establish a system for communicating with the family of the injured person and other concerned parties.

3. Key points concerning a rescue operation

(1) Duties of the rescue team leader

The rescue team leader must:

a) inform the rescue workers of the course of action that has been selected;

b) keep the field commander informed of the progress of operations;

c) keep a close watch on the physical condition and energy level of rescue workers;

d) be aware of what equipment and food the rescue workers have;

e) maintain contact with other rescue teams and decide whether it is necessary to call in support;

f) ensure the safety of both rescue workers and the injured person;

g) determine how the injured person is to be rescued;

h) take action to deal with injuries to rescue workers, sudden changes in weather, etc.

(2) Precautions to observe at the assembly site and on the way to it

The rescue team must transport the equipment which the field commander has called for, and must find an appropriate site to assemble. On the way to the assembly site, the rescue team must use radio communications to remain abreast of the latest breaking information and keep track of the movements of other rescue teams.

(3) Gathering of information at the assembly site

The rescue workers must obtain the following information from eye witnesses, persons who reported the accident, family members, and other persons connected with the accident.

a) What happened? What is the terrain like at the accident site? How far is it to the accident site? How long will it take to get there?

b) How many injured persons are there? What is their condition? (Can they walk? How badly are they hurt? etc.)

c) Will it be necessary to form a search party?

d) Can anyone lead the rescue team to the accident site?

e) What are other organizations doing?

(4) Reporting to the field commander, calling in more equipment

In order to relay to the field commander the information obtained from persons connected with the accident, the rescue team leader must keep the rescue workers informed of the course of action that has been determined by the field commander. The rescue team leader must call in any extra equipment and food that may be necessary.

(5) Key points concerning the route to the accident site and search methods

a) Route to the accident site

(i) The weather and local terrain must be considered when selecting the route to the accident site.

(ii) Sufficient rest must be allowed to prevent fatigue, and the rescue team should be allowed to maintain an even pace from start to finish.

(iii) The water level can rise suddenly in valleys and marshes during snowmelt and after a rain. If a rescue team must enter such areas, it must pay close attention to weather conditions prior to and during rescue operations.

(iv) When it is necessary to cross a river, avoid narrow sections with a fast current. A washed out bridge is a telltale sign of a dangerously strong current.

(v) When a rescue team operating at night enters an area shrouded in fog, there is a high risk of wandering in circles. Upon encountering thick fog, it is advisable to take a short rest and check maps and compasses to be sure you are proceeding in the right direction.

(vi) The danger of falling rock is high at the base of cliffs and steep inclines. Take care when walking in such areas not to dislodge loose rocks.

(vi) Stay in close contact with the field command center, be aware of the operations of other rescue teams and organizations, and pay close attention to changing weather and other risk factors.

b) Precautions to observe during an extended rescue operation

A rescue operation in especially difficult when the injured person's location is unknown. The following precautions must be observed when searching for the injured person.

(i) If it is possible to narrow down the search area

- When the route that the injured person was planning to take is known, the rescue team should split into two search parties, one of which proceeds from the hiker's point of departure and the other from where the hike was intended to end. If a likely alternative escape route exists, a search team should also be assigned to it.
- When there is no snow cover, rescuers should not overlook the possibility that the hiker may have followed rock-strewn stream beds, the course of previous landslides, escarpments, or animal paths to get down from the mountain.
- When there is snow cover, the rescue team should use a guide or consult with local residents familiar with the area to find out where avalanches are most likely to occur and areas (such as marshes) where a hiker is likely to wander in circles.

(ii) If it is not possible to narrow down the search area

When it is not possible to narrow down the search area, another alternative is to study the record of previous accidents in the local area and identify the locations where an accident is most likely to occur. Search parties can then begin with these sites and expand the search from there.

(iii) When search operations are expected to take a long time, rescuers must take care not to expend all their energy on the search. An overall plan must be devised which will allow rescuers to always keep about one-third of their energy in reserve.

(6) Determining a route for transporting the injured person out of the mountains

a) The safest and surest path down from the mountains must be selected while taking into account the severity of the injured person's injury, the fatigue of rescue workers, and the need for paramedics.

b) The route that will be the least tiring for rescue workers should be selected even if it is not the shortest one possible. Such factors as the width of the path, degree of incline, and surface conditions on the path play a particularly important part in this decision.

c) In estimating the safety of different routes out of the mountains, rescue workers must also take into account such factors as weather, the time of day, and the conditions that have been encountered on the way to the accident site.

d) Once the route down from the mountains has been determined, rescuers must contact the field command center so that they can be met by paramedics.

(7) Use of stretchers

a) Types of stretchers and how to make them

(i) Rescue stretcher (see Figure 1)

(ii) Basket stretcher (snowboard) (see figure 2)

(iii) Makeshift stretcher—prepared using plastic sheets (see Figure 3)

(iv) Makeshift stretcher—prepared using tree branches (see Figure 4)

Fig.1 Rescue stretcher—securing the injured person

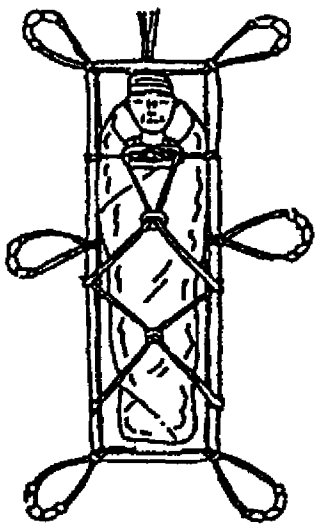
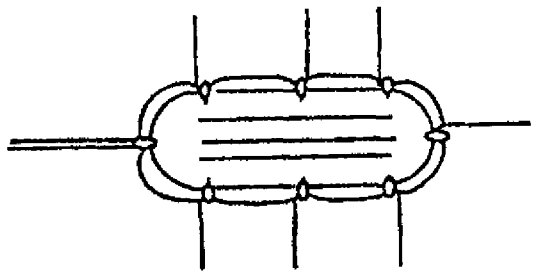
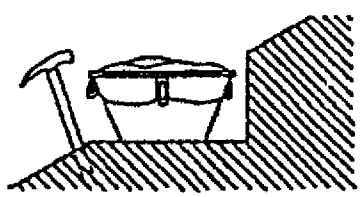


Fig.2 Basket stretcher (snowboard)



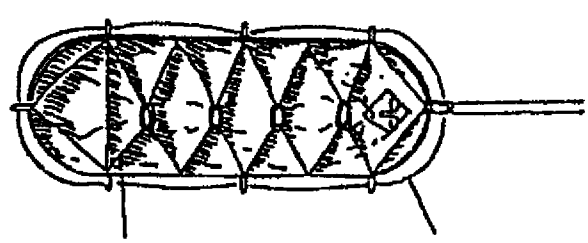
View from underside

- Comment
  Most appropriate for transporting injured persons over snowy terrain.
- Securing the injured person
  When a person lies injured on a sloping surface, before attempting to place the person in the stretcher, first cut a terrace into the snow in order to work on a level surface.



Note: Make the terrace by cutting into the slope from the downhill side. Two or three cuts with an ice axe will be sufficient.

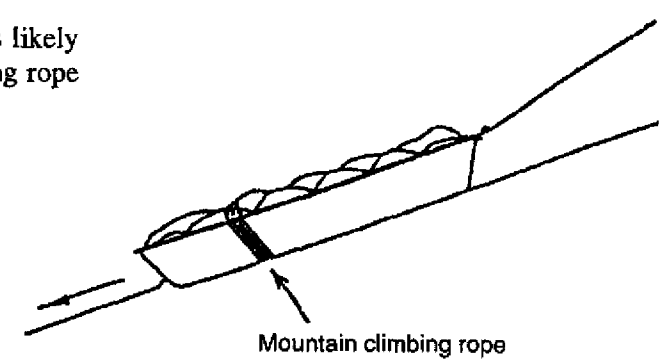
- Securing the injured person and stretcher
  Tie both the injured person and the control rope to the snowboard. Tie the injured person down at many different points, and make sure that the injured person is securely tied to the control rope.



Rope for securing injured person

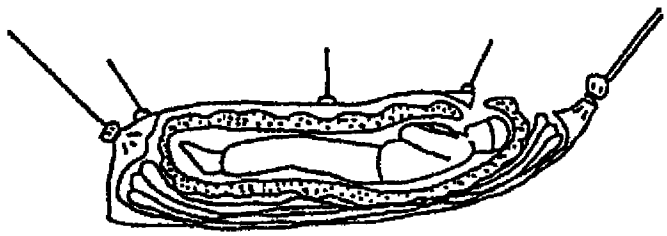
Control rope

- Braking the snowboard
  On steep slopes where the snowboard is likely to travel too fast, tie a mountain climbing rope around the snowboard to slow it down.



Mountain climbing rope

Fig.3 Using plastic sheets to create a makeshift stretcher



- Comment
  This is a useful way to make extra stretchers when there are multiple injured persons on snowy terrain.
- Securing the stretcher and injured person
  When it is necessary to transport the injured person as quickly as possible (to a safe location, to find shelter from bad weather, etc.), use a plastic sheet to make a stretcher, then secure the injured person in the stretcher.

- Making the stretcher

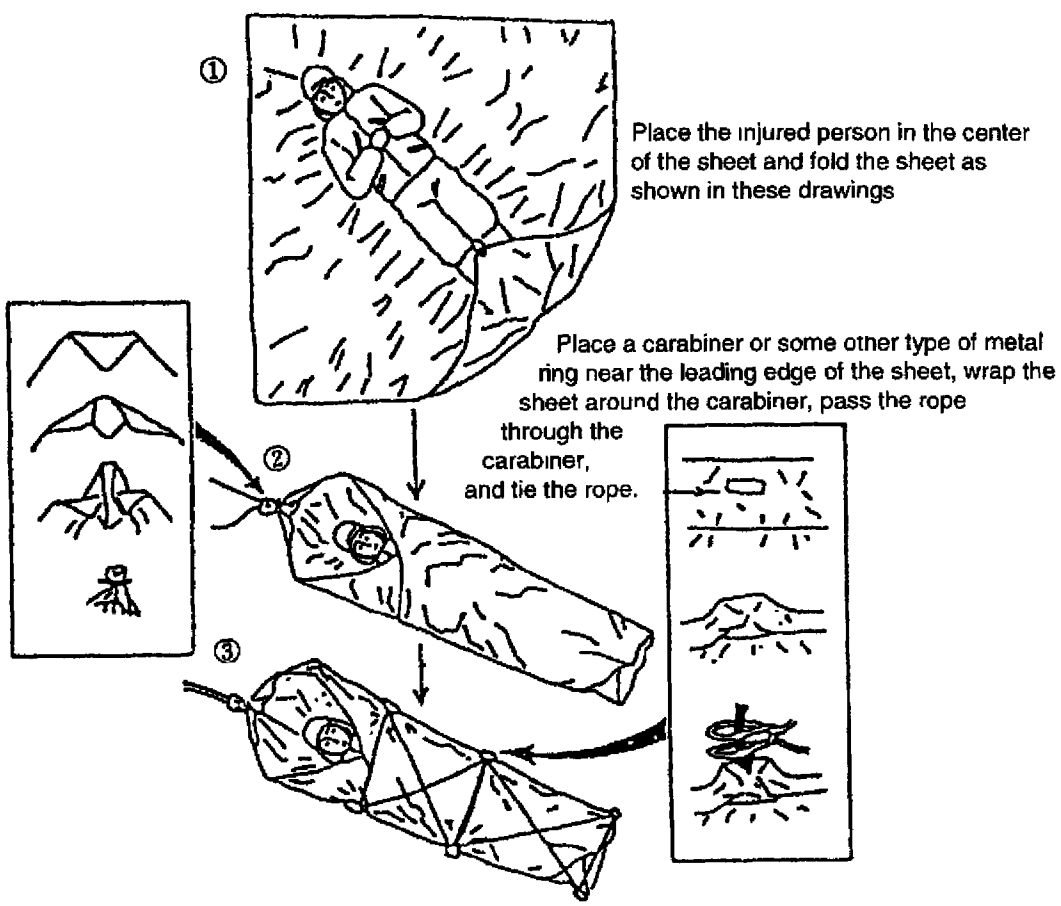
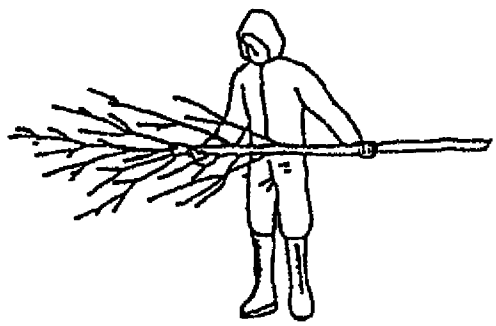
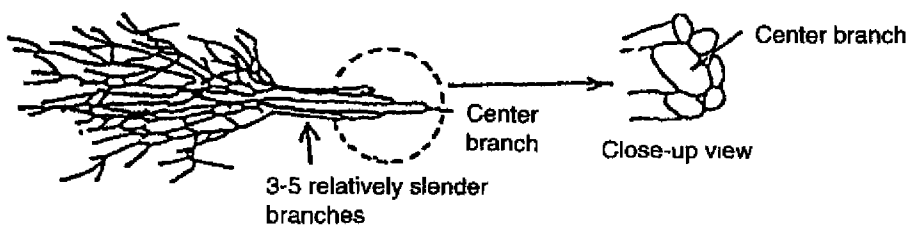


Fig.4 Using tree branches to make a stretcher

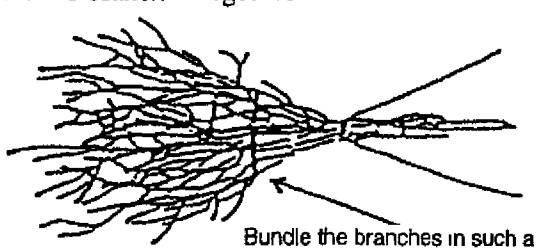
- Comment
  This method can be used as a last resort when the rescuer has no stretcher on hand (or cannot wait for one to be delivered).
- Securing the stretcher and injured person
  Bundle several slender tree branches together and place the injured person (wrapped in a blanket or plastic sheet) on the branches.
- Making the stretcher
  ① Gather several slender tree branches of 2.5 to 3 meters in length. (The branches should have a lot of twigs on the end.)



② Put the thickest branch in the center and surround it with the more slender ones.

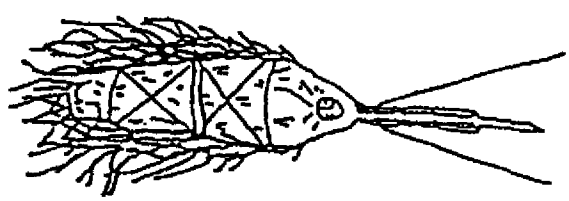


③ Bundle the branches together



Bundle the branches in such a manner that the twiggy ends are intertwined amongst each other. The rope used to tie the branches together should be placed in a location where the injured person's body will not rest directly upon it.

④ Completed stretcher with injured person ready to transport



Note: Unless it is necessary in order to save a life, live branches must not be cut down from trees to make this kind of stretcher.

b) Key points concerning the use of a stretcher

The following key points must be kept in mind when using a stretcher to transport an injured person.

(i) In principle, there should be at least ten rescue workers for the transport of one injured person.

(ii) The stretcher should be suspended whenever possible from a shoulder sling rather than carried by hand in order to reduce arm fatigue.

(iii) If rescue workers rotate stretcher carrying duties, an entire carrying team should be rotated simultaneously at intervals of approximately 15 to 30 minutes. The rotation should be carried out at a level spot with plenty of room for maneuver. Some carrying positions are more stressful than others, and this fact must be taken into account in deciding where to position each member.

(iv) On steep slopes, a control rope should be used to prevent the stretcher and/or rescue members from falling. With one end of the control rope tied to the rear of the stretcher, two rescue workers should take turns feeding out the control rope from above as the stretcher is carried down the slope. These two rescue workers should use a tree or other firm object to anchor their position.

(v) Closely monitor the injured person's condition at all times for any signs of change.

(vi) In principle, the injured person's head should always be kept on the more elevated end of the stretcher.

Section 3 Safety Precautions

Mountain accidents often occur in a dangerous setting and necessitate extended rescue operations. In order to prevent rescue workers themselves from falling, becoming lost, or having some other accident, the following safety precautions must be observed.

1. Safety precautions upon entering the mountains

(1) Long-distance travel on foot must be carried out at a steady pace. All team members must be aware of whether those following behind are keeping up with the team.

(2) It is easy to lose one's balance while walking on ridges and over snow. Rescue workers should train regularly on this type of terrain.

(3) During snowmelt, the water level of marshes can rise quickly. Marshes should be avoided whenever possible.

(4) When crossing rivers, use stepping stones if possible. If not, make an effort to cross at a 90-degree angle to the current.

2. Safety measures during rescue operations

(1) There are not many solid objects in the mountains to which a rope can be tied. Make the best possible use of what is available, and be sure that what you use will not come loose.

(2) Footing is especially precarious on cliffs and steep slopes. Be sure to test the ground before each step.

(3) The ground tends to be wet and slippery near marshes and waterfalls. To avoids slips and falls, be sure the entire sole of your foot is in contact with the ground before taking each step.

3. Safety precautions upon leaving the mountains

(1) When transporting an injured person, choose the widest and most gently sloping path possible. Rescue workers should take turns carrying the stretcher, with an entire team of carriers rotating simultaneously. Be careful not to let any member of the rescue team fall behind the group.

(2) Continually monitor the injured person's condition, and maintain constant contact with the field command center in order to be prepared should the injured person's condition begin to deteriorate rapidly. If necessary, have doctors waiting at the rescue team's destination.

(3) In descending the mountain, beware of the danger of falling rock.