EXPLORER SEARCH & RESCUE

TEAM MEMBER and TEAM LEADER TRAINING MANUAL

1976

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A most sincere thanks is due to the thousands of ESAR members who, over the last 20 years, have worked hard to accumulate the experience reported herein. It is the efforts of these young people that has made ESAR the viable, effective, and satisfying program that it now is. JW

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EXPLORER SEARCH AND RESCUE

TEAM MEMBER AND TEAM LEADER TRAINING MANUAL

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1976

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SEARCHING TECHNIQUES

INTRODUCTION

Though specific search plans will vary with the circumstances, a general strategy has evolved which can be applied to most wilderness search situations. It revolves around the following five modes: (2)

Search Tactics

1. **Preliminary Mode:** Gathering of preliminary information, request to and arrival of search teams, formation of initial search plan, etc.
2. **Confinement Mode:** Establishing a perimeter to confine the lost person within the search area.
3. **Detection Mode:** Informal checks and sweep searches calculated to find the lost person or clues he may have left behind.
4. **Tracking Mode:** Following tracks or other clues left by the lost person.
5. **Evacuation Mode:** Providing care for the subject and evacuating him by litter if necessary.

Of these five modes, ESAR team members will usually be most involved in Confinement, Detection and Evacuation.

In the Preliminary mode, the ESAR OL will assume the job of working with the responsible agency (usually sheriff) and representatives of other search and rescue groups to formulate a search plan. The team member is usually not involved in this.

Thus far, ESAR teams have usually not been involved in tracking. Tracking generally takes two forms: (1) Tracking by use of trained dogs, and (2) Human tracking. Tracking dogs attempt to follow the path of the lost person by detecting and following his scent: a scent article (e.g. clothing the subject has worn) is required so that the dog knows what scent to follow. Human tracking is a step-by-step process of following the signs left by the subject as he walks. This generally requires considerable skill. There has been a lot of interest in human tracking recently. The U.S. Border Patrol has a number of expert trackers and has been running up an impressive record in looking for lost persons. At this writing, however, this experience has been mostly confined to the Southwestern States. We should see the development of human tracking in other areas of the country over the next several years.

CONFINEMENT

Objective:

The idea behind confinement is simple. Trap the lost person inside of a known area until:

1. The area can be searched, or
2. He walks out of the area and (in the process) is picked up by search teams.

When used:

In the very early stages of a search operation.

In practice, confinement may not be easy to achieve but, in the long run, it will be worth a reasonable effort. The usual inclination is to immediately send teams to the most probable search areas; however, if the OL guesses the wrong area or the teams are too late, the subject has had additional time to wander further. Consequently, the potential search area has increased in size. An early effort to achieve confinement is a hedge against a potentially massive search effort that would be necessary if the search area becomes too large.

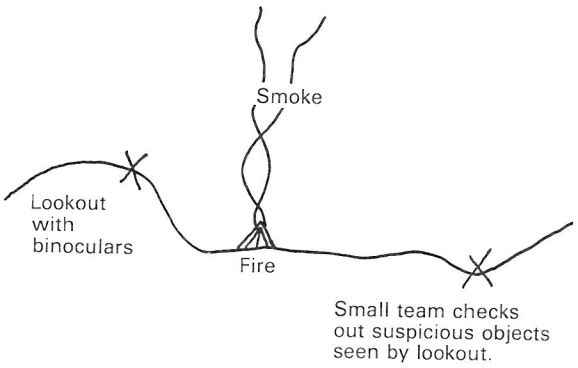
Methods:

TRAIL BLOCKS - Small teams are sent to block trails that lead away from the search area. They record the names of all persons who leave the search area and notify those entering the area about the lost person. At least 1 person must remain awake at all times and assume a position such that no one could pass by undetected. The trail block is to be manned continually until directed otherwise.

ROAD BLOCKS - Road blocks are similar to trail blocks. Often adult volunteers or jeep groups might assume this function so as to relieve search teams for off-road duties. If the search area is to be closed to non-search persons (e.g. trackers are working within the area and additional people would cause confusion,) a law officer will generally be stationed at the road block.

LOOKOUTS - Often there are places around the perimeter of a search area which afford a good view into adjacent valleys, drainages, etc. Other places may work as natural funnels causing a lost person to come a certain way. A small team, located at such a position, can survey the surrounding country with binoculars and possibly detect the lost person if he wanders by. Several kinds of devices (smoke from a fire, noise makers, lanterns) can be used to attract the lost person. Another variation is to man the lookout while another small team checks out various locations and suspicious objects within the lookout's field of view. All of these methods are calculated to keep the lost person from leaving the search area undetected.

MANNED LOOKOUT

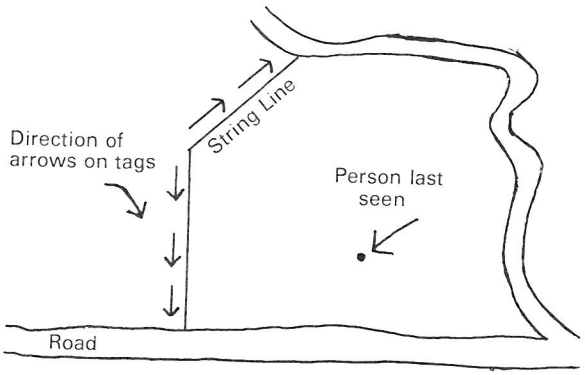


CAMP-IN - A camp-in may be a lookout, trail block, radio relay, or any other situation where a small team continually mans a certain location. It might be located in a position of good visibility, at the junction of two trails, where several drainages converge, etc. Devices to attract the lost person to the camp may be employed. Emphasis is upon a small self-sufficient team manning a known location and surveying the adjacent countryside until directed otherwise.

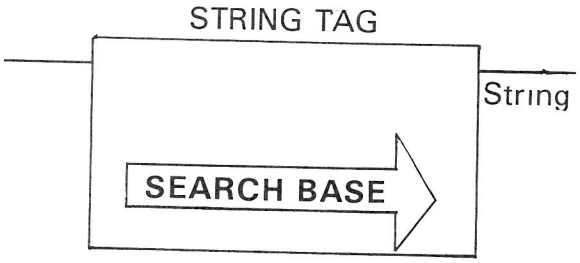
TRACK TRAPS - a track trap is a form of an unmanned camp-in which may be useful sometimes. It essentially consists of locating areas where a lost person is likely to wander, raking the dirt flat, and then re-checking the area periodically for tracks.

STRING LINES - Lookouts, camp-ins, etc. are especially effective in the more open areas where visibility is good. In the densely wooded or brushy areas, tagged string lines can accomplish a similar purpose.

STRING LINES USED FOR CONFINEMENT



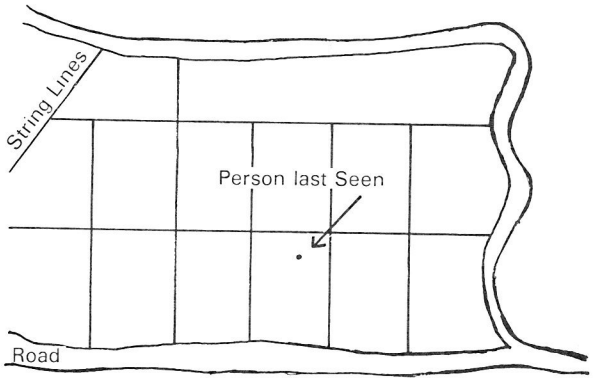
Tags on the string line attract the attention of the lost person and direct him to follow the string out to safety.



After initial confinement, additional string lines can be used to sub-divide the area.

String lines can be used for confinement and to mark search sectors

FURTHER DIVISION OF THE SEARCH AREA

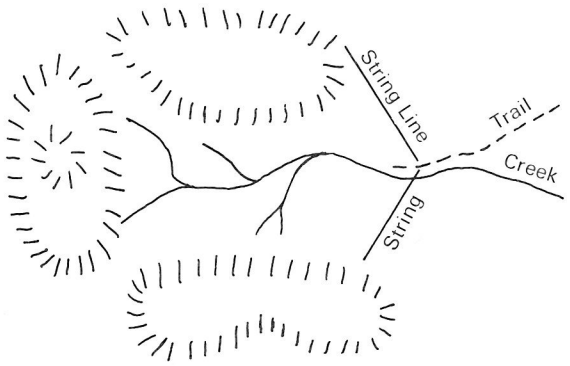


This sub-division does two desirable things:

1. Decreases the time it will take the lost person to wander into a string line.
2. It effectively segments the search area into manageable sectors to be searched by teams.

Another application, similar to a camp-in, is to place string lines within the search area so as to lead the lost person to a trail, manned camp site, or some other useful place.

STRING PLACED TO ATTRACT A LOST PERSON TO A TRAIL



String tags with arrows tell the lost person which way to walk out.

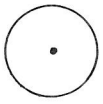
The Importance Of A Fast Response

The need for a fast reaction to lost child searches or a search for a person with medical difficulties has long been accepted. It has been only more recently, however, that the concept of fast response has been applied to the whole cross section of lost person situations. It used to be felt that the lost hunter or hiker would frequently find his own way out if given a day or so. This is often true. However, for those who don't walk out, the search effort becomes almost impossible because of the enormous size of the potential search area. From the stand point of the lost person, it is preferable to start the search soon. Although this increases the number of false starts, it is the only way to keep the potential search area small. The smaller the area, the easier it will be to confine and search.

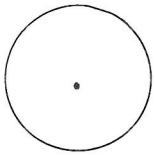
The relationship of distance traveled from the point last seen to the potential search area size is shown below.

POTENTIAL SEARCH AREA AS A FUNCTION OF DISTANCE TRAVELED BY THE LOST PERSON

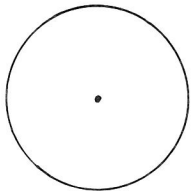
Distance Traveled: 1 mi
Search Area: 3.1 sq. mi.



Distance Traveled: 2 mi.
Search Area: 12.6 sq. mi.



Distance Traveled: 3 mi.
Search Area: 28.3 sq. mi.



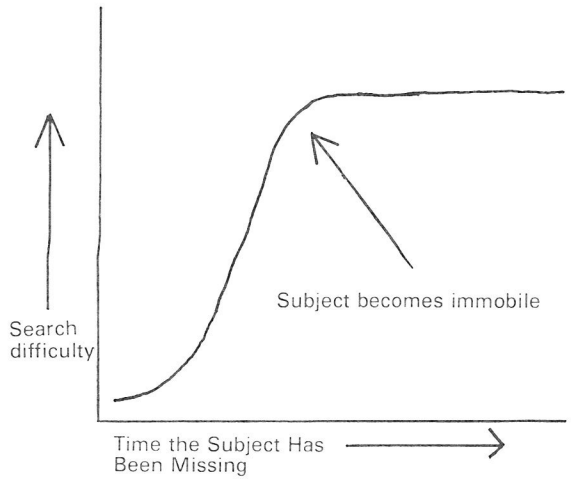
Distance Traveled: 4 mi.
Search Area: 50.3 sq. mi.

If the lost person has had time to travel 10 miles, the search area could be 314 sq. mi. Considering that it may require 50 searchers a whole day to search 1 sq. mi. (in some areas it could require 300), there is virtually no way that large areas can be searched. The area must be kept small: fast response is the only practical way to do this.

Since search area size relates directly to search difficulty, the following graph illustrates the correspondence between search difficulty and the amount of time the subject has been missing.

SEARCH DIFFICULTY AS A FUNCTION OF TIME

Reproduced with permission from Dennis Kelley (4)



Search difficulty increases rapidly until the subject becomes immobile. After that, difficulty increases somewhat and then levels out. As the subject stops he may still be able to shout or otherwise respond to searcher efforts. As he becomes unconscious and dies he is the hardest to find but does not become any more difficult.

Confinement and Detection will be much easier if the potential search area is small: rapid response to search situations is critical.

DETECTION

Introduction

Detection is a deliberate attempt to find the lost person or to find clues left by the lost person. It is here that ESAR manpower is most used.

Methods of detection have been divided into 3 categories:

Type I Search -
Quick informal check of the most likely areas (also called reconnaissance or hasty searching).

Type II Search -
The criteria is efficiency: a fast systematic check of large areas using sweep methods which produce the highest results per man-hour of effort (also called open grids).

Type III Search -
The criteria is thoroughness: a slower highly systematic search of smaller areas using thorough sweep methods (also called close grids).

This naming system, used by ESAR for some years, was adopted because it generally corresponds to the stages of a developing search operation: Type I usually preceeds Type II, Type II comes before Type III.

Type I Methods

Objectives:

1. A quick check of specific high probability areas.
2. Obtain information about the search area.

When used:

1. In the early stages of a search.
2. Anytime to check on unconfirmed sightings or to re-check high-probability sites.

Methods:

Small highly mobile teams check out:

a. Roads
b. Trails
c. Drainages
d. Ridge areas
e. Buildings
f. Hazards
g. Others

A Type I search is a quick informal check of high probability areas. Checking out a drainage is an example.

The team size may vary from 3 (minimum for safety) to 6 persons. The team members may occasionally spread out (as when running a wide ridge) but usually not. It is wise to stop at intervals, look over the area, call out to the lost person and wait for a reply. The team leader must keep the OL informed of the team's progress, clues found, and unmapped roads, trails, buildings, etc. in the area.

If the team finds a clue, base should be notified of the find and its location. If the OL instructs the team to bring the item out, a marker should be left at the location of the find. This enables other searchers or police officers to return to the location if it later becomes necessary.

MARKER LEFT AT THE SITE OF A FIND
A wool sweater was found

EXPLORER SEARCH & RESCUE

TEAM 60 DATE 6-1-75 TIME 11:20 MARKER # _____ (if any)

GRID INFORMATION: TYPE OF GRID _____

☐ LEFT END ☒ STARTED
☐ CENTER OF TEAM ☐ ENDED HERE
☐ RIGHT END

DESCRIPTION OF ITEM ☒ FOUND ☐ LEFT HERE (IF ANY):

one blue wool sweater

MARKER

Type II Search Methods

Objective:

A rapid search of large areas.

When used:

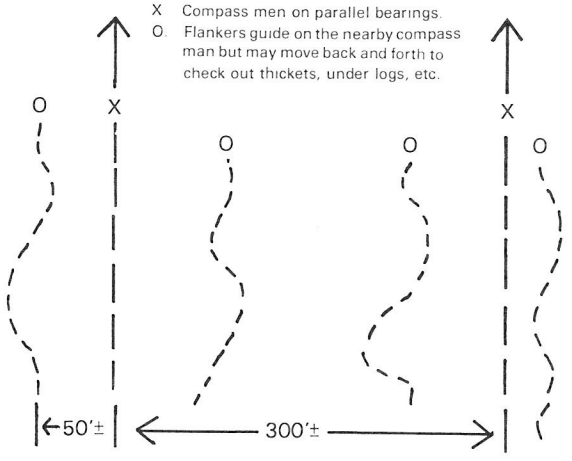
1. In the early stages of a search operation especially if the time frame for victim survival is short.
2. In those situations where the search area is large, no particularily likely areas can be identified, and there is insufficient man-power to cover it thoroughly.

Methods:

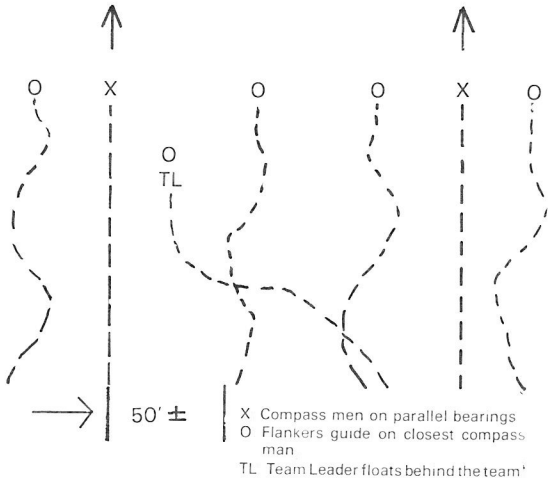
Sweep searching with large between-man spacing. Though these methods are not as thorough as ones using closer spacing, they are more efficient (will produce greater results per man-hour of search time). This will be explained in more detail a little later on. Team size may vary from 3 to 7 persons.

Very wide spacing can be accomplished by using 3-man teams on parallel compass bearings. The between-team distance can be virtually anything since the teams are capable of working independently from each other.

TYPE II METHODS
3-MAN TEAMS AT VERY WIDE SPACING



TYPE II METHODS
TWO 3-MAN TEAMS AT MODERATE SPACING



When the team size exceeds 5 persons it is usually wise to have the Team Leader float behind the team. His duties are to:

1. See that the compassmen maintain parallel bearings.
2. Trouble-shoot problems.
3. Check on finds.

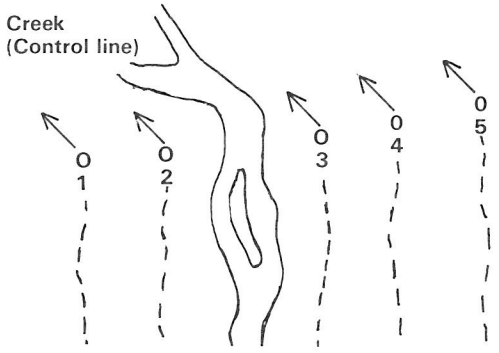
If a team member finds something or has difficulty getting through a thicket, he should call out "halt." The TL should check the reason for the halt and will give the command to move when everyone is ready. *It is a general principle of gridding that any team member can call a halt: only the TL can re-start the team.*

As with the Type I search, the team should stop periodically and call out to the lost person. This must be followed by silence so as to hear any potential reply. Caution - if you hear a reply check on the radio to see if any other teams in the area heard it or heard your team: it can be embarrasing when teams start chasing each other while thinking they are chasing the subject.

It is also important that team members look behind themselves as well as ahead or to the side. This substantially increases the chances of finding an object.

Frequently Type II methods will be used to check drainages. In heavily forested areas, creeks can be easier for the subject to walk than the surrounding brush. They then become logical routes for search teams to work.

TYPE II METHODS
5-MAN TEAM CHECKING BOTH SIDES OF A CREEK

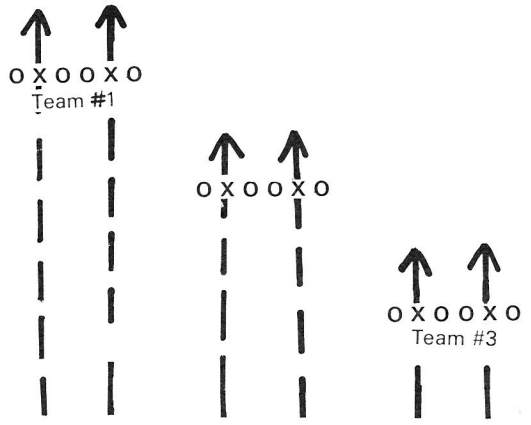


The command "guide right" or "guide left" is used to tell a team member which person (to the right or left) he should stay to the side of (guide on). In the above illustration, #2 and #3 are following a creek (control line). #1 is guiding right (guiding on the person to his right). #4 is guiding on #3 and #5 is guiding on #4 (both are guiding left).

The command "shift right" or "shift left" is used to tell the team members to move to the right or left as well as ahead. In the above illustration, #2 and #3 can see that the creek is turning to the left. However, if the brush is thick, #1 and #4 may not realize the turn is coming. By shouting "shift left," all team members will move left as well as ahead. This is often necessary when following an irregular control line such as a creek, trail or road.

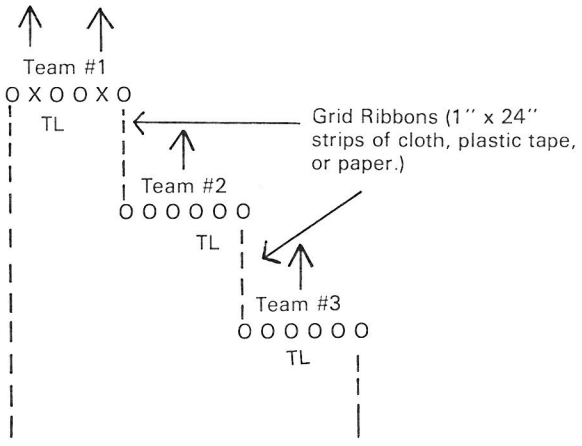
Many times several teams will be assigned to work parallel sweeps. There are two common ways of keeping the teams from overlapping each other or from leaving gaps between them. One is by use of compass, the other is by using grid ribbons.

TYPE II METHODS
3 TEAMS ON PARALLEL SWEEPS USING COMPASS FOR CONTROL



This method puts emphasis upon accurate compass work; however, if the length of each sweep is not great, it is a rapid and practical method.

TYPE II METHODS
3 TEAMS ON PARALLEL SWEEPS USING RIBBONS FOR CONTROL



By laying ribbons on limbs, brush, etc., the end man marks his path. The end man of the next team can follow these ribbons thereby leaving no gap or overlap in the sweeps of the teams. Usually the ribbons are picked up by the following team for re-use later on. The area searched is effectively marked - the area behind the teams and between the ribbon lines.

The primary difference between Type II and Type III methods is the amount of spacing between searchers.

Type III Search Methods

Objective:

A thorough search of specified areas.

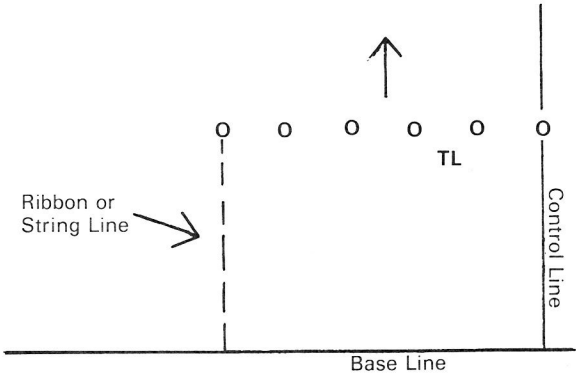
When used:

1. When Type II methods have been tried but the probability of detection was lower than desired. (Probability of Detection: the probability that the search object will be found if it is in the search area.)
2. When the search area is limited and the available manpower is large.
3. Most evidence searches.

Methods:

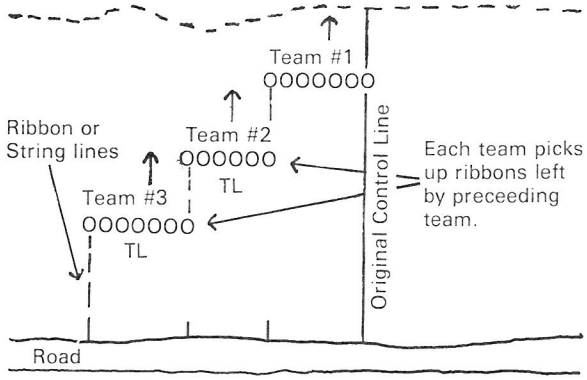
Sweep searching at close spacing. The emphasis is upon thoroughness. Team size may vary from 5 to 9 persons.

TYPE III METHODS
Close spacing increases thoroughness



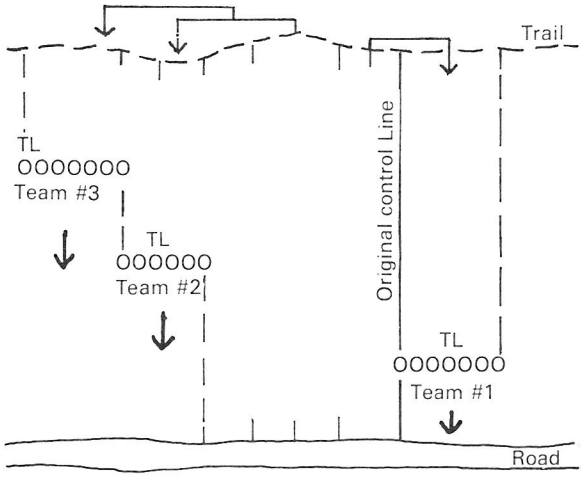
In Type III searching, ribbons or string lines are almost always used for control: it is essential to clearly mark the searched areas from unsearched areas.

TYPE III METHODS
3 TEAMS GRIDDING PARALLEL SWEEPS



In the the above illustration, each team is guiding right.

TYPE III METHODS
3 TEAMS ON RETURN SWEEPS



In the above illustration Team #1 is guiding right. Teams #2 and #3 are guiding left.

MENTAL ATTITUDE WHILE SEARCHING: It is a common error for beginners to think that by merely gridding through an area the area will automatically be covered thoroughly. Even with a very close spacing, things will be missed if the members are not consciously looking. It is very important to develop a *habit of aggressively looking around* while searching. This can be done by deliberately creating the attitude in your mind that *YOU expect to find the lost person.* Each time you approach a log, you expect to find something behind it. As you walk by a thicket, you assume there is something in the thicket to be found. This is sort of a mental game but it is an important one. It tends to make the search more interesting: it also makes it more effective. *A deliberate, conscious and aggressive attitude toward looking is an extremely valuable component of effective search work.*

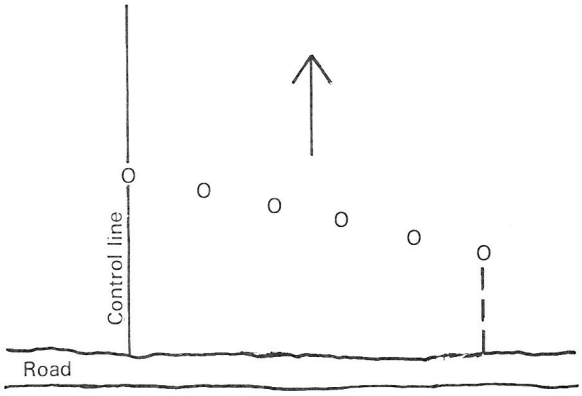
LOOKING BEHIND YOURSELF: In the research mentioned earlier, those subjects who were passed over (missed) by grid teams were asked what percent of the time they would have been found if the searchers had looked behind themselves as well as ahead. Their answers averaged 56 per cent. This is a high number. It supports the notion that viewing an area from several directions is important. *Looking behind yourself provides a very different view: it should substantially increase searching effectiveness. (10)*

Aggressive looking increases search effectiveness.

SPACING: The spacing for a Type III search should be the maximum distance that each searcher can see all of the ground between himself and the next person. Since the next person can also see the same ground from the opposite angle, a double coverage is obtained. This produces a high degree of thoroughness.

STAGGERED SPACING OF TEAM MEMBERS: One variation of gridding is to stagger the spacing of team members so that each team member is a few steps behind the person he is guiding on. The choice between a staggered spacing or an abreast spacing seems to be mostly that of preference: there has been no research to show that one method produces better results than the other.

STAGGERED SPACING OF TEAM MEMBERS
WHILE GRIDDING



TAGGING THE ENDS OF GRID SWEEPS: On larger searches it is often necessary for the team to leave a tag at the start and end of each sweep. The tag tells what team left or arrived at that location, when, and the kind of grid that was used. This enables the next team to know where the last sweep departed from. The tags can also be checked to detect problems: if two teams are supposed to be on parallel bearings 400' apart but their tags are found only 150' apart, a problem has been discovered that otherwise might be missed. Also, base personnel can check the location of the tags so as to more accurately map the team sweeps.

EXAMPLE OF TAG
Left where a team started a sweep.

EXPLORER SEARCH & RESCUE

TEAM 84 DATE 6-1-75 TIME 1420 MARKER # _____ (if any)

GRID INFORMATION: TYPE OF GRID 7 GUIDE 30

☐ LEFT END ☒ STARTED
☒ CENTER OF TEAM ☐ ENDED HERE
☐ RIGHT END

DESCRIPTION OF ITEM ☐ FOUND ☐ LEFT HERE (IF ANY).

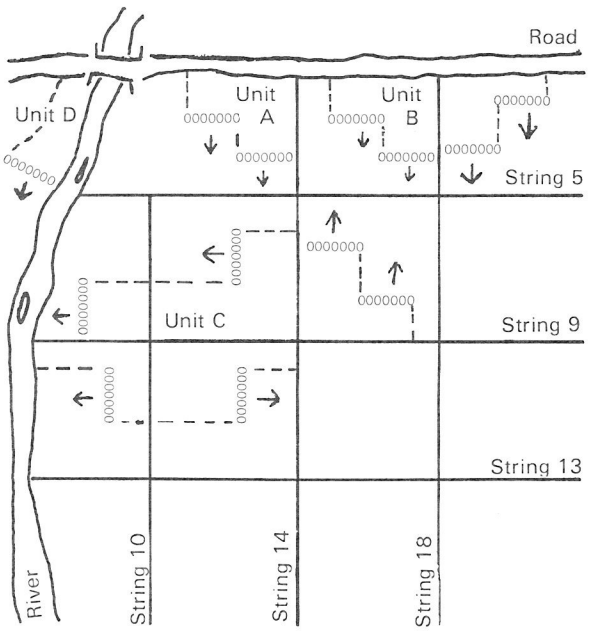
MARKER

At one time ribbons were used to mark the start and end of sweeps rather than tags. Ribbons, however, quickly became confusing. Within hours there were so many ribbons in the area that they became meaningless to use as markers. A written tag can be read and understood anytime. It doesn't really require any more time either.

RIBBONS: A good rule is to space ribbons such that from each ribbon you can see the next two. This will reduce time consuming delays created when a team has to stop and look for the next ribbon. It is also possible that the next sweep will be at night: the ribbons will be harder to find then.

LARGE SCALE SEARCHES: ESAR has become well known for the ability to coordinate large numbers of searchers from member units. The usual method of handling large search operations is to assign each ESAR unit to search one portion of the search area.

LARGE SCALE SEARCH
Each ESAR unit is assigned to a search area.



The Importance of Looking for Clues

In the pressure of a search for a lost person, it is easy to over-look clues. This demonstrates a generally recognized psychological principle: as the mind concentrates on one thing (looking for a person), it tends to exclude from consciousness an awareness of other things (footprints, candy wrapper on the ground, etc.).

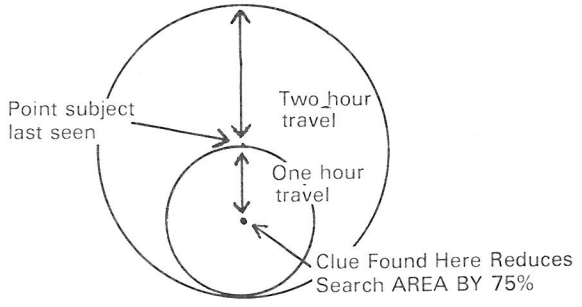
This tendency can be countered by a deliberate and conscious effort to look for clues as well as people. Earlier it was stated that the searcher must be aggressive in his looking; this applies to clues also.

There are two primary reasons for the emphasis upon looking for clues:

1. There are more clues in the area than lost persons.
2. The finding of a clue can substantially reduce the potential search area.

This second point can be illustrated in the following diagram.

CLUES REDUCE SEARCH AREA SIZE
Reproduced with permission from Dennis Kelley (4)

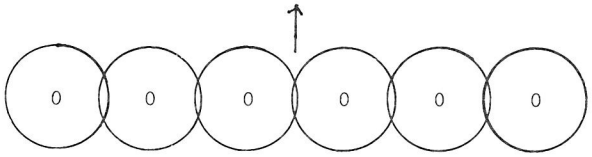


While the searcher will easily agree with the importance of looking for clues, it must be emphasized as an aspect of training. Looking for clues generally doesn't come naturally: it must be taught. Each person must develop the habit of searching for clues. In the long run it will pay off very well.

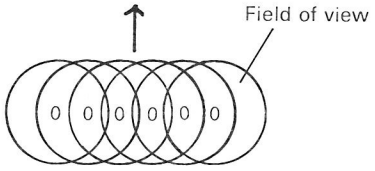
The Difference Between Efficient & Thorough Sweep Methods

It was mentioned earlier that sweep methods using wide spacing will generally produce more results per man hour of search time than methods using close spacing. The fact that the team covers a much wider path in the same amount of time more than compensates for the decrease in thoroughness. The following diagram can explain this:

EFFECTS OF SPACING ON
EFFICIENCY & THOROUGHNESS



Wider spacing results in less overlap.
Result: Decreased Thoroughness
Higher Efficiency (though Thoroughness drops some, the area covered by the team increases several times.)



Close spacing causes much overlap.
Result: High Thoroughness
Low Efficiency (the area width is small.)

Definitions: Thoroughness - % of items found in the area.

Efficiency - Proportion of items found within an area per man-hour of search effort.

The observation that wide spacing is more efficient though less thorough was confirmed by field research conducted in 1973. In that experiment, the performance of teams was measured for 20', 60', & 100' between-man spacings. The results obtained for a 50/50 mixture of conscious and unconscious subjects during the day are shown in the following chart. (10)

PROBABILITY OF DETECTION & EFFICIENCY RATINGS FOR THREE GRID SPACINGS

(Based upon:
1. 50/50 mixture of conscious and unconscious subjects
2. Western Washington thick brush and tree cover.)

Grid Method (Between-man spacings)	Probability of Detection**	Efficiency
20'	92%	.046
60'	71%	.088
100'	53%	.100

**The probability that the search object will be found if it is in the search area. (POD)

Comparing the 20' grid to the 100' spacing, the POD dropped almost by half; however, the area covered increased by a factor of 5. The net result was a significant increase in efficiency: the 100' grid will find more subjects in less time than the 20' grid.

The criteria for Type II methods is efficiency: the objective is to systematically cover large areas in a short amount of time. The criteria for Type III methods is thoroughness: the objective is to maintain a high POD. Each approach has a place in wilderness search and rescue and will be used frequently.

Experience has shown that team members are naturally reluctant to space themselves at wide intervals: there is an uncomfortable feeling that the sweep may pass over the lost person and miss him. Indeed, this may happen (and occasionally will). It must not be seen as a reflection on the team's performance. Methods of wide spacing involve taking a calculated risk. A 60' spacing will cover 3 times the ground as a 20' spacing with only a somewhat reduced POD. In cases where the lost person may not live long (needs medicine, severe weather, etc.) or where the search area exceeds the ability of available manpower to search thoroughly, methods of wide spacing are the most likely to be successful. True, it is taking a gamble but it is a well calculated gamble and will pay off more times than not.

The job of the team is to carry out the assignment handed them by the OL. If a 60' spacing is requested, then the *TL should stride it off as he lines his fellows up.* When the area has been searched, the OL will mark it off on the map in base and will assign a POD value to the area. If the area was searched to a 71% POD, he will state that. No area will be represented to have been searched more thoroughly than it really was. If time or manpower becomes available later, the area can be re-searched to raise the POD. The

important point is that *the team and OL must be in complete agreement as to what spacing is to be used. The OL will assign a POD value to the area according to the spacing.* Though the team members may feel somewhat uncomfortable with the wide spacing, it is the OL, not the team, who bears responsibility for the decision. The team's duties are to carry out the OL's decisions.

IMPORTANT NOTE: POD values for various levels of spacing will depend a lot upon such local conditions as thickness of brush, tree cover, etc. New values should be worked out by each ESAR unit to apply to the terrain within their area of operation. In doing this, a reading of previously conducted research would be helpful. (10)

Although close spacing is more thorough, wide spacing tends to be more efficient.

Multiple Sweeps of the Same Area

When Type II methods have been used with no success, the OL is faced with two choices:

1. Re-search selected areas to raise the POD.
2. Expand the area of search.

Of course, with sufficient manpower it is possible to do both at the same time.

It is not always necessary to re-search an area with a highly thorough method in order to raise the POD to a high level. The following table shows POD values when the same area is searched twice.

PROBABILITY OF DETECTION TABLES

For Two Sweeps of the Same Area

Based Upon:

1. Western Washington thick brush & trees.
2. 50/50 combination of conscious & unconscious subjects. (10)

Sequence of Sweeps*	Both Sweeps Daytime	First Sweep Nighttime	Both Sweeps Nighttime
20	92%	81%	
60	71	52	
100	53	35	
20 & 20	99	98	97
20 & 60	98	95	91
20 & 100	96	91	88
60 & 20	98	96	91
60 & 60	91	86	77
60 & 100	86	78	68
100 & 20	96	94	88
100 & 60	86	81	68
100 & 100	78	69	57

*Between-man distance in feet.

Tables such as the above allow the OL to estimate the POD for an area after it has been searched twice. The tables can also be useful in search planning.

EXAMPLE: Say a 60' grid was used to search a suspected area (POD 71%). Say further that the operation leader feels that the area should be searched to at least a 90% POD. A second search using the 60' spacing would be sufficient. (Two daytime 60' grids of the same area produce a 91% POD.) A second search using a 20' spacing would produce a POD of 98%: however, it would require 3 times the manpower as a 60' grid.

As before, the selection of search method and area will be made by the OL in conjunction with other officials in charge of the search. The explanation above was included so that you may be familiar with the basic reasoning being used and know why you might be asked to search an area twice.

Grid Naming

Until not too long ago, close gridding (Type III) dominated search & rescue thinking in many areas: it was felt that an area should always be gridded " such that you could be sure the lost person wasn't there." It wasn't until more recently that search experience backed by research demonstrated that wide spacing will produce better results under certain circumstances. The trend is pretty well in motion now: grid spacings of both wide and close intervals have applications in search & rescue.

Because of this, and because of the importance of accurate communications between the team & OL concerning team spacing, the following grid naming system was evolved.

GRID NAMING SYSTEM

Consists of a **Number - Word - Number** sequence.

1st number:

The number of team members on the grid line. This excludes the TL if he chooses to float behind the team.

Word:

Either "Compass" or "Guide".

Compass - if the team is using a compass bearing for directional control.

Guide - if the team is guiding on a string line, ribbon line, creek, road, ridge top, or virtually anything other than compass.

2nd number:

The average between-man distance in feet.

EXAMPLE:

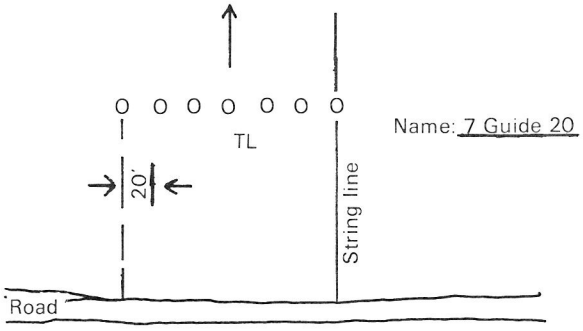
6 Compass 30

6 persons on the grid line.

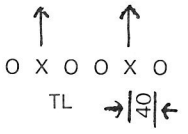
Compass is being used for directional control.

30' average between-man distance

ADDITIONAL EXAMPLES:



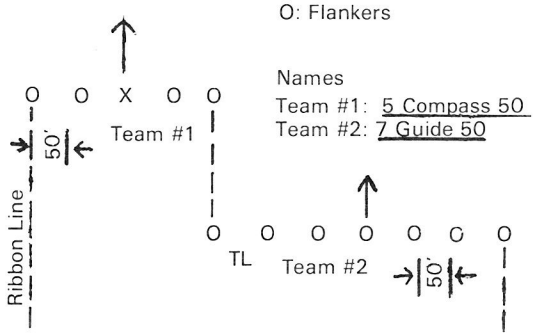
Name: 7 Guide 20



Name: 6 Compass 40

X: Compass men on parallel bearings

O: Flankers



Names

Team #1: 5 Compass 50

Team #2: 7 Guide 50

Advantages of this system:

1. When the team radios in that they are starting a 5 Compass 60 (or whatever), it provides one last opportunity to discover any differences between the OL's intentions and the TL's understanding of those intentions.
2. If you multiply the two numbers it will give you the team's width. This is useful information to put on the operations map in base.
3. The last number is what the OL will use to estimate a POD for the area.

Night searching is necessary and can be productive.

Night Searching

Night searches are frequently necessary. A 3 year old child missing in a suburban wooded area, a lost person overdue for medication, or a person missing under hypothermic weather conditions may not last too long. In these circumstances time is valuable: the nighttime cannot be wasted.

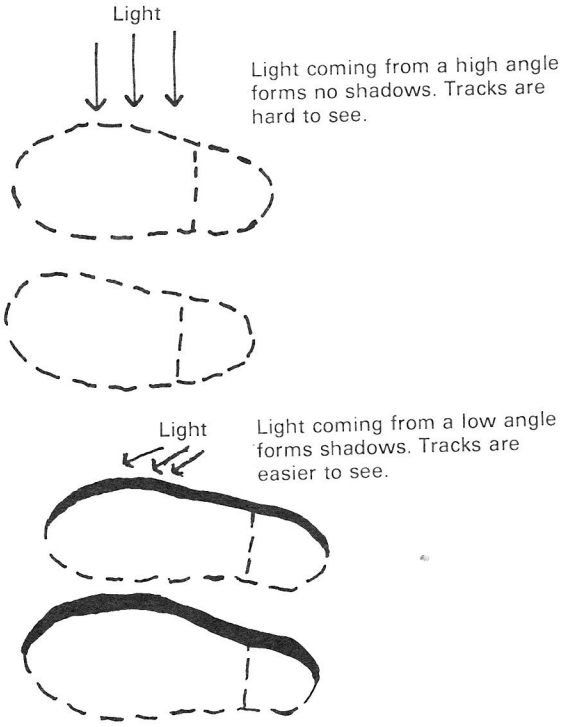
The effectiveness of night searching appears to vary. Under conditions of thick brush and trees, night searching was found to be slower and less effective than during the day. (10) However, a high nighttime success rate has been built up by a unit working in more open terrain. (2)

Regardless of its effectiveness, almost any night search will be better than no search at all. If a 100' spacing carries a 35% Probability of Detection (POD) at night, that's not too bad. If the alternative is no search, the POD will be 0%.

Search methods at night are essentially the same as those during the day. A flashlight is, of course, essential but this would normally be carried anyway. A headlamp is very good because it frees the hands for other purposes. Gas lanterns can be very effective at night because they produce so much more light. If aluminum foil is wrapped half way around on the inside of the globe, the searcher can raise the lantern without shining the light in his eyes. This is more comfortable for the eyes and increases his visibility.

If you are searching an area where tracks might remain in the dirt, a flashlight or lantern held at low angles will tend to make the tracks more visible.(2)

SEEING TRACKS AT NIGHT



As with daytime searches, it is wise to stop periodically and call out to the lost person. Remain quiet for a potential reply. Because of your lights, the lost person may see you sooner than during the day. It is also probable that, if conscious, he may see you before you see him: this means he may be calling to you to attract your attention. Be listening as well as looking.

A certain amount of caution is needed at night. It's easier to trip on snags or step into a hole at night. If you encounter mine shafts or cliffs in the area, the TL should notify base. If the risk to searchers is unacceptable, a further search may have to wait for daylight.

During suburban searches, you are very much in the public eye.

Searches Within Populated Areas

A small child missing in a neighborhood wooded area or an evidence search in an urban park are not at all unusual. A key difference between these searches and the more typical operations in wilderness areas is that they are in populated areas.

Search methods usable in wooded areas are also usable in suburban woodlots and parks. It is, however, especially important to be aware that the ESAR unit is highly visible to the public in these situations. Profanity, arguments or even just fooling around will create a bad impression among bystanders. The team's attitude should be serious and business-like. No litter should be left. If grid ribbons or string lines are used, they should be picked up at the end of the search. Keep constantly aware that many eyes are watching your performance.

In the case of the small child missing in a suburban area, small ESAR teams may be asked to contact neighbors. Your job is to explain the situation politely and ask the home owner to check his basement, sheds, etc. anywhere the lost child might have gone. Offer your help in checking out buildings if you think it will help. However, if a property owner refuses permission for you to go on his property, withdraw politely and notify the OL of the refusal. If its not important, that's OK: if it is important, a law officer can be sent to ask permission.

Evidence Searches

Often ESAR units are requested to assist law enforcement agencies by searching for evidence in wooded areas. The object of a search may be a piece of clothing, a gun or knife, a body, money, or virtually anything that doesn't naturally belong where it was found.

Search methods used in evidence searches are almost always Type III. Very close spacing may be used for extreme thoroughness. String lines should be laid along the ground to precisely mark the sweeps from the unsearched areas. If the object is small (e.g. knife) the team members may search on their knees. If a body is sought, it may be necessary to turn over leaves, dig through piles of rubbish, etc. (the body may be covered up). If the area is covered with brush, it may be necessary to cut and remove the brush: the police will get permission first. The emphasis is upon thoroughness.

If, at any point, the searcher finds something that may remotely resemble anything that they are looking for, he should stop, back off and notify his TL. The TL will, in turn, ask for a police detective or patrolman to take a look. The team member should not touch the object or other items nearby. If the officer is satisfied that the object is not material, he will say so. The search can then continue. If the find looks good, the officer will ask the team to back off or to help him check the immediate area. He is in charge: do exactly as he asks.

In an evidence search, string is used to mark sectors. Then each area is searched thoroughly.

It will be necessary for the finder to give his name and address to the policeman in charge. If the evidence is used in court, the team member who found it may be called to testify on how he found it and where.

As with searches in suburban areas, ESAR teams are very visible to police officials during evidence searches. A serious business-like attitude will help secure a close and respectful relationship between ESAR and the police agency.

River Searches

With the popularity of river canoeing, rafting, inner tubing, etc., the frequency of river or irrigation canal accidents has increased notably.

Usually, one of three situations will prevail:

1. The accident takes place and the subject gets himself out of the river. He walks to a phone and calls someone to pick him up or walks home or walks to his car. The accident goes unreported and no search is started.
2. The subject ends up stranded on an island, log jam, or boulder. He is alive but can't get off by himself.
3. The subject quickly drowns.

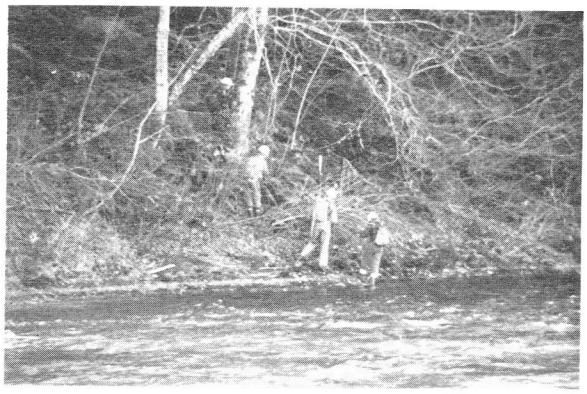
In the 2nd and 3rd situation, a search starts when:

A. Someone sees the stranded subject or sights the body.

B. Someone reports the subject overdue.

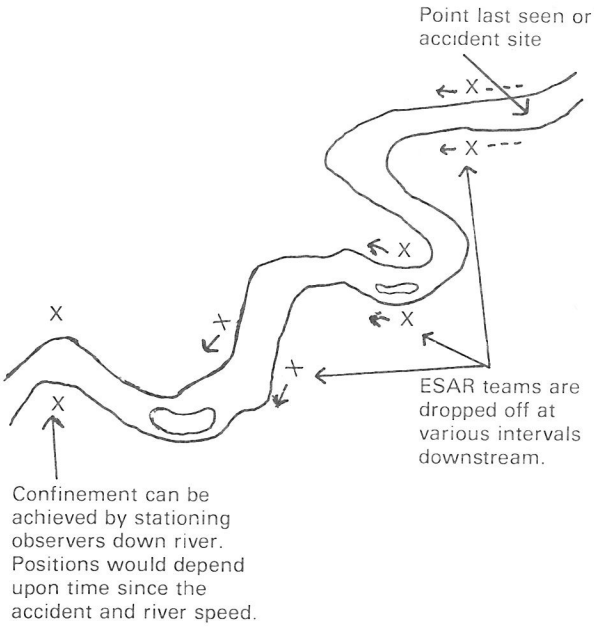
In (A), the role of the ESAR team may be to help carry a boat in to the river or assist divers in carrying SCUBA equipment cross country to the river. The actual rescue or body recovery is usually beyond the scope of ESAR training.

In (B), ESAR generally takes on the function of searching the river banks. The usual method is to drop teams off on both sides of the river at various intervals downstream. The teams then move in a downstream direction. Confinement can be achieved by figuring the time since the accident, the speed of the water, and then stationing observers on a bridge at the appropriate distance down river.



If hurt, the subject may have been able to get out of the water but not much further. By searching the banks as well as the shoreline you stand a better chance of finding a clue.

RIVER SEARCHES



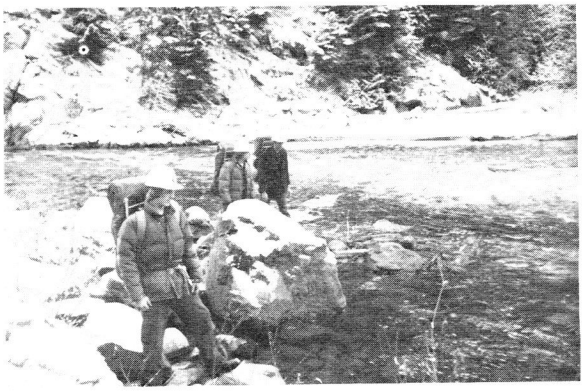
By having the teams work in pairs on opposite banks, the teams can sometimes help each other. A team on one bank may have a difficult time seeing under an over-hang: it can radio the other team to take a look from the opposite bank.

Rivers can be quite dangerous. Generally, searchers should stay out of the water and off of steep banks which afford no protection should a person start sliding. In calmer waters it may be permissable to wade in up to the knees to check out an area; however, this should be done with a life jacket and considerable judgement. In water above the knees the searcher starts to become buoyant and is increasingly susceptable to the current: this is an area more suited to trained divers.

Often, there will be a dam upstream from the accident site: the appropriate officials may be able to reduce the water flow to aid the search.

If the subject has drowned, his body will usually end up on one of several places.

1. Trapped by the current against a log jam, or against the upstream side of a boulder.
2. In a shallow area. The body becomes beached as the water level lowers.
3. In a deep pool. By looking into the pool at a high angle, you might be able to see the body moving slowly in the current.



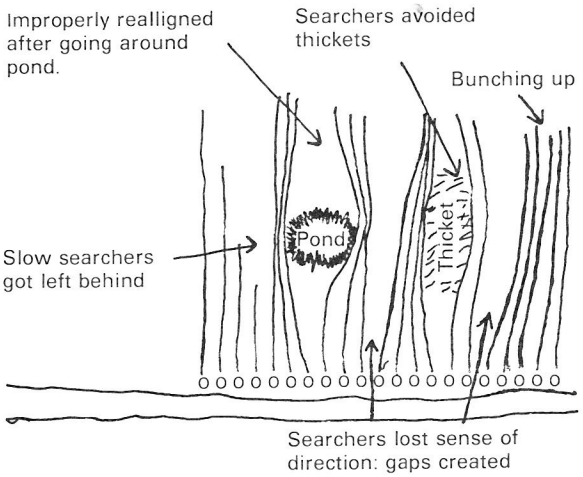
Check river pools and the upstream side of boulders, logs, etc.

The Evolution of Search Methods

In ESAR's 19 year history, a number of search ideas have been tried and abandoned. The following partial list is included so that members of new units won't have to learn from their own experiences but can benefit from the experience already gained.

1. The "long line" of searchers was quickly abandoned as a practical search method. The "long line" usually took the form of lining up 30 to 80 persons at intervals along a road and then proceeding into the brush on a grid.

"THE LONG LINE" GRID
(ABANDONED)



The primary disadvantages were:

1. It took considerable time to set up: everyone had to be ready before anyone could start.
2. To advance together, the line could go only as fast as its slowest member. With one person in heavy brush, the others would be forced to slow down.
3. Even with radios spread among the members, it was extremely awkward to control. Irritation was a frequent by-product.

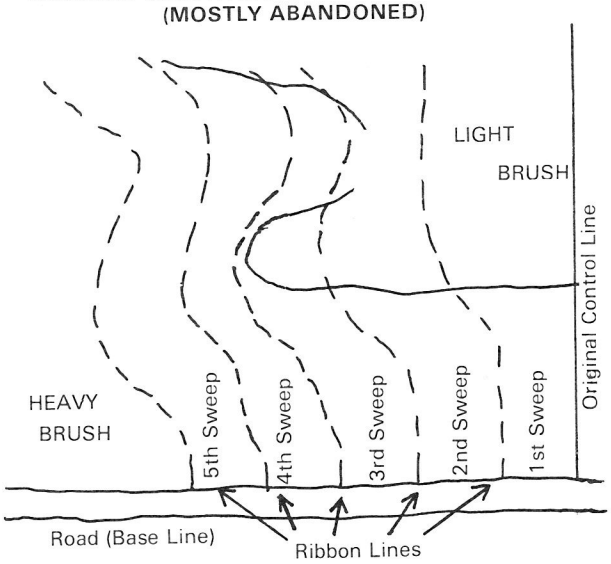
2. 10 to 12 man teams (abandoned in most areas of thick ground cover). After the "long line" was discarded, the use of grid ribbons was introduced so that teams could move independantly of each other on parallel sweeps. This was a real step forward but there remained a tendency to use large teams (10 plus members). In time, this too changed. Smaller teams are easier to control and less frustration producing in difficult terrain. Currently team size may vary from as small as 3 to 8 or 9 as a maximum.

3. Team Leader being in the grid line (rarely done now). By being part of the grid line, the TL made the team wider by one more person. However, it made it more difficult for him to control the team, check on things, etc. As gridding evolved, the TL was relieved from line duties, allowed to float behind the team, and devote most of his attention to keeping the team functioning. Though the team was not so wide it tended to function more smoothly: what was lost in width was regained in speed. Today, about the only time the TL will include himself in the line is when he has a small experienced team.

4. Changing the between-man interval during a sweep (mostly abandoned). For a long time it seemed reasonable to some that, as a team moved into less dense ground cover, the between-man distance should increase. The opposite would be true when moving into a thicket. The effort was to obtain the maximum permissable spacing at all times thereby making the greatest use of the manpower.

The result became a highly irregular ribbon line for the next team to follow. The problem became progressively worse with succeeding sweeps.

VARIABLE-INTERVAL SPACING WHILE GRIDDING
(MOSTLY ABANDONED)



The curved ribbon lines became progressively more difficult to follow. Sometimes the left-right shift movements went at right angles to the direction of travel. The advantage of getting maximum spacing as the team moved from one kind of ground cover to another was soon lost in the non-productive shift movements created by irregular ribbon lines. Most ESAR units have gone to a fixed-interval grid: the interval remains the same for the entire sweep.

Terms

Grid Ribbon:

A ribbon of cloth, plastic, or paper (1" x 24")

Base Line:

The line on which the team members spread out in preparation for gridding.

Control Line:

The line which determines the direction of team movement (roughly perpendicular to the base line).

Examples of Control Lines:
Ribbon lines
String lines
Road
Creek
Ridge crest
Compass line

Shift Right (or left):

A command to move right (or left) as well as ahead.

Efficiency:

The proportion of items found within an area per man-hour of search time.

Thoroughness:

The percentage of items found during a sweep.

Type I Search:

A preliminary informal check of trails, buildings, drainages, etc. within the search area.

Type II Search:

An organized grid where the fellows are spread out at wide intervals. The emphasis is upon efficiency.

Type III Search:

A highly organized grid where the fellows are spread out at very close intervals. The emphasis is upon thoroughness.

Guide Right (or left):

A command telling each team member to stay to the side of the person on his right (or left).

EVACUATION

Introduction

Once you have learned how to navigate and live in the wilderness, in the thickest sections and under the most adverse conditions, once you have learned how to systematically search for a lost person and now you have found the subject - what do you do?

As every rescue person knows, the plan of action must be geared to the particular situation; but, in every case, the first consideration is towards the subject. There are three basic steps to be immediately taken when the subject is found. They are:

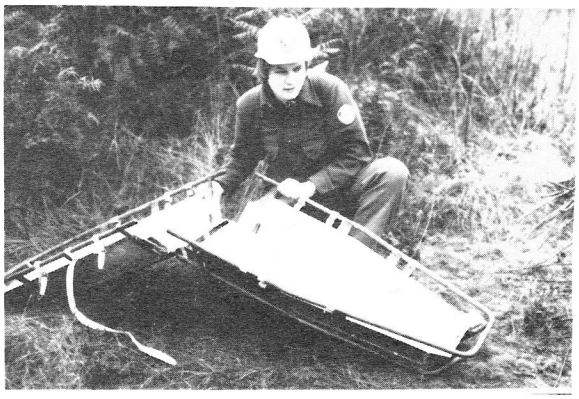
1. Give immediate first-aid if necessary.
2. Give the subject confidence that he will be all right now that he has been found.
3. Notify base of the location of the subject and his condition.

There are three basic conditions in which the subject will be found:

1. Lost or slightly injured and needs only a slight amount of assistance.
2. Injured beyond his abilities to help himself and others must help him.
3. Deceased.

The first case occurs when a lost person is found or when a person becomes ill on a camping trip and help is requested. In such cases all that may be requested is to lead the way out or possibly give him a hand with his pack. In any case, base is notified of the find and his condition.

The second situation will require more of the teams. The first thing will be to perform the necessary first-aid and to notify base. It must be understood that the first-aid may take a long time and that other things may be proceeding at the same time. There are 3 to 9 men on the team, thus giving rise to 3 to 9 activities which may be going on at the same time. These include first-aid, setting up a shelter for the subject, notifying base on the radio, starting a fire, heating food or drink for the subject, etc. A rescue team is normally kept in base to carry in a litter when it is asked for. When you have ascertained that an evacuation by litter is necessary and the litter has arrived, your immediate problem is packing the subject in the litter. The Stokes Litter is often used because (1) they can easily adapt to wilderness use, (2) they are not hard to buy, and (3) they are cheaper than many other kinds of litters. The Stokes Litter is made of tubular steel and wire. It is very rigid and provides a number of hand holds along the sides. The Stokes can be cut in half and stored or transported in two pieces when not in use. (5)



A two-piece litter is ideal for search & rescue. A modified Stokes will serve quite well.

Litter Packing

In order to pad the subject comfortably and to prevent any additional injuries, up to four sleeping bags are used.

First-

A plastic or nylon tarp is laid on the bottom of the litter with one half of it hanging out.

Second-

A sleeping bag is laid on the bottom of the litter and part way up one side.

Third-

Another sleeping bag is laid in the bottom and part way up the other side.

Fourth-

Another full-zippered sleeping bag is laid open so that it is half in and half out. The subject is then carefully placed in the litter and the sleeping bag closed over him. If the subject is cold but conscious, hot packs can be placed over his stomach, in his arm pits, and at his feet. This will considerably lessen the time it takes him to warm up. Caution - only packs that produce a mild temperature and no noxious by-products can be used inside the litter.

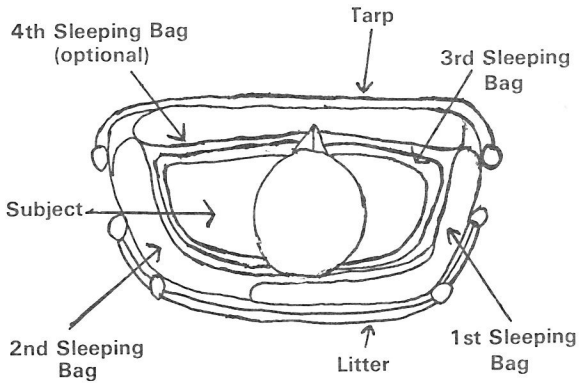
Fifth-

Another sleeping bag is placed over and tucked around the subject. This one may be omitted in good weather or if the padding isn't necessary to help immobilize the subject.

Last-

The other half of the tarp is brought over the whole package and is tied in by taking cord and zig-zagging back and forth across the top of the litter or by use of special tie straps.

CROSS SECTION OF LITTER



Particular emphasis is placed on the padding and protecting of the head and face. When properly done, part of the waterproof tarp at the head will be free to be gently laid over the face. Sufficient padding must be placed under and around the head so that the head cannot roll around and strike the stretcher's steel tubing. A handkerchief or other light cloth placed over the subject's face will protect his eyes from falling twigs but still enable him to see what's going on.

Heavy padding means a comfortable ride.

The method described here (use of 3 to 4 sleeping bags) involves more padding than is advocated in most search and rescue manuals. The padding does two desirable things:

1. Immobilizes the subject
2. Increases comfort

This method of litter packing has proved extremely successful. ESAR records show a number of instances where an injured hiker spent hours in pain while his companions hiked out for help. After being packed into a litter as described here, that same person fell asleep while being carried out. The ride is extremely comfortable, almost dream-like: when packing is done this way.

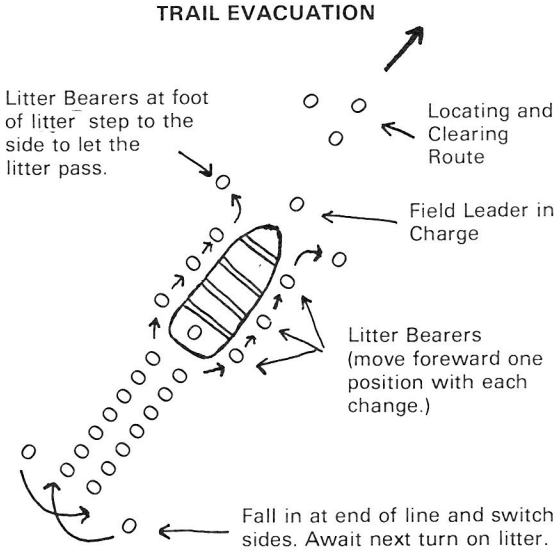
Litter Carrying

The best number of men to carry the litter is six: three on a side. Since the litter and subject are usually quite heavy, frequent stops are made to switch positions on the litter. The litter is raised and lowered smoothly and evenly.

When there are several ESAR teams available to carry the litter, the evacuation will be faster and more comfortable for the subject. In this case, several fellows will go ahead of the litter to clear trail. The litter and six bearers then follow. The remaining men follow behind the litter. On the signal from the FL in charge, two fellows in the line behind the litter will move up to take the head of the litter. The two who were at the head move up to the middle, the middle two move up to the foot and the two who were at the foot of the litter drop off. The fellows who dropped off let the litter pass them by, fall in at the end of the line and work their way back up to the head of the litter. If they change sides prior to their next turn on the litter, the strain on each arm will be equalized. Position changes will be called about once per minute. This way each person spends about three minutes on the litter at a turn. This is hard work: three minutes is usually plenty.

Generally speaking it is easier to carry the litter feet first. As team members change on to the litter, the freshest person is at the heavy end (at the subject's head). As he tires he changes toward the lighter foot end of the litter. From a patient comfort stand point, the head should be as high or slightly higher than the feet. This means that the litter may have to be carried head first when going uphill.

TRAIL EVACUATION

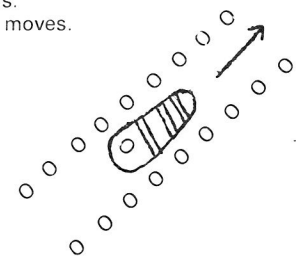


This kind of evacuation can proceed at a reasonably fast speed. The litter is stopped and set down only occasionally.

Sometimes the ground cover or footing will be so difficult that the litter and litter bearers cannot both move at the same time. In this situation the bearers can be placed in pairs ahead of the litter and the litter will be passed between them.

EVACUATION THROUGH EXTREMELY DIFFICULT TERRAIN

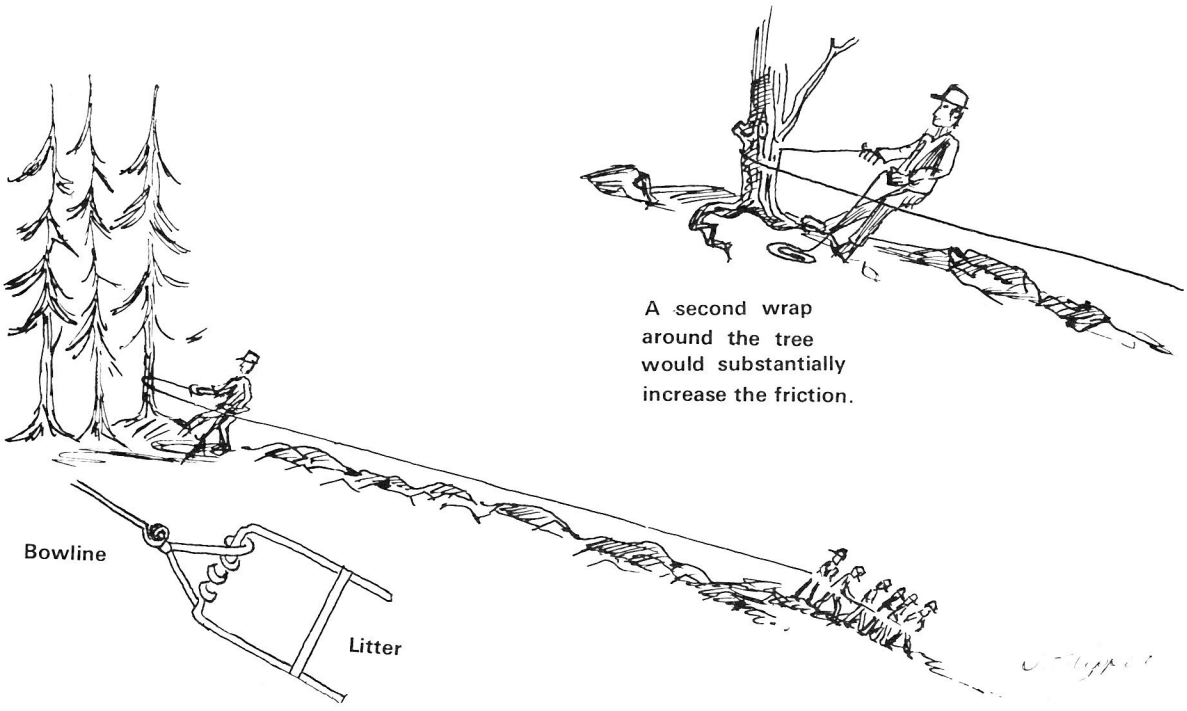
The litter is passed down the line between pairs of litter bearers. Only the litter moves.



Throughout the evacuation the FL in charge, or someone appointed by him, should frequently check with the subject. If he is uncomfortable the padding can be adjusted. If he is thirsty, a drink can be given. Of even greater importance is the sense of security and confidence that will develop: he knows he is in good hands and will feel better because of it. The litter bearers should tell him what is happening ("we will be going down a steeper slope for about 25' ", "we are going to set the litter down on this log while we send a few fellows around to take the litter on the other side.") If he knows what is happening he will feel much more secure.

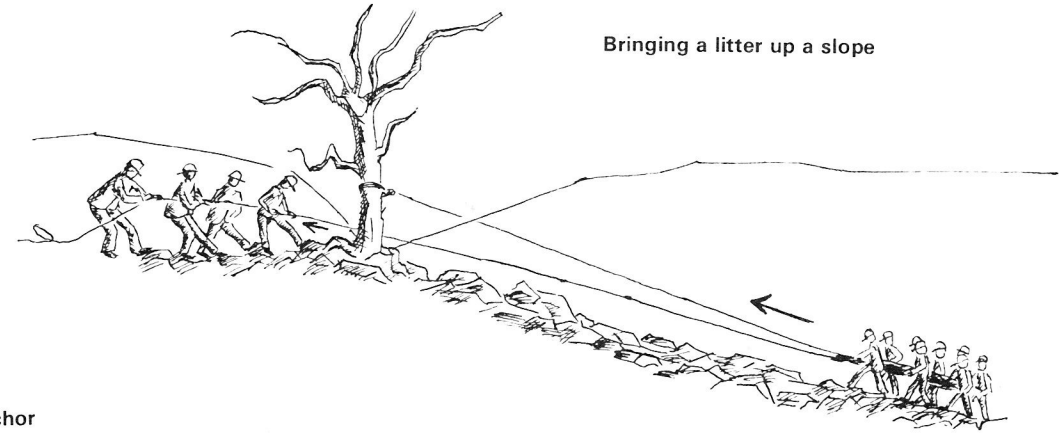
It is equally important to avoid any saying or doing anything negative ("don't slip - we may lose it," "he (the subject) doesn't look good" etc.). Such comments can greatly discourage the subject. Even if he is unconscious or semi-conscious he may be able to hear what you say: most of us have had the experience while sleeping of some actual sound in the room being incorporated into a dream. What you say can very well influence the well-being of the subject. (Incidentally, this is why ESAR teams use the word "subject" rather than "victim." The word "victim" tends to carry a meaning of serious injury. "Subject" is more neutral. This can be important when talking about the subject in his presence or when in the presence of friends or relatives.

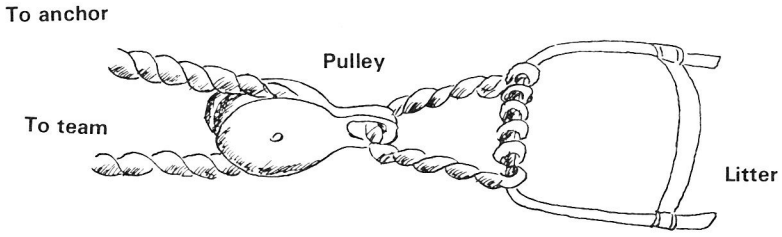
BELAYING A LITTER WHILE DESCENDING A SLOPE



To climb up a slope, another team can help the litter bearers by pulling the litter upward. This substantially reduces the physical strain on the litter bearers.

Sometimes it is necessary to descend a steeper slope with a litter. For the protection of the subject the litter should be belayed.





Although the above methods involve the use of ropes, they are not technical and are well within the scope of ESAR training. However, more advanced methods, especially those adapted to high angle rock or ice require substantially greater training and skill. Such evacuations are best left to those rescue groups who specialize in that kind of activity.

Deceased Persons

When a deceased person is found, the team should first check to see that there are no signs of life. Base should then be notified (use code word) and the area secured from further disruption. *The team should not disturb the body or surrounding area except to examine for signs of life.* This is especially true if there is suspicion that death was due to foul play. Only after your OL gives the OK is the team to move in and pack the body in a litter.

No ESAR member will be required to handle or work with a deceased person if he would rather not. When a deceased person is to be evacuated, the body is usually placed in a cadaver bag (a rubberized full-length bag with a full-length zipper). If a bag is not available, a tarp or two blankets will do the same thing. The body is placed in a litter and tied in. The same problem in evacuation exists here as with evacuating an injured subject except that it does not need extreme care in handling.

About one out of every four or five operations involves the evacuation of a deceased person. It is best to adopt a detached impersonal attitude in these cases. There is nothing that can be done for the subject; however, you will greatly ease the suffering of his friends and relatives by helping to transport him out of the woods so that the wishes of his family may be carried out.

Evacuation by Helicopter

Evacuation by helicopter is becoming more frequent. It will be up to the operation leader and others to decide if a helicopter will be requested. Any landing site must be at least 100 feet in diameter, free from trees or snags, fairly level, and, if possible, have an approach over a lake, the top of a cliff or some other area clear of obstructions. Stay away from the helicopter until the rotors have stopped unless your TL advises differently. Approach only from the front; where you can be seen.

When a litter is to be put into a helicopter for evacuation, it is important to send some information along with the subject. A note stating the condition of the subject, known injuries, and first-aid already given should be attached. The subject's name and other identifying information should be included if known.

Always stay to the front of a helicopter - where the pilot can see you.

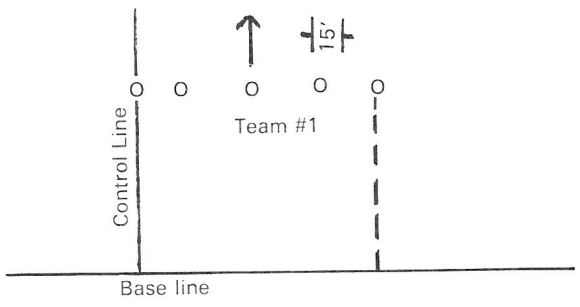
The note should also request the hospital to hold on to the litter and sleeping bags until an ESAR member can pick them up.

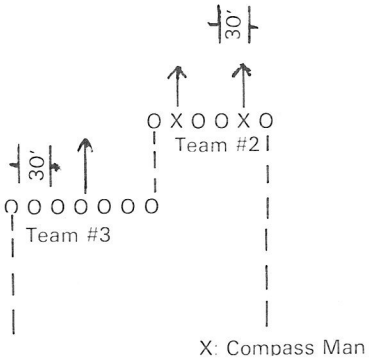
PROBLEMS:

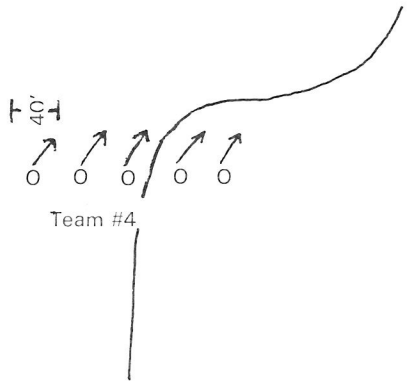
Sections On Confinement, Detection And Evacuation

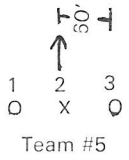
The following questions review the content of the "Searching Techniques" section. You are urged to try answering them. The answers are on page 77.

1. Name three methods used to acnieve confinement on search operations.
2. What is the minimum team size?
3. Why should a marker be left at the location of a "find"?
4. As a TL, you stopped the team and yelled out the subject's name. What is the next thing you do?
5. After you yell the subject's name, you hear a reply in the distance. What do you do next?
6. (True or False) A team member calls a grid to a halt because he has to check under a big log. After checking it he gives the command to re-start the gridding.
7. One method to keep teams on adjacent parallel sweeps from overlaping or leaving gaps in their path is to use grid ribbons. What is another method?
8. In Type II search methods, the emphasis is upon efficiency. In Type III methods the emphasis is upon ——————————————.
9. In Type II searches where wide spacing is used, there is a tendency for the team members to feel uncomfortable with the spacing. Why?
10. Using the tables given earlier, what is the probability of detection when a 100' grid at night is followed by a 20' grid during the day? Both grids are in the same area.
11. Say a given area was searched by day with a 100' grid. Later the OL decides that the area should be searched with at least an 85% POD. If the second search of the area is also done by day, what spacing should be used to do the job in the least time? Use the POD tables in this book.
12. In the Number-Word-Number sequence used in grid naming, what does the first number represent?
13. Name the grid used by each of the following teams









14. Using the diagrams in problem Number 13, state whether the following teams are guiding right or guiding left.
    Team Number 1?
    Team Number 3?
15. Which of the diagrams in problem Number 13 show a team in a "shift right" situation?
16. Which member of Team Number 5 (problem 13) is guiding left?
17. (True or False) Night searches are rarely productive.
18. During an evidence search, what should you do if you discover something that might be evidence?
19. A man is stranded on a boulder in the middle of a large fast moving river. Your ESAR team has several ropes, carabiners, life jackets, and other related equipment. How would you get the man off?
20. Give one argument in favor of having the TL be part of the grid line. Give one reason against.

EQUIPMENT, CLOTHING, AND FOOD

INTRODUCTION

The equipment, clothing and food that each person in Explorer Search & Rescue is required to have is based upon experience and common sense.

Generally this equipment is not expensive and can be purchased in any number of places. The biggest proportion of equipment and clothing that you will need can be purchased in surplus stores or second hand establishments.

EQUIPMENT

Two packs are required for search and rescue operations. One is the *24 hour pack:* It is carried during a single day search operation but has sufficient clothing, food and equipment to bivouac if necessary. The second pack is the *48 hr. pack:* It contains the 24 hr. Pack plus the remainder of your gear necessary to camp out. The combination of the two packs should sustain you for a minimum of two days. They are divided as follows and represent minumum requirements.

24 Hour Pack

The pack itself should be a large rucksack that can fit into or on the 48 hour pack.

Compass:

The Silva Ranger model has proved very good. Tie the compass lanyard to your shirt or put it around your neck.

Navigation kit:

Pencils, note paper, 360 degree protractor ruler, and map.

Head lamp or standard flashlight:

Put cardboard between the batteries to keep the light from going on accidentally inside the pack.

Extra batteries and bulb:

Pocket knife:

Carry it in your pocket with a lanyard tied to a belt loop.

50 ft. of 500 lb. nylon line.

1 roll of plastic grid ribbon

Water container:

1 qt. minimum, in hotter areas considerably more may be necessary (see Desert Search section).

Food:

Enough for 4 meals, no cooking required.

Toilet paper:

Wrapped in plastic.

Wool stocking cap.

Extra wool shirt or sweater.

Fire kit:

Candle stubs or fire starters, waterproof matches (dip wood matches in finger nail polish or wax).

Emergency Kit:

(See list below)

First Aid kit:

(See list below)

Clothing:

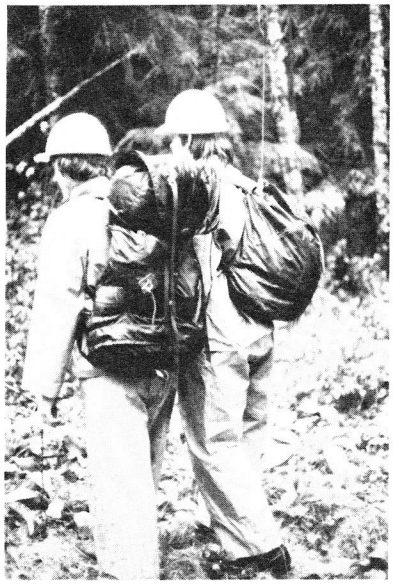
The following items would either be worn or carried in the 24 hour pack. In colder or wet climates, all clothing *must be wool.* Clothing

items carried in the pack should be inside waterproof bags.

pants
shirt
jacket or sweater
hat
socks (two pair)
gloves or mittens
rain gear (rubberized nylon)

Optional:

(Depending upon conditions) : Leather gloves, gaitors, hand warmers, sunglasses, suncream, insect repellent, snake bite kit, hard hat, broad brimmed hat, additional water bottles, long underwear.



Most knap-sacks are too small to serve as a 24 hour pack. The one on the right is adequate though minimum. Many brush-monkeys prefer a larger one (left.)

The 24 hour pack represents the minimum equipment needs of any searcher. A common error is for beginners to carry less than the above: This is a mistake. A search operation is no time for a person to slow down his team because of an equipment deficiency. The 24 hour pack must contain enough gear to provide adequately for the searcher, to provide emergency bivouac capability, and still have enough left over to care for the lost subject or an injured team member. This is considerably more equipment than carried by the average recreational hiker on a day hike. *The 24 hour pack is minimum gear for the field. You are not to leave base with anything less: you are to never allow your pack to get separated from you while in the field.* In a search and rescue context, the 24 hour pack doesn't contain a survival kit - it *is* a survival kit.

Emergency Kit

Whistle
4 safety pins
Single edge razor blade
3 packages, 10 matches each, waterproof (emergency supply)
2" candle stub (emergency fire starter)
2 garbage bags or 6' X 6' mil plastic tarp (emergency shelter)
Emergency sun glasses

The 48 hr. Pack should be a large frame with packsack.

48 Hour Pack

The pack should be a frame with bag.

24 hr. pack

Sleeping bag-

pack it inside a tough outer bag (protection against brush) and a plastic inner bag (protection from water).

Shelter-

9' x 12' 6 mil Polyethylene or 3 oz. nylon tarp. Tarps are more popular than tents because of weight, cost and versatility.

Insulating Sleeping pad-

closed cell foam

Mess Kit-

a spoon, cup and pan are sufficient

Extra Clothing-

wool socks, under clothing (wrapped in plastic)

Stove-

small butane or white gas are usually best.

Food-

minimum of 3 hot meals

CLOTHING

You must use your judgement on the type and amount of clothing you will carry depending on conditions of the search area. Some wilderness areas are likely to be very wet and cold. Others may be quite hot. If you are not properly clothed your service to the

team will be limited. The following are the recommended types of clothing to be worn.

Wool clothing provides more insulation when wet than other fibers. For this reason wool is the basic clothing requirement for ESAR.

Under clothing:

Wool or a blend of wool and other materials are good.

****Pants:**

Wool, military surplus is good.

****Socks:**

At least one and usually two pairs of wool socks should be worn during summer and winter.

****Shirts and Sweaters:**

Light weight wool shirts or sweaters are recommended for both summer and winter. Several thin layers are preferable to one thick layer of clothing. Light shirts and sweaters can be put on or taken off to regulate temperature - this can't be done with a single heavy garment.

Jackets or Parkas:

Jackets should be light weight and somewhat water resistant. A ski parka makes a good wind break and will keep you dry for a limited period of time. A hood and long body (extends well below the waist) are desirable.

****Raingear:**

Rubberized nylon parka (with hood) and rain pants are extremely important. Though sometimes expensive, the heavier gauge (very rip resistant) rubberized suits will return their value to the wearer: They make the difference between miserable suffering and relative comfort during long, wet searches. A bright color is recommended.

Ponchos are not recommended in wooded and brushy areas. They don't keep the legs dry, tend to blow in the wind, often catch on brush and are easy to step on when croutching down: Ponchos have caused mountaineering accidents.

In wet weather, a durable rain suit (parka & pants) can make the difference between misery and comfort.

****Boots:**

A good lug soled leather boot that covers the ankle is usually best. Boots should be treated with a good waterproofing that is compatible with its tanning oil base or silicone.

****Hat:**

Almost any hat or combination that covers the ears and protects from wind and rain is desirable. A wool stocking cap under a rain parka hood is an example. A hard hat gives protection from falling objects and adds an aspect of uniform appearance if worn by all team members. Wool liners that provide warmth underneath a hard hat are available.

Gloves:

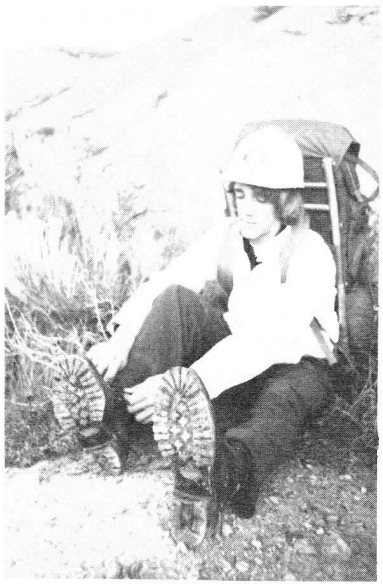
Leather gloves supply useful protection when going through thick brush or carrying a litter. Wool gloves or mittens are a must in winter: They are especially good under a windproof outer mitten.

Sleeping Bag:

Down or dacron sleeping bags are the only kind recommended. Down is warmer, lighter, and more compressable but more expensive. Dacron dries faster and will be better than down when wet. Always carry your sleeping bag wrapped in plastic protected by a tough nylon or canvas outer bag.

**This clothing will generally be required where the weather is cool, wet or unpredictable.

During wet weather operations, an extra set of clothing left in a car in base camp will assure a warmer and more comfortable trip home. This also tends to reduce the chance of catching cold.



Lugged sole boots provide better traction in virtually all kinds of terrain.

Wool clothing is best for search work under cool, wet, or hot desert conditions. During dry warm weather other materials may be used. The fabric should be tough enough to protect the wearer from brush, dust, sun, etc. Such clothing should not constrict at the ankles, waist, neck, or wrists; it is important to help maintain good circulation. In sunny climates, care must be given to preventing sunburn. A bandana worn around the head or a large-brimmed hat will protect the neck from the sun.

WILDERNESS EATING

The amount and kind of food that a searcher carries is important. There must be enough good food to maintain energy. At the same time there should be no unnecessary weight.

Suggested Menus

The following are a few sample menus. There are many more which are quite usable (See "Desert Search" section for suggested menus under hot weather conditions.)

Breakfast Number 1:

Oatmeal, raisins, brown sugar, hard candy, cocoa.

Breakfast Number 2:

Granola, sugar, dried fruit, hot jello.

Lunch Number 1:

Wheat crackers, cheese, processed meat, orange drink, hard candy.

Lunch Number 2:

Kippered herring, rye-crisp, dried fruit, lemonade, gorp.

Dinner Number 1:

Soup, french bread, vienna sausage, candy bar, tea.

Dinner Number 2:

Beef stew (dehydrated pkg.), wheat crackers, pudding, tea.

Types of Food

Cereal:

Oatmeal, Cream-of-Wheat, Granola, etc.

Dried Fruit:

Prunes, peaches, apricots, apples, dates, figs.

Soup:

Dehydrated packages

Cheese:

Brick or sliced

Candy:

Hard candy, chocolate

Pudding:

Instant

French Bread:

Soft bread with hard crust, (doesn't crumble in pack).

Meat or fish:

Beef jerky, tins of turkey, chicken, beef, sardines or kippered herring.

Salt:

Miniature size container.

Rice:

Instant

Dehydrated or freeze-dried meals:

Though expensive, these meals are of good quality. Avoid those that require considerable cooking in preference to those that only require hot water. These meals are not desirable under desert conditions.

Gorp:

This is anything you can nibble on. One mixture is peanuts, raisins, M & M's, Wheat Chex, pretzels and gum drops. This should be carried in a plastic sack in an accessible portion of your 24 hour pack.

Preparation and Eating Hints

Package food that has a long shelf life without refrigeration. This way you can have your whole pack ready to go without need for last minute preparation. Those food items not used on one search can be kept until the next operation.

Always carry a supply of gorp. This adds energy and keeps you from getting hungry between meals.

Honey is a quick energy food. It can conveniently be carried in plastic containers.

Wrap all food in plastic bags: This keeps the food dry and makes it easier to prepare.

Most of the food items listed can be purchased at a local supermarket.

While on search operations, eat small amounts at frequent intervals. This maintains your energy and prevents hunger while, at the same time, minimizing the demand on your digestive system.

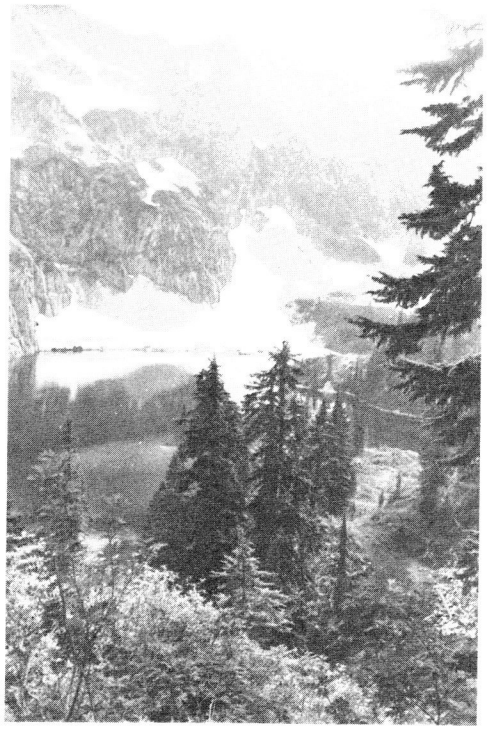
Always have something hot for dinner and breakfast.

Always bring adequate equipment and food. Be prepared for the worst that nature can offer.

First Aid Kit

(reprinted with permission from *Mountaineering First Aid* published by the Seattle Mountaineers)

Item	Quantity	Use
Aspirin	12 tablets - 5 grain	1 to 2 every 4 hours for pain
Antacid	6 tablets	For indigestion or heartburn; may be Bucladin, Ulcetral Rollaids, etc.
Antihistamine	6 tablets	1 every 4 hours for insect bites,colds or hives
Bandaids	12 one inch	For lacerations
Butterfly Bandaids (or know how to make)	6 (various sizes)	For closing lacerations
Carlisle (Battle Dressing)	1 four inch	For large bleeding wounds
Moleskin	½ package	For blisters
Needle	1 medium size	To remove splinters, etc.
Tincture of Benzoin	1 oz. bottle (plastic)	To hold tape in place and protect the skin
Antibacterial soap or Tincture of Zepherin	1 oz. bottle (plastic)	Mild antiseptic for abrasions, cuts
Razor blade, single edge	1	For shaving hairy spots before taping
Roller gauze	2 rolls 2" x 5 yards	For holding gauze flats in place
Safety pins	3 (1 large)	Mending seatless pants
Salt tablets	24	To prevent exhaustion and cramps due to heavy perspiring
Steri-pad gauze flats	6, 4" x 4"	For larger wounds
Tape, non water-proof	2" roll	For sprains, securing dressings, etc.
Triangular bandage	1	For supporting arm, protecting dressings from contamination
Drugs	As prescribed by personal physician	If carried, each should be stored in a separate container, and clearly labelled as to dosage, expiration date, type of drug and expected reaction
Elastic bandage	1 three inch	For securing dressings in place. Training in its use is required.
Thermometer	1 (-40° F to 120° F)	For measuring temperature
Wire mesh splint	1	For suspected fractures



WILDERNESS NAVIGATION

INTRODUCTION

On Explorer Search & Rescue operations it is essential that all teams be able to move from one place to another with maximum efficiency, safety, and speed - the lives of many people may depend on it. This ability, however can be gained only through conscientious effort to master the skills involved. The purpose of this section is to review those skills so that they may be more easily learned. **Remember,** when you become a member of Explorer Search & Rescue the lives of people will depend upon your actions - learn well!

COMPASS AND STRIDE

Many times ESAR teams are called upon to go into areas where there are no trails or roads. Let us say, for example, that an aircraft has crashed on the side of a mountain. The crash site has been determined by search planes but no landing can be made. The only alternative now open is to send in ground teams. It is not enough for these teams to go "that-away" for a "couple" of miles. In country where a man may stand within a hundred feet of an airplane and not see it, such directions are far too vague. What is needed is an accurate way to determine direction and to measure distance.

Stride

Fortunately a rapid but fairly dependable method exists for measuring distance. It is called a stride. A stride is the distance covered every two steps by a person as he walks. Thus by counting the number of times your left foot hits the ground you would be counting the number of strides necessary to walk a certain distance.

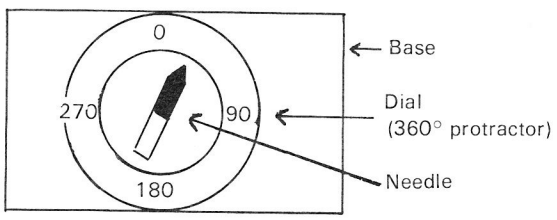
Stride length is the number of feet (usually between 4 and 6) that any particular person may cover in one stride Stride length varies from person to person and is also dependent upon whether or not you are going uphill or down, through thick brush or open field, and under a heavy or light pack. Because of this it will be necessary for you to determine your own stride length. To do this you will walk a distance of known length (say 100 ft.) and count the number of strides required to cover that distance. If it took 20 strides then your stride length is 100 divided by 20, which in this case is 5 feet.

During your weekends of field practice you will have an opportunity to determine your stride length.

Compass

Fortunately too, there exists an accurate way to determine direction. This is done with a compass. Although the compass is not as easy to master as using strides, it is a fairly simple instrument and learning its use need not be complicated.

Most compasses consist of three parts: (1) a magnetized needle (north end usually colored or pointed, or a card in some compasses), (2) a dial or protractor, and (3) a base. Except for details, they look like this:



When the needle is allowed to rotate freely (that is, when the compass is held horizontally,) the needle will align itself with the earth's magnetic field and point in the direction of magnetic north). Note the distinction here, the needle points toward magnetic north (where the earth's magnetic force lines converge) not toward true north (the north end of the axis on which the earth rotate). The following figure illustrates the different locations of the magnetic north pole and the true north pole.

Accurate use of compass is an important component of ESAR training.

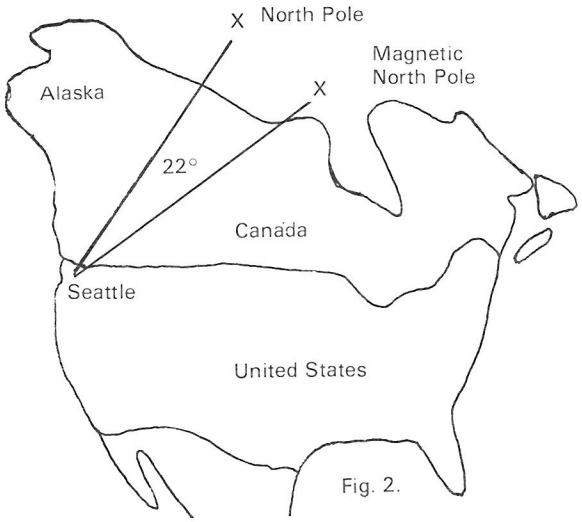


Fig. 2.

From Fig. 2 you will note that the angle formed between the directions of the two different poles at Seattle is 22 degrees. This is called **variation** and is referred to as 22 degrees east variation (magnetic north is 22 degrees east of true north). Observe also that the variation will change from place to place as you move over the earth's surface. For example the variation in Northern Alaska is certainly much different from the variation in Seattle. In Western Washington a 22 degree east variation is used. In Eastern Pennsylvania the variation is 10 degrees west. For purposes of instruction, this manual will use the 22 degree variation. In actual field work be sure you use the variation for your area.

LINES OF MAGNETIC DECLINATION

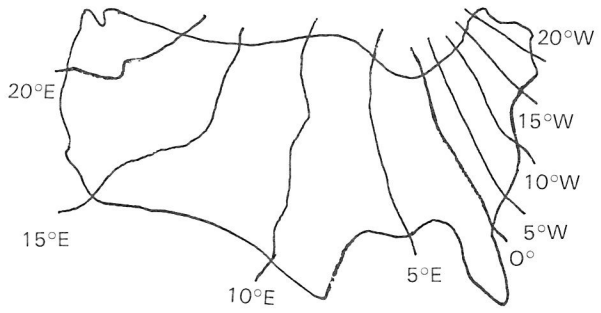


Fig. 3

A **bearing** is a direction as measured in degrees by a compass. Any bearing can be determined by using north as 0 degrees and measuring clockwise around a circular protractor. Thus east is a bearing of 90 degrees, south is 180 degrees, west is 270 degrees, northwest is 315 degrees, etc.

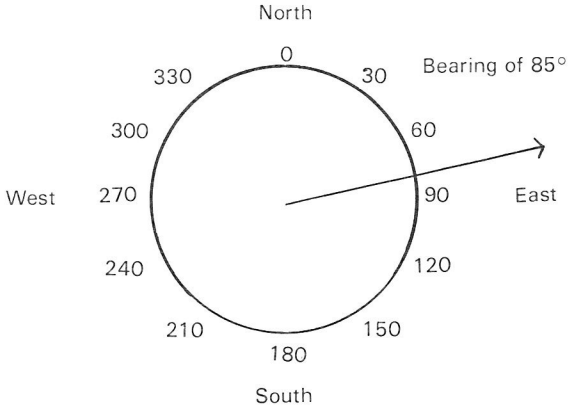


Fig. 4

The dial of a compass is no more than a 360 degree protractor (shown above). However, before one can use it to measure an angle (bearing) of direction he needs to have some reference line from which the angle is determined. To illustrate: it is meaningless to ask, "what is the angular direction of the following line?"

Fig. 5.

This question does not make sense because no reference line from which an angle is formed has been given. However, if the same question was asked using the line marked "M" as a base line, then by using a protractor you could quickly find that the direction of our first line is 80 degrees M (that is, 80 degrees in a clockwise direction from the line marked "M"). See Fig. 6

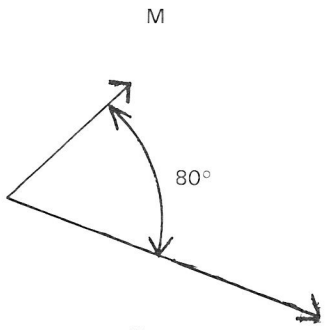


Fig. 6

Since the needle of a compass always points toward magnetic north (refer again to Fig. 2) it is this direction that will form a reference line from which all other angles (or bearings) can be measured. In short, this means that all we have to do to determine any bearing is to measure the angle formed by (A) the needle and (B) the direction we are measuring. For example, if we wish to find the direction of line X in Fig. 7, the process is (1) center the base of the compass against line X, (2) turn the dial until the needle points to the 0 degree mark and (3) then read the dial at the place corresponding to the direction of the line. In this case we find the direction to be 60 degrees M. (The reason for the "M" will be explained a little later.)

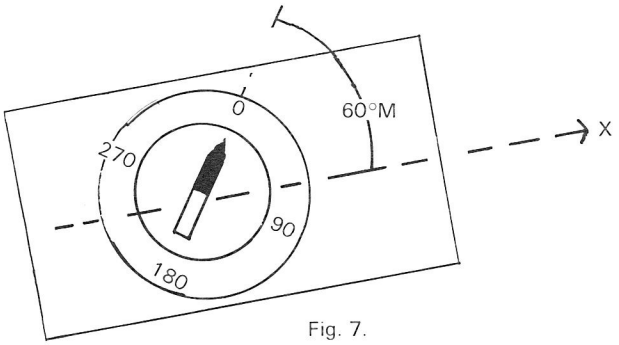


Fig. 7.

*Note: Figures 7, 8, 9 and 12 illustrate the process by which a compass is used. Do not use your own compass to verify these examples: it will not work because the page has not been oriented. This (orientation) comes under the heading of MAPS and will be explained later.

Likewise in Fig. 8, we find the direction of line Y to be 268 degrees M.

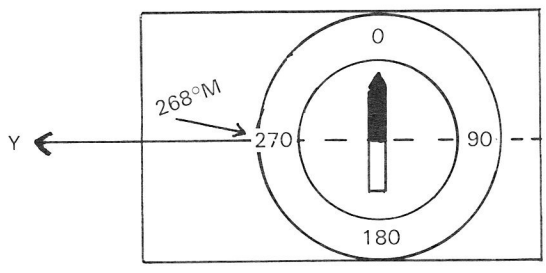


Fig. 8

Figures 7 and 8 illustrate how you may use a compass to determine a bearing of a particular direction. The opposite procedure is also important. Here the question is, "given a certain bearing, what is its direction?" The method now is similar to before but with the steps reversed: (1) set the dial to the bearing you have been given, (2) turn the whole compass until the needle points to the 0 degree point of the dial, then (3) the compass is now facing in the correct direction. To illustrate, say we want to find the direction corresponding to the bearing of 132 degrees M. First, set the dial on 132 degrees second, turn the compass until the needle points to 0 degrees, then the compass is pointing in the proper direction.

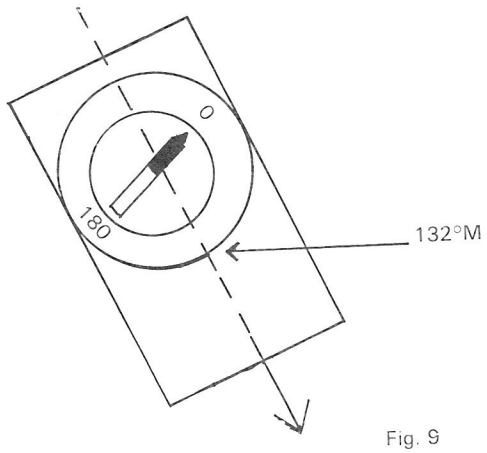


Fig. 9

Up to now we have been using the direction from you to the magnetic north pole as the reference line from which all other bearings have been measured. This is the simplest method because the needle of the compass points directly toward the magnetic pole; however, there will be many times, especially in using maps, when this procedure will not be adequate.

Often it will be necessary to determine what is called a "true bearing." In this case the direction from you to the true north pole forms the reference line from which other bearings are measured. The only change is that we are using a different reference line than before (see Fig. 2).

To show what is happening, consider the bearing of line Z in Fig. 10 in relation to both the true and magnetic reference directions.

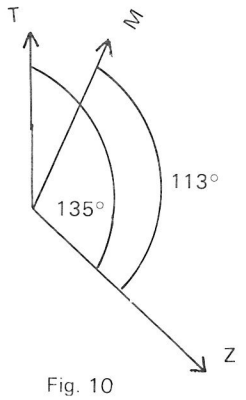
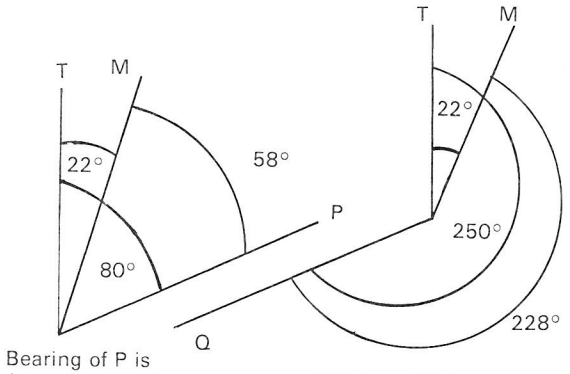


Fig. 10

We find that relative to true north (indicated by "T") the bearing of line Z is 135 degrees. Relative to magnetic north ("M") the bearing is 113 degrees. Since both these bearings describe the same direction we add the letters "T" (relative to true north) or "M" (relative to magnetic north) to distinguish between them. In this case the bearing of line Z is both 135 degrees T and 113 degrees M. Note that we now have two ways of giving a bearing (either true or magnetic). The only difference is the reference direction from which the angles are measured. From now on it will be important to carefully state whether we are talking about true bearings or magnetic bearings.

As you recall, we said the magnetic variation (angular difference between the direction of true north and magnetic north) in the Seattle area was 22 degrees. From this it is easily shown that the difference between a true and magnetic bearing will also be 22 degrees. Examples:



Bearing of P is 80°T and 58°M

Bearing of Q is 250°T and 228°M

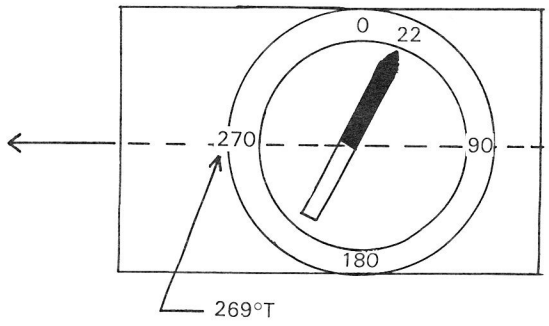
Fig. 11

By studying the illustrations in Fig. 11 you probably have deduced that the true bearing is 22 degrees larger than the magnetic bearing in the Seattle area. This is correct and gives a handy "rule of thumb" guide for converting one kind of bearing to the other. It is important that you understand this difference because in the course of your training it will be necessary for you to make many such conversions.

Knowing this, it is now possible for you to take magnetic bearings and convert them to true bearings (add 22 degrees). Likewise given true bearings you can convert them to magnetic bearings (subtract 22 degrees) and use the compass to find the direction. In both cases you will use the compass precisely as outlined earlier and will be measuring magnetic bearings exclusively.

Some of you, however, will have compasses with devices built into them that allow for direct measurement of true bearings.

In using such a compass to find the bearing of some visible object you follow the following steps: (1) point the compass (base) in the direction of the object, (2) turn the dial until the needle points to 22 degrees east of north, and (3) read the dial at the place corresponding to the direction. The bearing is true. Basically the compass would look like this:



If you are given a true bearing and asked to find the corresponding direction, the steps are: (1) set the bearing on the dial, (2) turn the compass until the needle points to 22 degrees east of north, and (3) the compass is now pointing in the direction of the true bearing.

Actually the only difference (in the procedures to determine true and magnetic bearings directly) is that in true measurements the needle points to 22 degrees east of north on the dial while in magnetic measurements the needle points to the 0 degree mark on the dial.

Deviation

In the preceeding paragraphs it was stated that the compass needle always points toward magnetic north. This is not quite true. The near presence of a magnet (like another compass,) metals containing iron, or even iron deposits in the ground can deflect the needle. This is called deviation. When this happens the compass will no longer give meaningful bearings. To avoid the possibility of such deflections always be sure that there is no metal (heavy zippers, axes, steel hard hats, etc.) near when you use a compass.

Types of Compasses

There is an extremely wide variety of compasses available to the public. They vary from small, inaccurate pocket-watch models to large and very sensitive navigation instruments. For the purposes of ESAR training it is desirable that you select a compass that meets the following criteria:

Lightweight -
Under a pound

Small -
About the size of your hand

Accurate -
Can measure to a 1 degree tolerance

Reliable -
Sturdy, can be used at night

Fast -
Bearings can be made in 20 seconds or less. This is usually achieved by liquid or magnetic dampening which causes the needle to settle down rapidly.

If you already have a compass that meets most of the above criteria it probably will be sufficient; however, if you do not, but are planning to buy one, we strongly recommend the Silva. All but the smallest Silva compasses meet, and in some cases vastly exceed, the specifications listed above. They have been used for many years by ESAR members and have been found to be well suited to our needs.

MAPS - SCALE AND ORIENTATION

Most of you are familiar with the state road maps available at most service stations. If you know how to use it you are well on your way to knowing how to use a map of mountainous areas. Briefly a map is a piece of paper with a collection of symbols which represent various geographical and man made features. It is organized so that a proper perspective is maintained between those features as they actually exist and as they are shown on the map.

To be useful, a map must show two items other than symbols. These are (1) a scale and (2) an indicator of the orientation of the map.

The scale is usually of the form: 1" equals 10,560', 1:126,720, or 0 ——————————— 2 ——— ——————— 4 miles. All of the scales listed above mean the same thing: one inch on the map is the same as two miles of earth's surface. Specifically the first one reads: one inch equals 10,560 feet. The second example says: one unit on the map equals 126,720 of the same units in the field. In this case the unit may be feet, inches, meters or virtually any measure of length. The third example facilitates the use of dividers on the map. Of course, not all maps have the same scale as listed above. Common scales may vary from 1" equals 70' to 1' equals 20 miles.

Almost always a map is oriented to true north. This means that there is an arrow on the map that indicates the direction of true north. By using this arrow as a reference line it becomes possible, with a protractor, to measure the direction between any two points on the map. As an example, assume Fig. 13 is a map.

Fig. 12

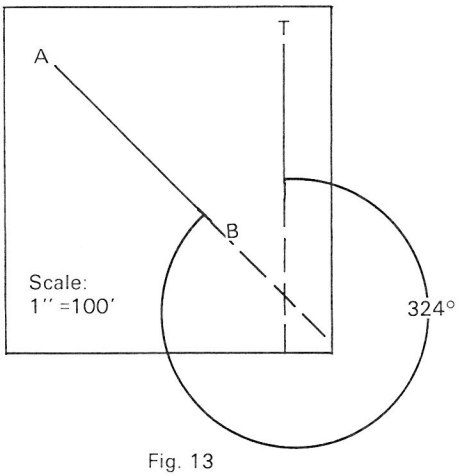


Fig. 13

It can be seen that the direction from point B to point A is 324 degrees T. Remember true bearings are measured in a clockwise direction from true north. This was done simply by extending the two lines and measuring the angle at their intersection. Likewise, by using the scale, the distance between A and B is found to be 1¾ inches in the map or 175 feet in the field.

It is possible that you may find a map oriented to some direction other than true north. Such an orientation is perfectly correct, but is likely to cause confusion if you don't notice it; therefore, always look for something on the map that indicates how it is oriented. If there is no such marker, then you may assume that the top of the map is oriented to true north.

There are many types of maps in existence. The most common are the forest service maps, Metsker maps, and U.S. Govt. topographical maps. The most significant difference between these maps is the manner in which they indicate hills and mountains.

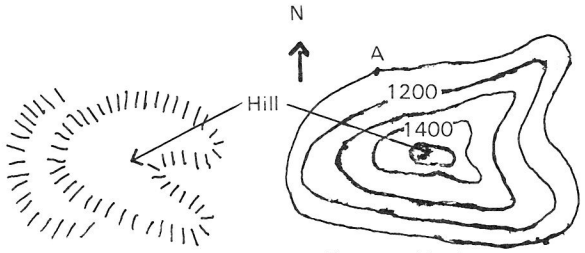


Fig. 14

Generally speaking, topographical maps are preferred because they provide more detailed information. Hills and valleys are illustrated through the use of contour lines. A **contour line** is a connected set of points all of which are the same elevation above sea level. Every point in the line marked 1200 is 1200 feet above sea level. Likewise every point in the next contour line toward the center is 1300 feet above sea level. You can see that if you were going south from point A you would first climb a hill and then descend it.

Map reading, like using compass and stride, is a skill that develops with practice. We don't expect you to be an expert now but by the time you complete the training you should have a fairly good understanding of their uses.

Topographic maps are usually the best kind for use in search and rescue.

Township and Range

Recalling the hypothetical operation mentioned earlier, let us now assume that the airplane crash site has been found by one of the ESAR teams. Let us say also that the pilot is injured and needs to be evacuated by litter. Since an evacuation by a single team is hard work, the team leader wants to direct the other ESAR teams to his location. The team leader's problem is to describe his location in some clear and unambiguous manner.

One method would be by giving his latitude and longitude coordinates. This system, although used in sea and air navigation, is not commonly adapted to land based rescue work.

Another method is termed location by township and range. This system is used widely (except on the east coast) and lends itself well to rescue work. At first it may seem confusing and complicated, but with a little effort it is not too difficult to master.

Within various states there is located what is called an "initial point" for survey purposes. Through this point a north-south meridian and an east-west base line have been surveyed. At intervals of 6 miles on both the meridian and base line additional paralled lines have been drawn to form a sort of grid pattern. See Fig. 15.

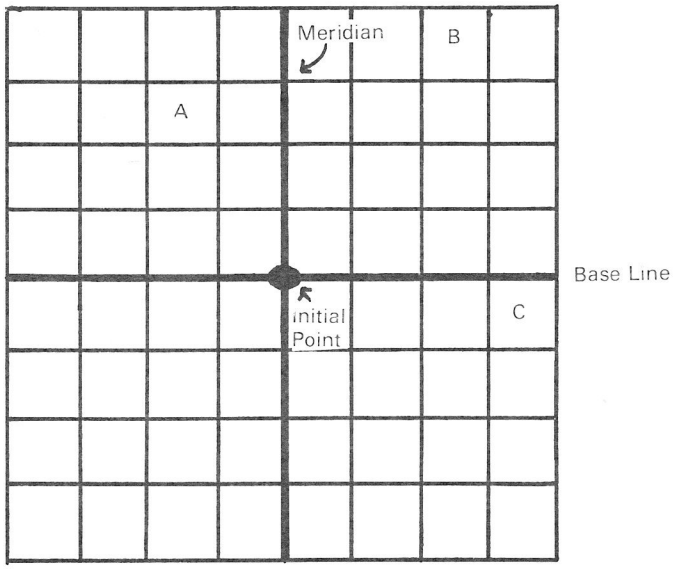


Fig. 15

This grid pattern may extend over the entire area of one or several states and effectively divides the states into a collection of squares six miles on a side. Each square (called a Township) is named according to its location relative to the initial point. Each unit north or south along the meridian is called a Township. (Unfortunately this is a little ambiguous. **Township** can correctly refer to either a unit along the meridian or to any one of the squares formed by the grid. Any confusion should clear as the explanation continues.) Each unit east or west along the base line is called a **Range.**

By giving Township and Range coordinates it now becomes possible to locate virtually any of the squares (Townships) in the grid. The method is analogous to problems in Algebra where you can locate a point by giving its x and y coordinates. The location of the Township marked "A" in Fig. 15 is given as: Township 3 North, Range 2 West. This means it is located in the third township north of the initial point and in the second range west of the same point. Likewise Township "B" is located as Township 4 North, Range 3 East. Township "C" is: Township 1 South, Range 4 East.

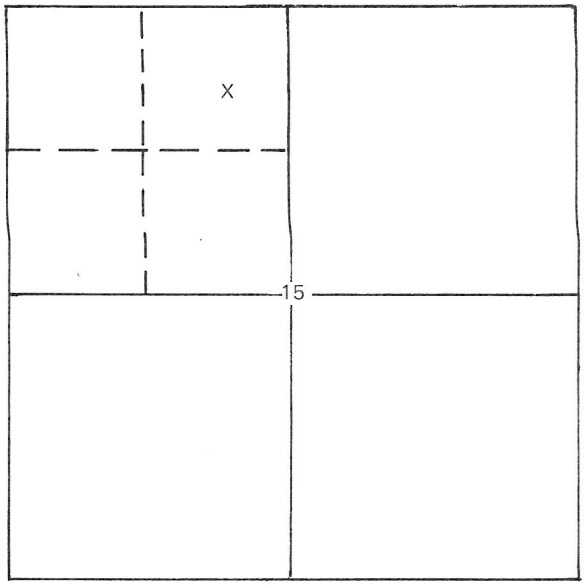
Recalling our hypothetical operation again, let us say the team leader has found himself to be in Township 27 North, Range 5 East. Remember a Township is a square six miles on a side or 36 square miles. Obviously if our team leader is going to get any help from other teams he will have to give his location more precisely.

Logically enough, each township is further divided into its component 36 square miles. Each square mile is called **section**. Fig. 16 illustrates how a township is divided into sections. Also it shows how the sections are numbered for ease of reference.

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Fig. 16

Let us now say that the team leader has located himself in Section 15. In other words his location is Sec. 15 or T 27 N, R 5 E. Since a section covers an area of one square mile, the team leader will have to be even more precise in giving his position. From this point on, the process is one of quartering. For example, consider the following figure to be section 15.



Sec. 15 of T 27 N, R 5 E.
Fig. 17

If the "X" mark represents the position of the team, we can now say they are in the NW¼ of Sec. 15 of T 27 N,R 5 E. If further accuracy is desired we can quarter again (as indicated by the dotted lines). Now the location is NE¼ of NW¼ of Sec. 15 of T 27 N, R 5 E.

The process of quartering could theoretically be kept up indefinitely; however, it is seldom carried past four operations. Thus the complete location of the team would read: NW¼ of SE¼ of NE¼ of NW¼ of Sec. 15 of T 27 N, R 5 E.

This description names one and only one 2½ acre piece of land.

As a second example, the location of pt. Y in Fig. 18 would be: NW¼ of SE¼ of Sec. 10 of T 19 N, R 8 W.

Point Z in Fig. 18 would be: NE¼ of SW¼ of Sec. 20, T 20 N, R 7 W.

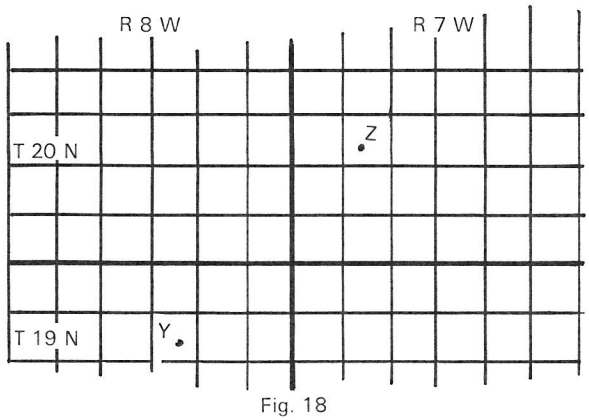
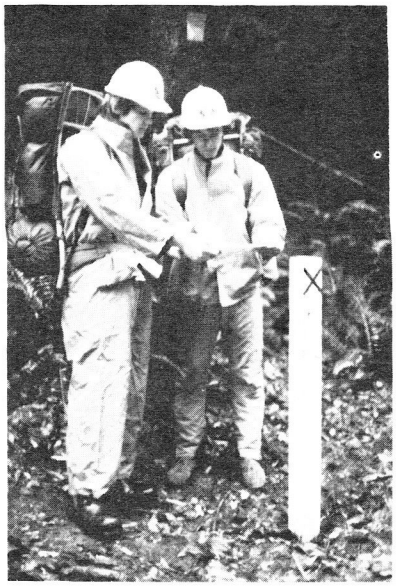


Fig. 18

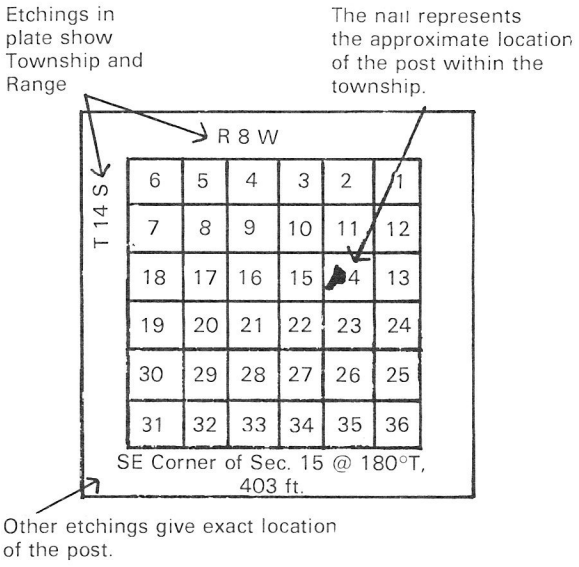


A survey post will tell you your location.

In surveyed areas, a wooden post is often planted where a section line crosses a road. These posts are usually white and have an "X" mark on the side facing the road. On the back side of the post a metal plate has been attached. This plate shows all of the sections within a township: a nail will be driven through the plate at the point representing the location of the post within the township.

Fig. 19

PLATE ON BACK SIDE OF SURVEY POST



These posts are very useful because they provide a quick and accurate check of your location. While in the field, you should use them frequently.

Location by Township and Range may seem complicated to you now; however, with a little practice you should be able to master it. It is a frequently used system in many parts of the country.

Uniform Map System

Another map system has been gaining acceptance for use in search and rescue. The objective was to find a system that could be applied to almost any kind of map and to most any kind of search and rescue need. The uniform map system has been the answer.

The system starts by making use of the sectional aeronautical charts that cover all of the U. S. Each chart contains a number of 15' quadrangles (areas 15' longitude by 15' latitude in size). Each quad is assigned a number. The numbering system starts in the upper left corner with #1 and counts horizontally to the right. After the first row, the counting starts at the left end of the second row again going to the right. This process is continued until the last quad is numbered in the lower right corner.

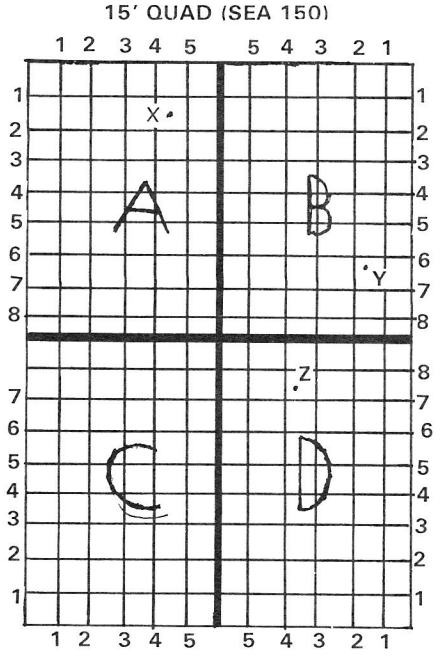
As an example, the numbering system for the seattle Sectional is shown in Fig. 20.

Fig. 20
SEATTLE SECTIONAL

To identify one particular quad it is necessary to give only the three letters (SEA for Seattle) that identify the sectional and the numbers which indicate the quad. Portland, Oregon, would be located in SEA 458.

The real advantage of this system is that all U.S. Geological Survey (topographic) maps easily conform to it. Each 15' map represents one quad. The maps in a set can be previously numbered and indexed for reference.

To pin-point a location within a 15' quad, distance in 1/10 of miles is measured first horizontally and then vertically from the **nearest corner** of the 15' quad. The letters A, B, C and D are used to indicate which corner you measured from.



For example, point "X" is located within SEA 150 A. Furthermore, it is 4.5 miles horizontally and 1.5 miles vertically from the nearest corner of the 15' quad. The location of point "X" is SEA 150 A 4515.

Other examples:

Point Y: SEA 150 B 1763

Point Z: SEA 150 D 3773

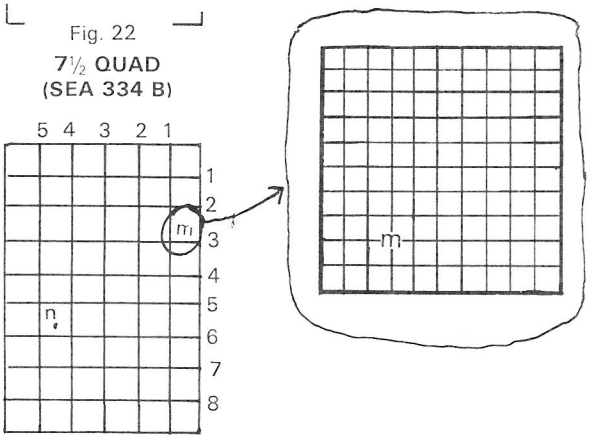
As you can see, this method will plot a location accurate to within 1/10 mile.

Where a 7½' map is being used, the same system applies. Each 7½' map will have a sectional designation (three letters), a number (three digits indicating which 15' quad it belongs to) and a letter (A, B, C or D indicating which portion of the 15' quad). The only precaution is to be sure you measure from the correct corner.

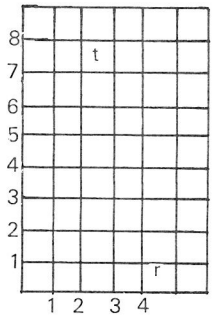
Map	Measure from
A	Upper left corner
B	Upper right corner
C	Lower left corner
D	Lower right corner

The Uniform Map System is becoming popular because it is simple and it can be applied to most maps.

Fig. 22



Examples: Point M: SEA 334 B 0728
Point N: SEA 334 B 4557



Examples: Point R: SEA 142 C 4407
Point T: SEA 142 C 2575

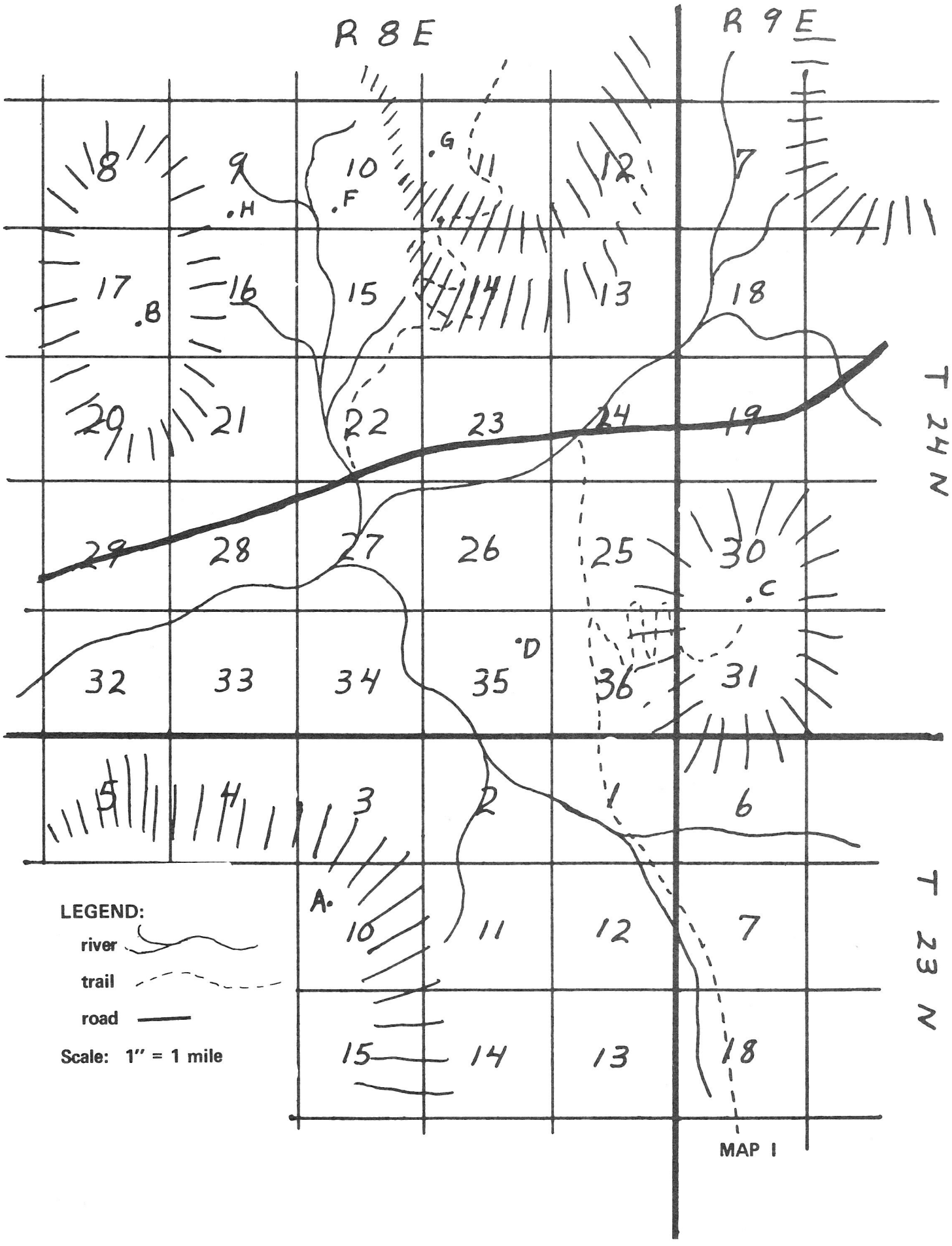
PROBLEMS: WILDERNESS NAVIGATION

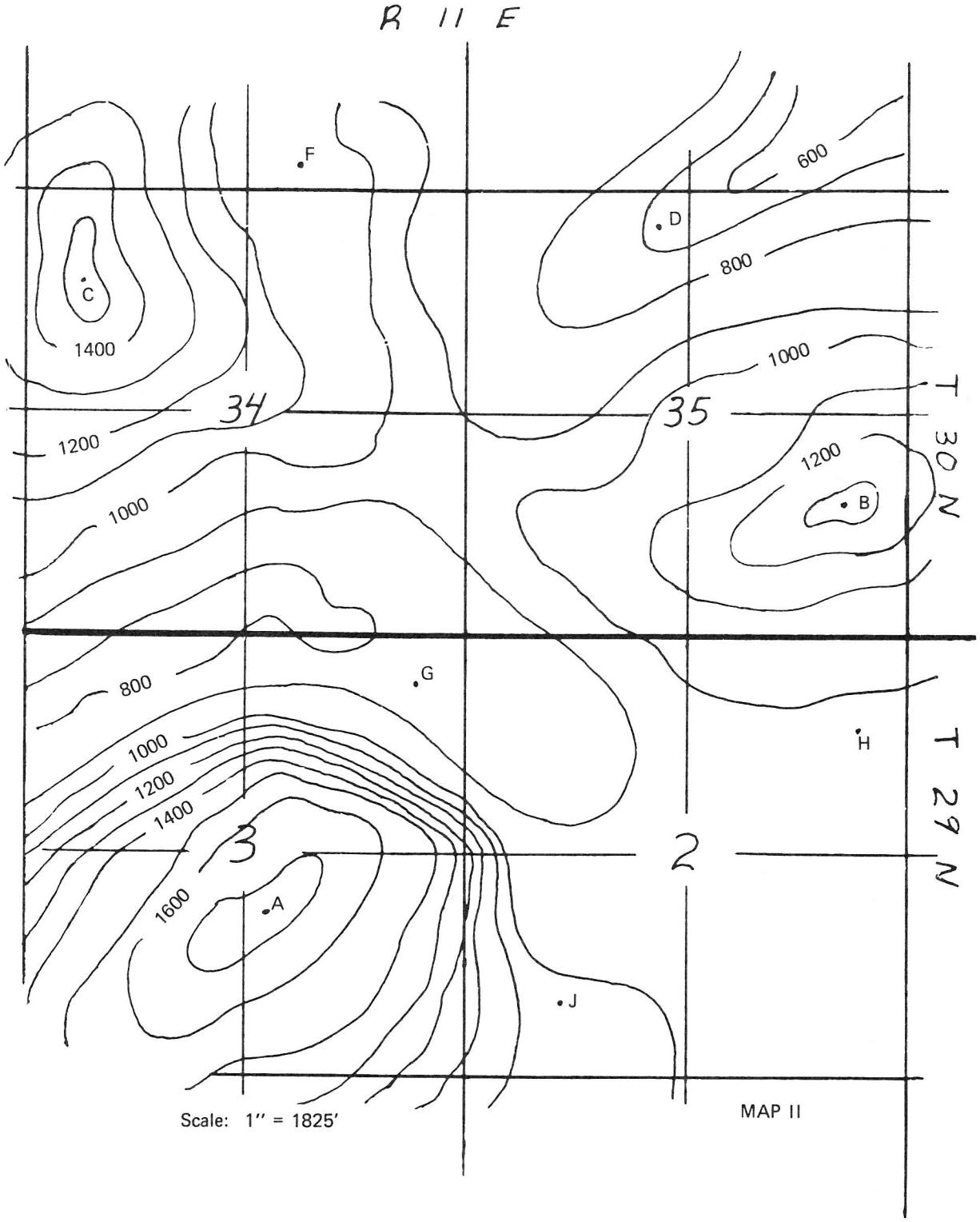
In this section, we have introduced a number of ideas and techniques. We do not expect you to be an expert simply on the basis of this reading. It is desirable that you have a general understanding of *this material before your first weekend of training;* however, thrre will be opportunities for you to ask questions at that time.

In the form of a review the following problems have been included. You are strongly urged to do them. The answers are on page 77.

I. The following questions are in reference to Map I (page 39). Use 22 degree E variation.
   1. a. What is the direction from pt. A to pt. B?
      b. What is the distance between pt. A and pt. B?
   2. Which area is more likely to be level - Sec. 14, T 24 N, R 8 E, or Sec. 13, T 23 N, R 8 E?
   3. a. What is the direction from pt. C to pt. A?
      b. What is the distance between these points?
   4. a. If you were to walk in a direct line from pt. A to pt. C would you:
         a. go uphill then down?
         b. go downhill then up?
         c. be on the level for the whole trip?
         d. cannot be determined
      b. How many times would you cross a river on that trip?
   5. If you were in the center of Sec. 7, T 23 N, R 9 E.
      a. How far away is the nearest trail?
      b. In what direction?
   6. Which is higher above sea level?
      a. Sec. 6, T 24 N, R 9 E.
      b. Sec. 27, T 24 N, R 8 E.
   7. What is located in NE¼, Sec. 35, T 24 N, R 8 E?
   8. If you were located at the SE corner of Sec. 19, T 24 N, R 9 E.
      a. What is the shortest distance to a road?
      b. In what direction (magnetic)?
   9. From pt. C, plot a direction of 311 degrees T. From pt. D, plot a direction of 358 degrees M.
      In what quarter section do these lines intersect?
   10. From pt. D, a bearing of 315 degrees M passes nearest what other point?

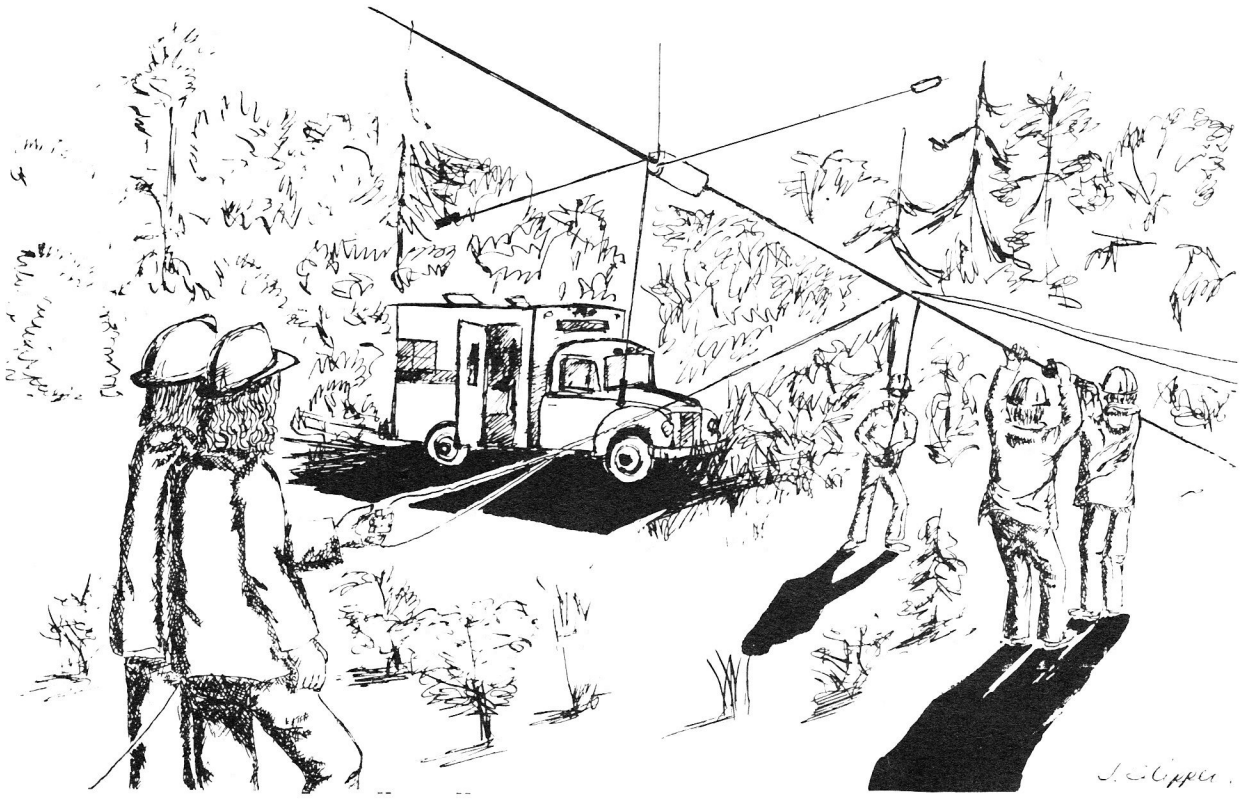
II. The following questions are in reference ot Map II (page 40). Use 22 degree E variation.
   1. How many peaks are shown on this map?
   2. a. Which peak is the highest?
      b. In what quarter section is it located?
   3. What is the elevation of point B?
   4. What geographical feature is located in SE¼ Sec. 34 and SW¼ Sec. 35 (both of T 30 N, R 11 E)?
   5. A stream which is not shown on the map passes through pt. D. What direction does it flow?
   6. In what quarter section is the steepest area shown?
   7. Which of the lettered points is lowest?
   8. What quarter section is most level?
   9. By quartering 4 times, what is the location of pt. J?


R 8 E
R 9 E
T 24 N
T 23 N
LEGEND:
river
trail
road
Scale: 1" = 1 mile
MAP I



Scale: 1" = 1825'

MAP II



COMMUNICATIONS

INTRODUCTION

Webster defines communication as "the exchange of thoughts and information. . .". ESAR finds the process somewhat more complex! If for example a message is garbled, it could result in needless action, failure of the mission or even loss of life. Since communications is only a tool, it's effectiveness is limited to the degree of skill exercised by the user. An attitude of professionalism greatly aids in accomplishing the goal. The objective is the timely and accurate exchange of information.

Every person can contribute whether they are involved as a special communications operator or only as a casual user of the system. Each person should be capable of communicating with materials readily available in the field. The following are the many types of communications used by ESAR.

BASIC COMMUNICATIONS

Visual Communications

METHOD - PURPOSE

Signs
: To direct ESAR personnel to the base camp or operations area. They should be highly visible day or night and indicate direction to travel.

Grid Ribbon
: To appropriately mark search area.

Written Note
: To provide a one-way message. Contents may include:
  - Intended recipient
  - Date, time and location
  - Direction and means of travel
  - Destination and purpose
  - Plans to return
  - Your name and companions with you
  - Special problems such as injuries

Hand Motion
: To direct aircraft or vehicles when other means are not possible or effective.

Special Light
: To attract attention of aircraft or to serve as a beacon to attract the lost person.

Signal Mirror
: To attract attention of aircraft or ground parties. Fairly ineffective at relaying messages.

Flare
: To attract attention of aircraft and mark location.

Smoke Device
: To attract attention, mark location and indicate wind direction.

Ground Markers
: To show landing area. Also used to request assistance even though aircraft may not land.

Audio Communications

METHOD - PURPOSE

Voice

To give directions in controlling grid teams. Also can be used in some cases to call out the name of the missing subject. Please note that voice communiction works best when the listeners outnumber the talkers.

PA System

Used as above but with more restraint. Loud speakers are capable of causing confusion if used excessively.

Signal Device

To indicate your approximate location or as a beacon to attract the lost person. Sirens, horns or whistles are subject to the effects of both wind and echo.

Warning -

Never create needless or confusing signals (e.g. waving at a search aircraft.) Misunderstandings may result that will cause problems or delay.

It is very desirable that radio operators have had experience in the field.

RADIO COMMUNICATIONS

It can safely be said that no subject produces more expert opinions in ESAR than radio communications! Even at that, Explorer Search and Rescue is developing a radio system that will best serve the present and future needs of the program. Utilizing the frequency of 47.500 MHz FM, ESAR units can coordinate an operation or training exercise as well as talk with many military helicopters equipped for that same frequency. Adjacent radio channels provide local coverage to ESAR units. All such channels are within the Low Band segment of the Special Emergency Radio Service licensed by the Federal Communications Commission (FCC).

Users should acquaint themselves with local operating procedures and FCC rules concerning the Special Emergency service. Other radio services sometimes used to supplement the ESAR net include:

Police
Local Government
Federal
Military
Amateur

Each has its own rules and regulations. Know the appropriate procedure *before* using someone else's transmitting equipment. You will be protecting their license as well as your future invitation to operate under the terms of their authorization.

Field Technique

Although an "in-town" communications center is important for mobilization and dispatch functions, it is the field system that will have the most direct impact on the mission and the ESAR members assisting. A control point in base camp is needed to coordinate radio communications. It might be as rustic as a tent or the tailgate of a station wagon, or as plush as a trailer or special "Commo" van. Whatever the set-up, the field base must be capable of talking with teams in the field. It is also desirable to have point to point communications back to town and to tie in with other search and rescue agencies. Sometimes a relay is needed to cover areas with marginal or no reception.

It is the task of the explorer who is the Crew Chief to take charge and install the field radio system. He will inquire of the OL as to which area needs radio coverage. Working with what often turns out to be a shortage of portable radios, he will assign the equipment to the Team Leader or his designate. Radios are like people and plants, they need tender loving care!

When team radios are switched on and left on during a search, it is not necessary to establish a regular check-in schedule. Should the OL come up with important information or a change in plans, he will be able to call the teams. However, if a team hasn't made any transmissions for an hour or so, the TL should check in and give his location. This way the OL knows the team is still within range, its radio is working, and the team's location can be plotted on the base map.

Where radios are switched off between messages, a definite check-in schedule is important. The team must call in on time even if they are busy and have nothing to report: the OL may have important information for the team. **The failure to hear from a team for a period of time can result in a needless search for the searchers.**

Radio Traffic; Instructions and Tips

TRAFFIC: Messages should be brief. If long and complex, they should be written out beforehand and transmitted in segments. This way the receiver can acknowledge his understanding of the contents as he is receiving the message. Other teams should not interrupt unless circumstances fully warrant such action. **Do not report injury or death over any radio except by code!**

A good team can get their point across without embarrassment even if the information is sensitive. For example:

The Right Way

"We are attempting to verify our exact position. Do you have information that might aid us?"

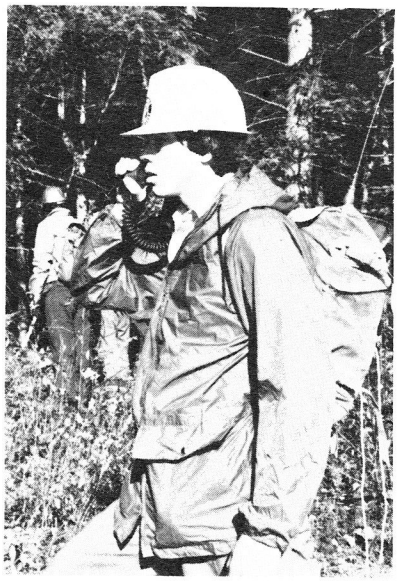
The Wrong Way

"We don't know where we are. I think we're lost!"

Common sense and taking time to use it will be the thing that makes a good communications system even better.

OPERATING INSTRUCTIONS: The following general information applies to a two-way portable radio in the field.

1. Keep the antenna vertical and fully erect.
2. Keep people away. This prevents background chatter and keeps the transmitted signal from being "soaked up."
3. Be careful of relationship of mouth and mike. About one inch is usually best.
4. Press the mike button one full second before starting to talk. Many radio sets won't start transmitting immediately - they require ½-1 second to warm up. If you begin to talk before the transmitter starts, your first few words will be lost.
5. Don't shout **or** talk too softly. **Do** use a firm voice.
6. Avoid rushing. By speaking slowly the message will be copied the first time.
7. Use easily understood words. The phonetic alphabet may be used for clarification. So called "10 Codes" are often confused or forgotten: this makes them more of a bar to communication than a help.
8. "Repeat" is often heard as "received." That's quite a difference! Instead, use the expression "say again." Many prefer "affirmative" and "negative" in place of "yes" and "no."
9. Use 24 hour clock, local time.
10. Keep it short, transmitting typically takes ten times the battery power as receiving.
11. Always yield the channel for more urgent or emergency traffic.



Keep the radio inside of the pack. This will protect it from rain and physical abuse.

SPECIAL TIPS: If you are having difficulty contacting someone by radio, try the following:

1. Move the set around. Sometimes even a foot will make the difference.
2. Improve the "ground" by placing the metal handle or case of the radio against the side of your face, a metal pack frame, or a sheet of foil.
3. If you are told that your carrier (signal) is being heard but without modulation (voice), you should use the mike button to "click" answers to questions put to you by the caller.

1 click means **Negative**
2 clicks means **Affirmative**
3 clicks means **You Require Assistance**
3 clicks repeated 3 times mean you have an **Emergency**

4. If the radio has been gradually growing weaker through the day it will need a warm night's rest to recover for use the next day. When the weather is cold, battery packs tend to slow down quite a bit. Place the set (minus antenna of course) in an occupied sleeping bag. By morning your set will stand a much better chance of operating. **Never attempt to warm battery packs by open flame!**
5. Under marginal radio conditions, the phonetic spelling of an important word may help to make it understood.

PHONETIC ALPHABETS

U.S. Public Safety		Aeronautical International	
Adam	Nora	Alpha	November
Boy	Ocean	Bravo	Oscar
Charles	Paul	Charlie	Papa
David	Queen	Delta	Quebec
Edward	Robert	Echo	Romeo
Frank	Sam	Foxtrot	Sierra
George	Tom	Golf	Tango
Henry	Union	Hotel	Uniform
Ida	Victor	India	Victor
John	William	Juliet	Whiskey
King	X-Ray	Kilo	X-Ray
Lincoln	Young	Lima	Yankee
Mary	Zebra	Mike	Zulu

SPECIALIZING

Explorers with a vocational or hobby interest in communications may want to specialize in this field. ESAR provides a place where the practical application of the subject can be achieved and, at the same time, render a valuable service. Perhaps a worthwhile goal for such persons would be the obtainment of Crew Chief status. This step is similar to a team member who advances to team leader. That is, the explorer is able to direct others as well as perform the duty himself.

Regardless of how involved an explorer wants to become in communications, he will benefit greatly from also undergoing the complete basic training course and taking part in actual operations as a team member. Besides seeing it like it is, a prospective "Commo" crew member will learn the terminology and be better able to relay operational messages. Anyway, who wants to sit in a nice warm communications van when he could be out in the wet and cold crashing through brush and brambles.

HELICOPTER PROCEDURES

INTRODUCTION

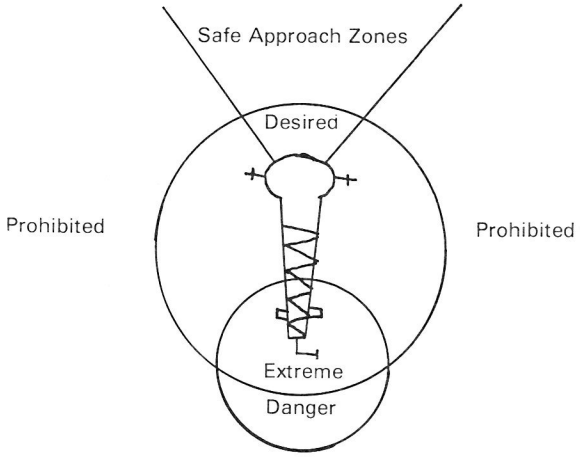
More and more frequently helicopters are being used in search and rescue work. The three primary uses are:

1. Air search
2. Transportation of teams
3. Evacuation

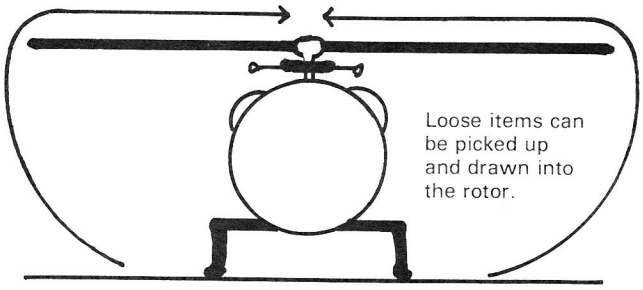
The following is a brief description of some of the safety rules and procedures that relate to helicopter use. *The diagrams in this section are reproduced with permission from Helirescue Manual.* (1)

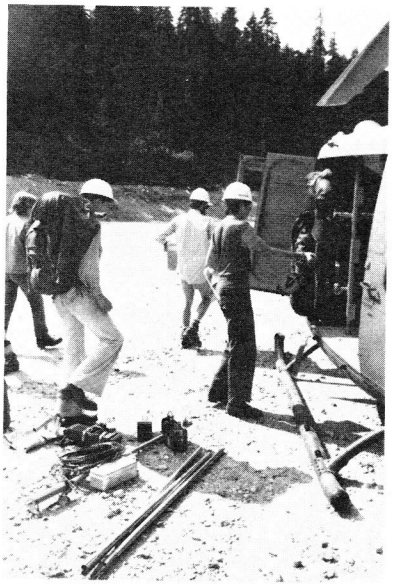
SAFETY RULES:

1. Stay at least 100 feet away from the helicopter when rotors are in motion unless specifically directed otherwise. The pilot may want to change position; the rotors may dip low or the tail rotor may swing around.



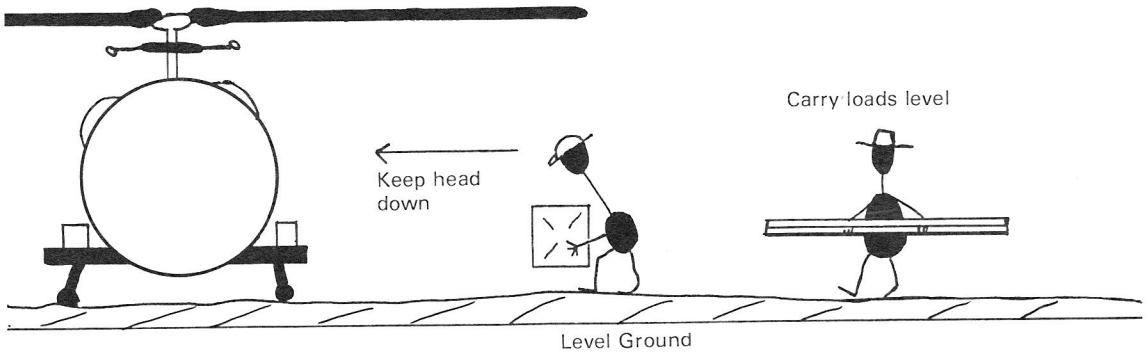
2. Keep all items in the helicopter zone secured. Loose items can be drawn into the rotor.





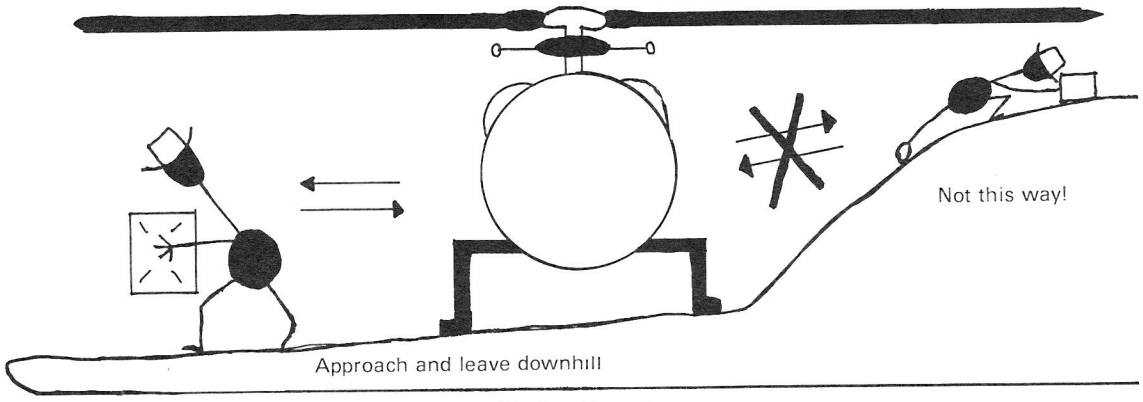
Let the pilot or crewmen supervise the loading of equipment.

3. Keep your head down at all times. A slow moving rotor will usually dip further than a fast moving rotor: it may be less than 5 feet off the ground. Keep large loads low to the ground.



Level Ground

4. Never approach or leave a helicopter from any side where the ground is higher than the helicopter - you may walk into the rotor.



Sloping Ground

5. Wear eye protection (goggles or face mask) when working near a helicopter with rotors in motion. The rotor wash can pick up all sorts of debris.
6. Always *approach or leave a helicopter from the front* so the pilot can see you at all times. Stay away from the tail rotor at all times.
7. Load and unload under the pilot's supervision. He knows best how to load the helicopter and how to secure equipment items. *At all times, the pilot is in charge.*
8. Do not approach the helicopter without the pilot's permission. Among military pilots, a thumbs up signal means you are asking permission to approach. He will reply by nodding his head or by returning the same thumbs up gesture.
9. Do not exit a helicopter until the pilot signals OK.
10. Never stand under a helicopter or in its take-off zone.
11. No smoking within 100 feet of the helicopter.

HELICOPTER OPERATIONS

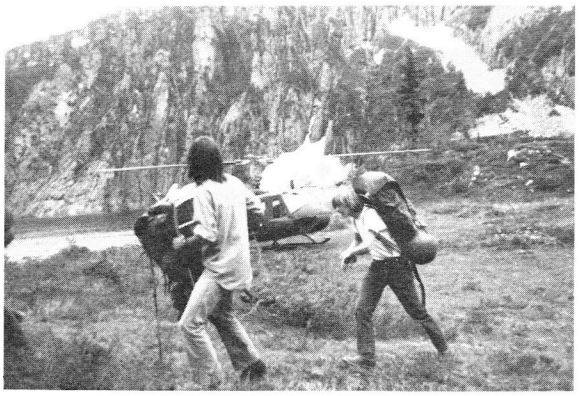
Loading Procedure

If a team is going to be loaded aboard a helicopter, the following procedure should be used.

1. The team leader asks permission to approach the helicopter (thumbs up signal).
2. When permission is obtained, he approaches from the downhill front side of the helicopter.
3. If the helicopter crew is ready to receive the rest of the team, the team leader should signal the remainder of the team.
4. Each team member should approach the helicopter from the same direction as the team leader. Packs should be carried in the arms, not on the back. Keep heads down and loose items secured. Eye protection should be worn along with a hard hat with chin strap.
5. Follow instructions from the crew on where to sit. Packs may be loaded separately or stored between the team members' legs.
6. Secure your seat belt.

Unloading Procedures

1. Remain within the helicopter until a crewman instructs the team to unload.
2. Step from the helicopter, take your pack in your arms and depart in a foreward downhill direction. Keep your head down and gear secure.
3. The team leader should be the last to leave, making sure that all team members and equipment have been off-loaded.



Exit the helicopter toward the front. Make sure you have all of your gear.

Landing Areas

A landing site should be 50-100 feet in diameter depending upon the size of the helicopter. It should be situated so that there is an adequate approach and take-off zone. It is important for the helicopter to face into the wind upon landing and take-off.

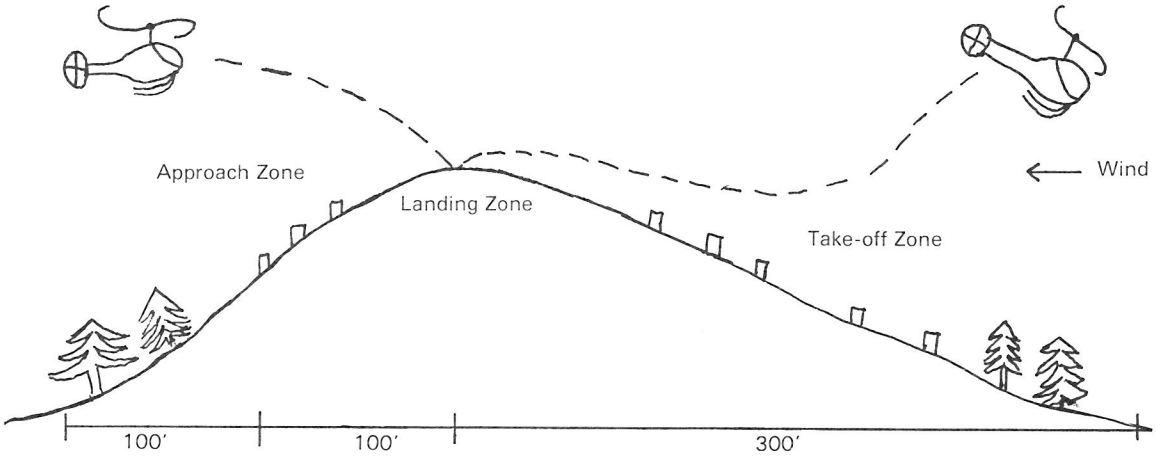
The take-off zone allows the helicopter to gain foreward speed before attempting to climb. An ideal take-off zone allows the helicopter to go down hill. Direct vertical climbs are possible but are more dangerous and should be avoided.

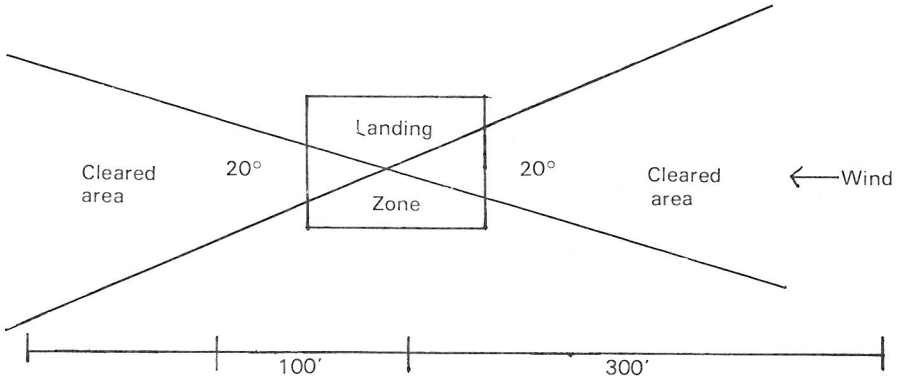
Emergency Procedures

If the helicopter looses power but has more than 300 feet elevation it is still possible to make a safe landing. The pilot can use the rotors to break the fall of the helicopter (autorotation). Just prior to landing he can change pitch and slow the descent to reasonable tolerances.

In this situation you should:

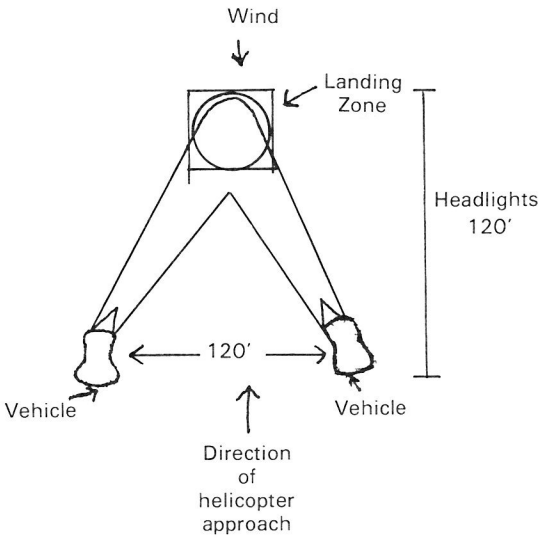
1. Stay calm
2. Tighten seat belt
3. Keep hard hat on and chin strap fastened.
4. Upon pilot orders *only,* throw out heavy equipment.
5. Note location of exits, door handles, etc.
6. Stay clear of any controls.
7. Upon landing, stay put until ordered by the pilot to exit. If the landing has been hard, stay within the helicopter until all motion has ceased: exception - in case of fire.





A gravel bar will often make an adequate landing zone.

LANDING ZONE AT NIGHT



Helicopter Evacuations

Helicopter evacuations can be accomplished in either of two ways.

1. Landing
2. Hovering pick-up

It is far preferable to have the helicopter land and load the subject inside. It is safer for all concerned.

Hovering recoveries can be justified only under serious circumstances and usually only in difficult terrain. For that reason, the actual pick-up will almost always be done under the supervision of Mountain Rescue members or other technical persons: it is not generally within the scope of ESAR training.

When preparing the subject for helicopter evacuation, the following considerations are necessary.

1. Tell the subject that he is going to be transported by helicopter - this can relieve a lot of uncertainty. Reassure him that he is being looked after and that the procedures to be used are safe. Inform him of the noise, vibration, and wind turbulence that are normal to helicopter use.
2. Make sure the subject is well secured in the litter and there are no loose straps, etc.
3. Supply face and eye protection to prevent injury by blowing debris.
4. Include a note with the litter:
   a. Subject's name
   b. Condition
   c. Treatment given
   d. Request the receiving hospital to hold onto the litter, sleeping bags, etc. until they can be claimed.

HYPOTHERMIA

INTRODUCTION

Accidental hypothermia accounts for a great many mountaineering fatalities in the northern regions of the U.S. Hypothermia is serious - it can kill people in a matter of hours. Hypothermia is also preventable - all it takes is knowledge, judgement, and equipment.

Hypothermia is the lowering of the body's core temperature. When heat loss exceeds heat production, the body temperature lowers from the normal 98.6 degrees F. The victim suffers very definite effects while this happens. When the core temperature reaches about 78 degrees F, death usually occurs. Hypothermia is sometimes called exposure. "Exposure", however, has no well defined meaning.

In the out-of-doors, hypothermia is often associated with cold, wetness, and wind. Cold hands, cold feet, and shivering are the beginning signs of hypothermia: almost everyone has felt these symptoms. However, there is a misimpression that there is little hazard as long as the temperature is above freezing. Many people associate danger with mountain climbers enduring sub-freezing temperatures on exposed slopes at high altitude. Actually more recreational hikers and hunters will die from hypothermia at low altitude at temperatures of 35-50 degrees F. The difference has to do with recognizing the hazard. Experienced climbers will know the hazard they face and will prepare for it: inexperienced hikers don't recognize the hazard or plan for it.

Hypothermia is serious. Each ESAR team member must be well acquainted with its effects for two reasons. (1) So that he may recognize hypothermia's effects on himself or on others in the team and act quickly to prevent it or to start treatment. (2) On a great many operations the subject of the search will be hypothermic: the team must know what to do when they find him.

The following example may serve to reinforce the importance of knowing about hypothermia.

A little over two years ago, four ESAR units were involved in a search for two missing hunters in a remote and very rugged area. On the first day, a group of 60 sincere but untrained and ill-equipped men from another organization also started searching. They were dressed in heavy cotton and carried no rain gear or 24 hour packs. The weather was cold 30-35 degrees F. Precipitation was heavy in the form of rain and wet snow. The terrain was very heavy trees and brush.

Six hours after leaving, one 4-men ESAR team rendezvoused with the group in the field. The Team Leader immediately recognized that several of these men were already well advanced into hypothermia. The team gave up their extra clothing to the most needy: four 24 hour packs couldn't supply 60 persons however. The Team Leader suggested that the group discontinue their search assignment, and start out taking a longer but easier route. They agreed. Two other ESAR teams were diverted from their assignment to set up a warming station at the midway point on the route out.

For the following 12 hours a total of 15 ESAR members provided clothing, hot food, warming fires, and guides for the 60. Three of the men were treated for intense hypothermia: one was later hospitalized. All of this was done from the resources contained

within fifteen 24 hour packs. Finally, at 3:00 AM, the ordeal ended when the last man had been loaded on a truck: this was 18 hours after the start of the search.

Wet snow and dense brush. Two hunters died here from hypothermia.

There is no way to know for sure what would have happened had the 1st 4-man team not been in the right place at the right time. Most authorities agree that probably several of the men would have perished that night. Had the men not taken the longer but easier route out, probably more would have died. The difference between the 15 ESAR fellows and the 60 men was only in their training and their equipment. The men hadn't heard of the word "hypothermia." They didn't know of its seriousness, how to recognize it, prevent it, or treat it. Because one Team Leader did know, a probable tragedy was avoided.

Later on the two hunters (the reason for the search) were found: both had died from hypothermia.

A TYPICAL CASE

Two friends, Fred and George, set out to make a quick 1-day climb of a nearby peak. The climb isn't hard, no special equipment or training is required. The weather is a comfortable 50 degrees F, no wind, and clear sky. Its a late summer day: a good day for a hike.

Fred ate a good breakfast. George had a candy bar just before they hit the trail: he rarely eats breakfast and wasn't hungry. Both fellows carry a light pack containing lunch and a jacket. Both are dressed in a light shirt, jeans, and hiking boots.

For the first three hours, they follow a trail. Both are enjoying the climb. They then start off cross country toward the peak.

About 11:00 AM the wind picks up a little and it starts to cloud over. By noon a drizzle starts falling. Both fellows put on their jackets. Pushing through the wet brush Fred and George soon become soaked; however, the peak is now close. It won't be much longer. Climbing above the brush level, the boys are exposed to winds of 15-20 mph. The temperature has dropped to 41 degrees F. Both are shivering but neither wants to be the first to suggest they turn back. They plod on up the ridge finally reaching the summit around 2:15 PM.

They had planned to eat lunch on the summit but, because of the cold, decide to head down after only a 5 minute breather. By now George is shivering rather violently. He has difficulty tying his boot lace. When Fred asks him if he's OK, George mumbles something about starting down.

Fred leads the way down. Both fellows are cold and tired. Neither boy says anything to the other. They just keep plodding on. George slips and falls twice. He gets up slowly the first time. The second time he just sits in the wet moss for a few minutes. When he gets up he leaves his pack and starts out to catch up with Fred.

Fred doesn't realize that George has fallen behind for some minutes. He stops to wait. When George still doesn't show, Fred climbs back up the slope through the wet brush. There is no trace of his partner. He figures that George took another route toward the trail - he can catch up with him there.

Somewhat disoriented, Fred has difficulty finding his way back to the trail. It is 5:00 PM before he finds the trail and starts down to the road. He finds no sign of George: nor is he really looking. Fred is cold, exhausted, and his thinking has become mechanical and dull.

At 7:00 PM, Fred makes it to the road. A farmer gives him a ride to his house where Fred is warmed and fed. What Fred doesn't know is that George collapsed only 500 feet from where he had left his pack. He died three hours ago. In George's pack, searchers will find an uneaten lunch and an unused wool stocking cap.

It was a late summer day: a good day for a hike.

SYMPTOMS

It is important to stress that only in the most mild stages of hypothermia the victim will be aware of his difficulty. Mental alertness is quickly lost. The person becomes incapable of recognizing his situation or of responding appropriately. This is why a person must take care of himself at the earliest sign of hypothermia and why each person should be watchful of the others.

SYMPTOMS OF HYPOTHERMIA

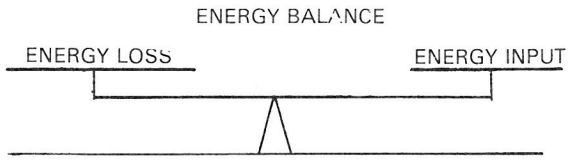
The hypothermic victim goes through a fairly predictable sequence of stages as his condition worsens. These symptoms are the clues that one must constantly look for within himself and among others.

Core Temperature	Symptoms observed by others	Symptoms felt by victim
99-96 Degrees F Mild	Poor coordination, slowing of pace, weakness, dizziness.	Inability to perform complex tasks, fatigue, uncontrollable shivering.
96-91 Degrees F Mild - Intense	Difficulty with speech, slowed reactons, stumbling, tense muscles, loss of attention.	Violent shivering, difficulty in speaking, sluggish thinking, stumbling, feeling of deep cold or numbness.
90-86 Degrees F Intense	Poor judgement, hallucinations, faltering, jerky motions, blue skin.	Shivering decreases and is replaced by muscular rigidity. Muscle coordination is affected producing erratic or jerky motions. Unclear thinking, dull comprehension, amnesia. Maintainence of posture is usually fair and there is contact with surrounding environment. Loss of will power, mental exhaustion.
85-81 Degrees F Intense - Severe	Stupor, blue skin, tiredness, lack of will power, faltering, pupil dilation.	Stupor, loss of contact with environment, muscular rigidity, slower pulse and respiration, blue skin, intense fatigue, great desire for rest.
80-78 Degrees F Severe	Unconsciousness, muscular failure, decreased heart and respiratory rate.	Great weakness, unconsciousness.
Below 78 Degrees F Extremely Severe	Whitish froth welling from the mouth, blue skin and fingernails, eyelids are grey-blue labored breathing, cardiac fibrillation, death.	

Good rain gear and wool clothing help considerably to reduce the danger of hypothermia.

PREVENTION

Prevention of hypothermia is not really complicated. Essentially all that is involved is maintaining a balance between energy loss and energy input over a period of time.



Hypothermia will not occur if energy loss and energy input are maintained in balance.

Mechanisms of Energy Loss

Conduction

Conduction is the loss of heat when an object comes into contact with something colder. Sitting on an ice block is an example of heat being conducted away from the body and into the ice. A sleeping bag laid directly on the ground or metal tools held in the hands will cause the user to lose body heat into the ground or metal.

Conduction losses can be minimized by putting an insulating layer between your body and the colder object. Mittens on the hands will reduce conduction of heat into the metal tools. A closed-cell pad will reduce heat loss between your sleeping bag and the ground.

In treating a hypothermic subject on cold ground, it is much more important to get a pad under the subject to reduce conduction than to cover him from above.

Convection

Body heat tends to warm a thin layer of air around the body. This warmed air provides excellent insulation provided that the air cannot move away. If, however, there is a slight breeze, the warmed air is blown off and is replaced by cooler air. The body must then expend energy to warm more air. This process of heat loss is called convection. For outdoorsmen, convection accounts for a large portion of heat loss.

Reduction of convection is relatively simple. Layers of clothing trap the air around the body: unable to move off, the warmed air insulates the body. Several layers of light clothing are generally preferred: air gets trapped within and between the layers. You can also add or take off layers to help regulate the rate of heat loss. Almost any material that prevents air movement potentially could be used in clothing (e.g. steel wool). However, wool and down (providing it is kept dry) are usually the best materials for outdoorsmen. A windproof outer layer will offer effective protection to convection loss when combined with other insulative layers.

Respiration

As a person breathes, he takes in cool air and releases warmed air. This represents heat loss by respiration.

There is little that a person can do to reduce heat loss by respiration. In uncomfortably cold air, the upper portion of a wool sock held over the mouth and nose by an elastic band will help to pre-heat the air making it more comfortable to breathe. Heat loss, however, can be reduced only by decreasing activity and (consequently) breathing lesser amounts of air.

Evaporation

As sweat evaporates from the skin, it absorbs body heat in the process. This heat passes away from the body.

It is important to let the sweat that is produced escape from your body and clothing. Fairly porous clothing will allow the vapor to travel through. If the outer layer of clothing is water-proof, the sweat will build up in the clothing. This reduces the insulative value of the fabric. If it is cold enough, the sweat may freeze in the outer layers. During search operations in heavy rain it is very common for the clothing under the rain suit to become saturated with sweat: usually this is preferable to not using rain gear and suffering heat loss by water chill. In these circumstances wool clothing must be stressed.

The only effective way of reducing heat loss by evaporation is to keep the sweat rate very low. This means you must pace your activity.

Radiation

Radiation is heat given off in all directions by the body. The amount of radiation loss depends upon the temperature of the body and the insulative quality of the clothing.

Radiation loss through the head can be enormous. At 40 degrees F, half of the body's heat production may be lost through the head. At 5 degrees F, three-fourths of the body's heat can be lost in this manner. There is a saying that "if your feet are cold, put on a hat." Wool stocking caps and parkas with hoods should be stressed.

Water Chill

Water will conduct heat about 240 times as well as air. Wet clothing will conduct heat from the skin to the outer environment much more rapidly than dry clothing. In many cases the heat conducted away will exceed the ability of the body to produce more heat. If sustained very long, the person will be in serious trouble. Wool clothing is preferred because it will not conduct the heat as rapidly when wet as will cotton and other materials.

Wind Chill

In the absence of wind, even low temperatures would be rather tolerable. However, the effects of even a slight wind can be substantial.

The relationship of wind and temperature is illustrated in the following chart. Emphasis must be given to the fact that wind chill is a substantial part of living and working in wilderness areas. Clothing must be suited to wind as well as temperature.

WIND-CHILL CHART

Wind Speed MPH	Actual Thermometer Reading F°										
	50	40	30	20	10	0	-10	-20	-30	-40	-50
	Equivalent Temp. F°										
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57
10	40	28	16	4	-9	-21	-33	-46	-58	-70	-83
15	36	22	9	-5	-18	-36	-45	-58	-72	-85	-99
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125
35	27	11	-4	-20	-35	-49	-67	-83	-98	-113	-129
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132
	Little danger for properly clothed person				Increasing Danger			Extreme Danger			

Wind speeds greater than 40 MPH have little additional effect.

Combinations

None of the heat-loss mechanisms described here occur in isolation. Very often they will all take place at the same time.

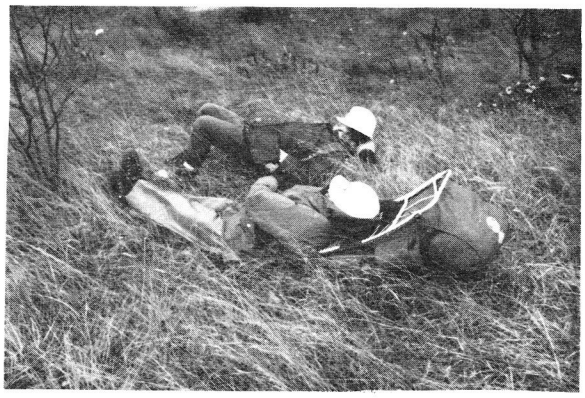
The elements that appear to come up most commonly in case histories of accidental hypothermia are wind chill and water chill. Traditionally, the subject is wet, there is a moderate wind, and the temperature is only "cool". No one of these factors seemed substantial: the combination, however, has often been fatal.

Methods of Energy Input

Rest:

It can't be stressed enough how important rest is. You can't go without it. Periodic short rests to catch your breath are more sensible than longer rests. The reason being that for the first 5 to 7 minutes of rest you get rid of 30-50% of the lactic acid and waste buildup. After that only about 5% of these wastes will be flushed out of your system. If you travel slower your body can assimilate these by-products as you move. You should never rest longer than it takes your sweat to cool unless you put on additional clothing.

Sleep is very important because it is the only true way to rest. One hour of sleep is better than none. Incidentally, it is worth mentioning that if you are **not fatigued** you can sleep in very cold situations without fear of freezing. The brain will wake you if the body is getting too cold.



Periodic short rests help to rebuild the body's energy reserve.

Eating:

A continuous intake of food is a vital source of heat when combatting hypothermia. Keep nibbling!

Sweets provide quick energy, while proteins and fats have a more lasting warming effect. Whatever you eat, eat plenty and drink plenty of liquids.

The amount you eat will vary from person to person. A physically inactive person needs about 1,500 to 2,000 calories a day. Physical activity increases the amount to 3,000 calories for light work and about 5,000 calories for heavy work. A person in a state of exhaustion may be dependent on the amount of food and water he can ingest to provide fuel to maintain body heat. If you don't eat, you are like a car running out of gas.

Dehydration frequently accompanies hypothermia in intense or severe cases. This is dangerous because in some cases it has caused pulmonary embolus. When there is inadequate fluid intake, the blood becomes thick and viscous. When this is combined with a decreased blood flow rate (due to arterial contraction) because of low temperature, the blood may clot. These clots will then be carried by the blood stream through the heart, and into the blood vessels that carry blood to the lungs. Since all blood must pass through the lungs before it can return to the body, these obstructions can reduce the blood flow to an amount insufficient to sustain life. Fluid intake is very important to an exhausted subject.

Psychological Aspects

There are several psychological aspects of wilderness travel that should be recognized because they often overlap into hypothermia.

Determination

Determination can be defined as "a state of mind which allows long-sought goals to overrule good judgement." This can cause a person to use up his energy reserves without leaving any for the return trip. Consequently he becomes vulnerable to accidents and hypothermia. Goals must be weighed carefully in terms of energy required. A good rule of

thumb is to expend 1/3 of your energy getting to the goal, 1/3 to return, and 1/3 in reserve.

Get-Home-Itis

Get-home-itis is a state of mind characterized by determination to get home on schedule no matter what the cost. It is motivated by pressures of home obligations, having to get to work, or most commonly **losing** face. As a person senses that he will not make it out on time, he begins to worry about what his family and friends will say. He fears they will think he "got lost": this is a hard label to live down. Little by little judgement is replaced by determination to get home. He will pick up the pace, skip rest stops, stop eating, take short cuts (which may not prove out), etc. The result can soon be exhaustion and extreme vulnerability to hypothermia.

It makes much more sense to ration energy output, to rest and eat periodically, to admit that it will take longer to hike out and to accept the fact that you will be late. Some people may kid you about being overdue. Chances are, however, more people (the ones who's opinions count) will admire you for your judgement and restraint.

Fear

Fear can range from a mild apprehension to sheer terror. It may be caused by fear of being alone or being lost, fear of hunger, fear of animals, fear of death or many others. The dangerous aspect of fear is that it leads rapidly to exhaustion. Various body reactions (increased adrenaline, increased blood to muscles) serve to accelerate the body's consumption of energy reserves. Simultaneously the mind tends to narrow and focus on the fear. Judgement lessens. Options which could help solve the problem are overlooked as the mind concentrates on only one thing. In extreme form (panic) energy is expended so rapidly and unproductively that exhaustion and hypothermia will follow very quickly.

It is easy to say that it is only fear that should be feared. It is, however, basically true. Psychologists tell us that only 10% of our worries are really based upon fact: 90% of our fears are entirely unfounded. Animals are almost never a threat to people in the woods. A person can survive weeks without food. Being alone or lost is not, in itself, serious: it is the person's reaction to being lost or alone which will matter. A cool-headed appraisal of estimated location, resources, terrain and weather conditions can result in the formulation of a plan. The plan may be to stay put, conserve resources, and attract attention. It may be to systematically try several potential routes to safety. Any plan based upon a deliberate and rational analysis of the situation will be more effective than a mindless response to fear.

Confidence is the opposite of fear. Confidence is usually built up through a series of successful experiences starting with the easy and graduated up to the more difficult. Such experiences are a built-in part of ESAR training.

Attitude

Experts say that people who want to survive a difficult situation stand a much better chance than those who don't care.

A graphic example of this principle took place on Mt. Rainier in 1967. Three climbers were trapped in a storm. One descended to the bottom of a 30 foot crevice where he was out of the wind. He made hot tea on his stove and deliberately exercised to produce body heat. The other two stayed on a ledge just below the lip of the crevice. Though still in the wind, they didn't even fasten up their parkas or use mittens. The two on the ledge felt they weren't going to make it; about 3 hours later they died. The fellow in the bottom of the crevice wanted to live; he was expecting the birth of his first niece or nephew. The next morning (12 hours after the others had died) he climbed to the top of the crevice and was met by a rescue team within minutes.

There is no question but that attitude is important in survival. Know-how and equipment, however, are also required.

Preventative Measures

1. STAY IN SHAPE
   A physically fit person will use his energy resources more efficiently.
2. KNOW ABOUT HYPOTHERMIA
   Remember that, except in the early stages, the subject is not aware of what's happening; his mind is becoming numb. Everyone on the team must moniter himself and the others. Know what to do and practice prevention.

Eating regularly will make you less vulnerable to hypothermia.

3. EAT CONTINUOUSLY
   Keep the intake of energy up. Carry a reserve supply of food beyond that which you expect to use.
4. DRESS ADEQUATELY
   Layers of wool clothing are best for protection from the wet. A wind/rain proof outer layer is extremely important; this should include pants as well as parka with hood. Carry extra protection for your hands and especially the head and neck.
5. CARRY SUFFICIENT GEAR FOR EMERGENCY BIVOUAC
   A plastic tarp or tube tent will provide a lot of protection from wind and rain (See list for 24 hour pack.)

6. USE JUDGEMENT ON WHEN TO BIVOUAC
   Look for a site **before** it becomes dark. Set up a camp **before** your mental functioning and coordination become affected.
7. IF NECESSARY, EXERCISE TO KEEP WARM
   If bivouacing in a cold situation or when exhausted, keep active. This produces body heat. Isometric contractions of muscle groups are better than violent exercises. In the latter, much heat will be lost through openings in the clothing or by air circulating within the clothing.

TREATMENT

Essentially, the treatment for hypothermia is to prevent further heat loss and to re-warm the subject if he is conscious. The unconscious subject must be quickly evacuated for re-warming under medical supervision.

Prevent further heat loss

1. Get the subject out of the wind and into a house, tent or other shelter.
2. Place insulation between the subject and the ground.
3. Replace the subject's wet clothing with dry clothing.
4. Place him in a pre-warmed sleeping bag. (Have another person warm up the sleeping bag first.)

The Conscious Subject

1. The best way, if possible, is a hot bath at 110 degrees F.
2. Hot soup, sugared tea, hot jello or other liquids are very good. They provide internal warmth as well as food energy.
3. A very useful technique is to have one or two team members strip down and crawl into the sleeping bag with the subject. The direct body-to-body transfer of heat is very effective. It may be necessary to change persons every 15 minutes or so to keep the team member(s) from getting chilled. Two zip-together sleeping bags are very effective for this purpose ; there is plenty of room for the subject plus two other persons as warmers.
4. One Mountain Rescue unit has developed a blanket for heating hypothermic subjects; it has saved several lives so far. Water is heated on a stove and then pumped through tubes within the blanket. The heat of the water is transferred to the subject very effectively. A less efficient but still good modification of this approach is to use hot water bottles.
5. Another idea, developed by one ESAR unit, has the advantage that it can be used simultaneously with a litter evacuation. Small solid fuel pocket warmers (Sportmen brand) are placed within the litter. They give off a low-level heat that warms the subject without danger of burning him.

The Unconscious Subject

When the core temperature falls to 82 degrees F (about when the subject becomes unconscious,) there is danger in attempting to re-warm him externally. Heat applied by body contact or other sources warms up the blood near the surface. The blood vessels, which were constricted, tend to open up and allow the surface blood into the core. Though this surface blood is warmer than before, it is still cooler than the core temperature. What results, therefore, is further cooling of the body core and risk of cardiac fibrillation.

Intake of hot soups, etc. would tend to warm from the inside-out rather than the outside-in; however, this is impossible with an unconscious subject.

Treatment of the unconscious subject should consist of protecting the subject from further heat loss and evacuating him as rapidly as possible. His temperature can be successfully raised under medical supervision in a hospital.

There is one new and very promising development in this area; the use of heated oxygen. Several portable units have very recently been developed which chemically heat the air prior to breathing by the subject. This avoids the problem described above because the heating is from the core-outward rather than vice-versa. The next several years should see considerable development of this concept. (18) (19)

PROBLEMS: HYPOTHERMIA

You are urged to answer the following questions. The answers are located on page 77.

1. What is Hypothermia?
2. What is Exposure?
3. Hypothermia is often associated with what kind of weather?
4. In the "Typical Case" describing Fred and George, George never used the stocking cap in his pack. Why?
5. Describe the symptoms of hypothermia starting with the mild stages and going through the severe.
6. A person laying on moist ground loses considerable body heat into the ground. This is an example of heat loss by ——————————————.
7. What is the most effective single way to reduce radiant heat loss from the body?
8. To prevent hypothermia, a very practical eating hint is to:
9. What is "Get-Home-Itis"?
10. In one place in this section it says there is little danger of a sleeping person freezing. In another place it says that you should use isometric exercises to keep warm. Explain the difference.
11. Describe five of the seven measures to prevent hypothermia.
12. Why should external heat not be applied to the unconscious hypothermia subject?

DESERT SEARCH

INTRODUCTION

Very few people are involuntarily exposed to extremely hot environments over a period of hours and days. Fewer yet are unavoidably exposed to hot weather without access to the water, salt, shade, and rest they must have to survive. Severe heat stress is a strange experience for most people. They may react in useless or harmful ways. **Most heat disorders and heat fatalities are the result of ignorance, neglect, or failure of self-discipline.** The folklore of heat survival is mostly erroneous. It is rooted in tales of toughness and desert adventurers more noted for their ego involvement than for accurate information.

Dealing with unaccustomed heat stress takes a cool head and the self-discipline necessary to act according to a few well-known facts:

1. The body is a mass of muscles, nerves, and organs. Its vital core is designed to operate within a temperature range between 96 degrees and 102 degrees F.

   If the body core gets a little cool, the body responds to conserve the heat generated by metabolism and muscular effort. The brain directs the person to seek a warmer environment and keep producing muscle heat.

   If the core gets warm, the body responds to get rid of surplus heat generated by metabolism, and muscular effort. The surplus heat must be moved to the skin and dumped into the environment. The brain directs the person to seek a cooler environment and to quit producing muscle heat.

2. The body has a heat income rate and a heat loss rate. When they are kept in balance, the body will remain in good working order.

   Heat income may be from metabolism, muscle effort, radiation and contact with air, rocks, water, etc.

   Heat loss may be from sweat evaporation, radiation, and contact with air, rocks, water, etc.

It has been only recently that ESAR units have begun developing in the hotter and more arid regions of the U.S. It is important that members of these units learn and adapt to the special demands created by search work in hot climates. There are dangers to this kind of work; proper training, discipline and equipment are essential.

Because ESAR is relatively new to search and rescue under desert or semi-desert conditions, the role that ESAR units may assume has not yet been well defined. Foot searching is the basic and traditional function of ESAR along with some other SAR groups. It is estimated that ESAR members can realistically gear up to help meet the need. However, search work in the true desert areas (extremely high heat) may not become a role suited to ESAR units. Searches from aircraft, 4-wheel-drive vehicles, and motorcycles, are more efficient than foot searches in desert areas: there is also less hazard because fewer searchers are involved and they are capable of traveling much greater distances. In addition, tracking is becoming popular in many of the arid regions; this is a technical skill well beyond the scope of ESAR training.

This section is written for the benefit of those ESAR units that will operate, at least part of the time, in the

hotter areas of the country. This information covers only the basics and should be supplimented by other materials (see references 7, 21, 23, and 24) and by appropriate field practice.

ACCLIMATIZATION

The body's muscles weaken with disuse and can be strengthened by a program of regular, gradually increasing exercise. In like manner, the body's cooling system weakens with disuse and can be strengthened by a program of acclimitization.

There is no question but that those people used to working in hot areas are more capable of putting up with the heat. A soldier assigned to a desert front must go through an acclimatization phase before he is ready for combat. The same is true of miners, ranchers, and other workers in hot areas.

Unfortunately most people in modern society, even though they live in desert areas, are not acclimatized to hot weather. Most spend a great deal of their time in minimal activity and even that is in air-conditioned buildings. It is important to be acclimatized to both physical work and heat; one without the other is not enough. It can take two weeks for a person to acclimatize to working in hot conditions - he can lose it within three days of returning to "civilization".

This poses serious problems to search and rescue under desert or semi-desert conditions. It is in the nature of search and rescue work that teams are mobilized with little notice and are exposed to extreme conditions of weather. All of this may happen within a matter of a few hours. There has been virtually no opportunity for acclimatization; at the same time the subject of the search could very likely die long before the searchers would have enough time to acclimatize. Local (acclimatized) people could be recruited for the search effort but these people often lack the discipline, training, equipment, or search and rescue knowledge necessary to run a search. This is a real dilemma.

This situation poses very serious problems for those faced with a search and rescue responsibility in hot areas. These leaders must insure that all personnel know the salient points of heat hygiene and will behave accordingly. The leaders must also institute and enforce sensible limits on the demands made on personnel.

Acclimatization: The Process

Acclimatization appears to be a combination of physiological adjustments and conscious adaptations.

The physiological adjustments include a more stable body temperature, production of more sweat, an ability to start sweating faster, a reduced salt loss, and decreased pulse rate. On the first day of work the body may sweat at only 1 qt./hr. (probably undercooling the body). By the 10th day the same person may perspire at 3 qts./hr. On the first day a person may require 10 g of salt more than usual; several weeks later a normal diet may provide sufficient salt.

Adaptations are also part of acclimatization. These tend to result from a conscious learning of how to avoid heat (e.g. walk on shady side of ridge), how to avoid unnecessary work (e.g. walk on hard ground rather than sand), how to dress more effectively, how often to drink and what amounts, etc.

The whole process of acclimatization will take varying amounts of time but tends to average 8-14 days.

Implications for Desert Search

Training:

It is essential that any group preparing itself for ESAR work in hotter climates undergo training prior to engaging in such work. This training should be graduated in difficulty until members have learned the necessary skills for operations within their area.

Knowledge of Heat Stress:

In addition to knowing the effects of heat exhaustion, heat stroke, etc. (described later in this section), each searcher should know his own personal signs of heat stress. Through practice and training, each person should learn his own pulse rate at rest and while working normally. He should then moniter his pulse frequently - any rise in pulse rate is a sign of stress. A searcher should get to know his usual sweat rate (amount of moisture around the hat brim, waist, in his socks). If he detects an increase of sweat rate he knows he is under stress. If he notices a distinct decrease, his cooling system is failing and his life is in danger. A dry mouth or conscious awareness of radiant heat are signs of stress. **Pulse rate and sweat rate are two measures of heat stress that are easily monitered by a person in the field.** However, both require that the person has previously measured his rate under normal conditions.

Discipline:

The need for discipline under hot weather conditions is great. It takes several forms.

Search assignments must be conservative. Considering the difficulty and danger of heavy exertion, unacclimatized searchers are best assigned to nearby areas or to tasks which require less activity (e.g. observer in a vehicle).

Team members must constantly moniter themselves and the other members of the group. Problems must be recognized early. Social pressure must be brought against the member who says he doesn't need to drink (the "he-man" ethic has no value here). The team must stay together and work as a unit; if one person has problems the others must be right there to act.

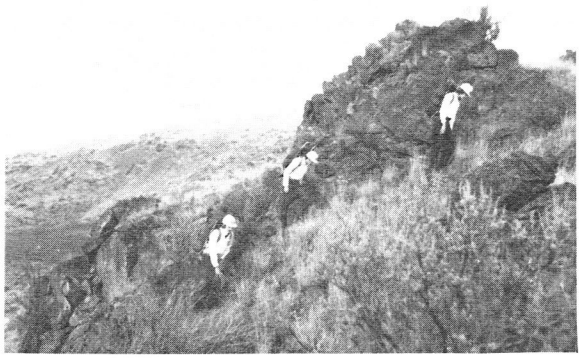
Rests should take place frequently. If unacclimatized searchers **must** work hard in the heat for 1 to 1½ hours, they **must** rest for the next 2 hours. The effects of heat stress are cumulative. Consequently a 2-3 day break (back to civilization for a full rest and full rehydration) should be scheduled periodically.

Water - A Team Responsibility:

All water carried by team members must be considered the joint property of all. The Team Leader must supervise its use. There are two strong reasons for considering water as team equipment rather than individual equipment.

1. It is the only way that the Team Leader can assure that sufficient water is being carried. He m st see that there is enough within the group to meet anticipated needs, maintain a reserve, and treat potential heat problems.
2. It tends to assure more effective consumption

of the water. If water was considered as individual equipment, a person who used up his supply might be reluctant to ask another team member for some of his. The member with an adequate supply may be reluctant to give up his reserve to another who needs it. Either way, the potential for heat problems increases dramatically. This is best avoided by treating water as a team resource available to all members.



Keep your eyes open for tracks or other clues.

HOT WEATHER OPERATIONS

Energy Conservation

Under semi-desert conditions the physical demands upon the body can be enormous. In addition to the usual heat-producing exercise of search work, the searcher must cope with the heat of the environment. This puts a heavy load upon the heat-regulation mechanisms of the body. Consequently, rest is important. However, rest can take various forms.

Pace Yourself:

It is essential to pace oneself. A slow steady effort will get you a lot further than spurts of speed. In the desert, where clear air makes distant objects appear closer than they are, distances are deceiving. A measured steady effort will more likely get you there.

The major heat-regulation mechanism is perspiration. Sweat is chilled as it evaporates. This, in turn, chills the blood in the capillaries of the skin. The cooler blood, when circulated within the body will cool the core and muscle areas. Unfortunately, unrestrained sweating will deplete the body's supply of fluids thereby endangering the ability of the body to regulate its temperature. Consequently, a person's sweating must be paced. There is a saying among experienced persons: "ration sweat, not water." Again, a slow steady effort will put less demand upon the body as well as to conserve body fluids.

If you have a choice, pick a route of travel which will help you conserve energy. A hard walking surface is better than sand. The shady side of a hill is better than an exposed ridge.

Rest Before Necessary:

Rather than waiting until you are fatigued, it is far wiser to rest at frequent intervals before you need it. This reduces the work load on the body.

Start Up Slowly - Wind Down Slowly:

It is much wiser to start hiking or working slowly rather than start out abruptly. This is especially true of the unacclimatized person. This gives the heat-regulatory mechanisms opportunity to begin functioning prior to the heavy load caused by hard work. Likewise, it is best to slow down prior to a rest rather than to just stop and sit down.

Rest During the Hot Part of the Day:

In most of the world's hot areas, work ceases for the several hours around noon. The logic is very simple. It taxes the body most when it is hottest out; physical work should be reduced to lessen the demands on the body at that time. Under conditions of heat, it may be wise to cease work at 11:00 AM and rest until about 5:00 PM. Factors such as determination to reach a certain goal by a certain time should be weighed carefully against the hazards of working under the midday sun.

While resting, it is highly desirable to get out of the sun. If no natural shade is available, a reflective opaque tarp can be used to provide artifical shade. If it is possible to rest 1½ to 2 feet above the ground, the temperature may be 10-30 degrees cooler. If it is not possible to get off of the ground, scrape off the upper 6" of sand before laying down. It will be much cooler than the surface sand.

Work at Night:

As mentioned in the "Searching Techniques" section, searching at night can often be effective. Flashlights can be seen by the lost person. A bright moon may provide ample light. These are all reasons why night searching can be effective. In desert areas, night searching takes on even more importance. It is physically much easier to work during the cool night hours. In many cases, what may be lost due to limited vision will be more than regained through not having to cope with the heat of the day. Many times it will make sense to search at night and sleep during the day.

Two cautions regarding night searches: it is easier to pass by an exhausted sleeping subject at night than during the day. Also wash-outs and small cliffs tend to blend in with the horizon and flat terrain. You can step off a bluff before you see it if you are not careful.

Get Sufficient Sleep:

While rests are helpful, there is no substitute for getting sufficient sleep. Without an adequate sleep schedule, the body cannot restore itself. In prolonged desert operations this could become dangerous.

Gullies and old trails must often be checked out by teams.

Equipment

As much as possible, each person and each team should be self-sufficient. The personal equipment would be pretty much the same as listed earlier in this manual. Additions would include more liquids, sunglasses, salt tablets, goggles, etc. In some areas, planned water consumption may be as high as 2½ to 3 gal./day per person. This requires a large number of containers.

Sunburn prevention is very important. Burned skin will not sweat. It, therefore, adds to the cooling problem as well as to discomfort or pain. The best protection is to shade the head and neck; this substantially reduces the radiant heat that will be obsorbed by the body. Several creams can also be used to limit exposure to sun. "Pan-Stick" (Max Factor) is opaque and will prevent sunlight from reaching the skin. "Pre Sun Lotion" (Westward Pharmaceuticals) will reduce the effects of sun exposure but is not opaque.

Under some circumstances self-sufficiency is not possible. Even vehicles will be unable to carry sufficient water, gasoline, and supplies for extended periods. During these operations, extensive re-supply arrangements have to be made and usually involve the establishment of supply depots and caches. If weather or terrain forbids the ability to re-supply, the search cannot be prolonged. Self-sufficiency is an important concept; the point here is that it may not always be possible.

Clothing is very important. Loose fitting clothing which covers almost all of the skin area is best in deserts. This protects the skin from sunburn and protects the body from radiant energy. (Opaque light colored outer clothing will reflect sunlight best.) The clothing also reduces the evaporation of moisture from the skin. This helps to conserve body fluids. Remember the layers of loose fitting clothing worn by the Arabs; it is a practical arrangement under desert conditions. Incidentally, **wool** clothing is best! Wool holds in sweat better than most materials and, therefore, helps to regulate evaporation. The ideal is for the body to be entirely coated with a light film of sweat. The wool tends to keep the sweat at skin level where its evaporation will be most effective in reducing body temperature. A dry area may indicate a problem because the absence of sweat means there is less cooling. Under less demanding conditions, heavy cotton clothing is adequate. It should be heavy enough to provide protection from bushes, rocks, etc. The main thing is for clothing to stop sunlight from reaching the skin and keep hot winds from stealing sweat before it does its cooling at skin level.

Boots should be sturdy enough to withstand the extreme temperatures of the rocks and sand. Socks should be wool and must be changed frequently.

Food

Search work requires energy. This energy comes from food. Heat, however, usually has the effect of depressing appetite. This means that it is essential to eat regularly in spite of the fact you may not want to eat. The intake of food must be maintained.

The menus should stress liquids, salt, sugar and foods that digest easily. Carbohydrates (sugar, fruits, vegetables) and starches (rice, potatoes, noodles) are good. Proteins (meat, fat, eggs, fish) should be limited except just before a sleep period.

Breakfast

Dried or canned** peaches, pears, apricots or apples. Cereal with powdered milk, sugar and raisins. Consume large quantities of coffee, juices, cocoa, etc. Drinks should be salted to some extent.

Lunch

Fresh, dried, or canned** fruit, pilot bread, beef jerky, and a large amount of lemonade or other drink mix, with about 1/2 tsp. of salt per quart.

Dinner (or just before a sleep period)

Any high carbohydrate meal such as rice, spaghetti, noodles, or macaroni. Add proteins in the sauce - not as the main meal. Thin salty soups or broths are suggested before the main course.

Snacks - Dried or canned**

Dried or canned** apricots, peaches, moist dates, pears, coconut flakes, raisins, salted nuts, jerky, lemonade powder. Avoid cheese, bologna, vienna sausage, etc.

Remedies

Salt tablets, glucose tablets, "Sportaid", and aspirin. Dramamine can be taken for nausea: if more than ¼ tablet is required, you should put yourself on the sick list for a day.

**Dried fruits require a lot of water to be reconstituted. If there are no streams or springs nearby, it is easier to carry canned foods containing their own water.

Water and Salt Management

When perspiring, the body loses both water and salt. Consequently it is important to replace both.

To take on water without salt causes the body to lose even more salt from within the cells. This can cause cramps and heat exhaustion. To consume salt without water will cause water to be taken from the cells. This worsens the dehydration and can lead to heat stroke.

It is important to take water and salt at the same time; one without the other may only worsen the situation.

When salt tablets are necessary, salt tablets containing glucose are preferred because they dissolve reliably and are less likely to cause an upset stomach. It is important to take sugar with the salt (often in the form of a sugared drink). This eases the assimilation of the salt and provides energy.

The quantity of fluids that should be consumed will depend upon the temperature, activity, and the individual. Suggestions have varied from 1 to 3 plus gal./day. Additional water should be carried in reserve. It is recommended that this water be divided among such drinks as pure water, packaged lemonade, "Gatorade", and "Sportaid."

Under very hot conditions, an unacclimatized person may need 10 to 12 salt tablets (660 mg.) per day in addition to the salt in his food. Later on, or if conditions are not extreme, a deliberately salty diet may be sufficient and salt tablets unnecessary. Each person, during training, should get a feel for his own salt requirements.

In hot weather, thirst is a good initial indicator of need for fluids. However, **thirst may go away after drinking only ¼ of the actual fluid loss.** Consequently it is essential to drink fluids at frequent intervals. Drink once every 20 minutes by the clock. During the long midday break, keep water in your cup and your cup in your hand. This way you will gradually rehydrate yourself. This is part of the discipline of working in hot areas; you must force yourself to drink often. It is a good habit to drink and take salt before you start out; anticipate your work hours by preparing for them.

Dark smelly urine is a sign of salt depletion. Scanty urine is a sign of water depletion. If you get enough water, excess salt will be urinated away. If water is short, go easy on salt. If urination is normal, you are managing salt and fluid intake correctly and your tissues are fully hydrated.

In summary, **it is essential to take water** (part of it in the form of sugared drinks) **and salt together. One without the other may do more harm than good. You must force yourself to drink at regular intervals; thirst is not a reliable indicator of need for fluids.**

Searchers must check out places where the lost person might have sought shelter.

DEHYDRATION

Dehydration is the loss of body fluids. Normally, a person will regulate his body fluid level to within ¼ of 1 per cent of his total body weight. This is a remarkably close tolerance; a 150 pound person will adjust his intake of fluids to within the size of one 6 oz. drink.

When approximately 2 per cent of body weight has been lost due to water loss, symptoms begin to appear; a 150 pound person would be down 3 pints of water. At 10 per cent (15 pints of water for a 150 pound person) the situation becomes severe. Losses up to 10 per cent , however, are generally reversible and may, in fact, be repeated without apparent harm. Dehydration will become fatal at about 15 to 25 per cent. The exact figure will depend upon the individual, the temperature, and other variables.

The maximum loss of fluids that a person can suffer goes down as temperature goes up. At 80 degrees F, an individual may endure a 25 per cent loss. At 90 degrees F, he may die from a 15 per cent loss. This creates a dangerous situation; one that it is important to know about.

As the temperature goes up:

1. Thirst is suppressed; a person "feels" less need to drink.
2. There is greater water loss; more water is evaporated to keep the body cool.
3. The body's tolerance for water loss decreases.

At about 92 degrees F, the body receives more heat from the environment than it can radiate away. At this point the body relies fully upon evaporation of sweat for cooling. It has been demonstrated that hard work under such conditions simply cannot be maintained very long by unacclimatized persons. The body's sweating ability simply can't keep up with the demand for cooling. For acclimated people, an hour or two of hard work may result in a 5 per cent dehydration.This means that a 150 pound man must replace 7½ pints of water. It is simply not possible for a man to sit down and drink that much water at one time. Even if he could, his stomach would be so enlarged and uncomfortable that additional hard work would be difficult. Consumption simply cannot keep up with loss during labor. **Pace the work and schedule the intake of fluids at frequent intervals.**

HEAT PROBLEMS

Heat Syncope (Fainting)

Cause -

One of the body's cooling mechanisms is to circulate the blood near the surface of the skin. The blood transfers the heat from within the body to the exterior where it can radiate away. As a result, the capillaries in the skin expand considerably. More blood goes to the skin areas than usual. If the person is standing, blood tends to pool in the legs. The net result is low blood pressure, diminished circulation to the brain and fainting.

The typical example of heat syncope is the soldier who faints while standing at attention on a hot parade ground.

Signs and Symptoms -

Partial black out, dizziness, results in fainting but recovery is quick

Treatment -

Same as for simple fainting. The subject should lie down and rest for a period. In this position, adequate circulation will be restored to the brain and recovery is assured. Recovery will be within ½ to 2 minutes.

In a search and rescue context, the real danger of heat syncope is the injury sustained by falling when the person faints. He may hit against rocks or even go over a ledge if he is near one at the time. Heat syncope may be brought on by standing up suddenly from a crouched, sitting, or lying position. These movements would best be done slowly and carefully.

Heat Cramps

Cause -

Muscle fatigue combined with marginal salt depletion (due to sweating) and/or heavy intake of water without accompanying salt.

Signs and Symptoms -

Cramps in the heavily exercised muscles (legs, arms, shoulders, forearms, fingers). These

cramps can definately be felt as hard lumps and are incredibly painful.

The cramps will usually be associated with heavy sweating.

Treatment -

Rest, drink a salt-water mixture and/or salt in other easily assimilated forms (jerky, peanuts). Don't massage the cramp, a steady pressure on the cramp area is more helpful.

Rest! Help the subject to relax. If he becomes tense, additional cramps may be precipitated in other muscles. This does present a dilemma. The prospect of additional cramps causes the subject to tense up; the tensing makes the cramps more likely. Do everything possible to make the subject comfortable and help him relax.

Salt Depletion Heat Exhaustion

Cause -

A deficiency of salt within the body. This is usually caused by salt loss accompanied by liberal water intake.

The danger of salt depletion heat exhaustion is greatest during the first several days of acclimatization to hot areas. After that physiological changes within the body greatly lessen the loss of salt and increase the tolerance for salt intake.

Signs and Symptoms -

Free sweating, pallor, blue lips, clammy skin, weak rapid pulse, profound weakness in every case, shock. Other symptoms that may or may not appear include dizziness, nausea, delirium, vomiting and heat cramps.

Treatment -

Same as for shock. Have the person rest, protect from heat loss, provide salt/water drink and salty foods. In severe cases, recovery should be managed in a hospital.

Water Depletion Heat Exhaustion

Cause -

A disruption of blood circulation and electrolytic balance of body fluids. It is most common among unacclimitized persons.

It is a preliminary stage of Heat Stroke.

Signs and Symptoms -

Mild - (1-5 per cent*) Thirst, sweating, impatience, weakness that comes and goes, nausea, rapid pulse, overheating sensation, limited urine production.

Moderate - (6-10 percent *) Gaunt haggard appearance, headache, dizziness, sweat decreases, no salivation, poor speech, blue lips, periods of pounding heartbeat, hyperpyrexia.

Severe - (11-20 per cent loss *) Spasticity, delirium, deafness, dimming of vision, death.

*Water loss as per cent of normal body weight.

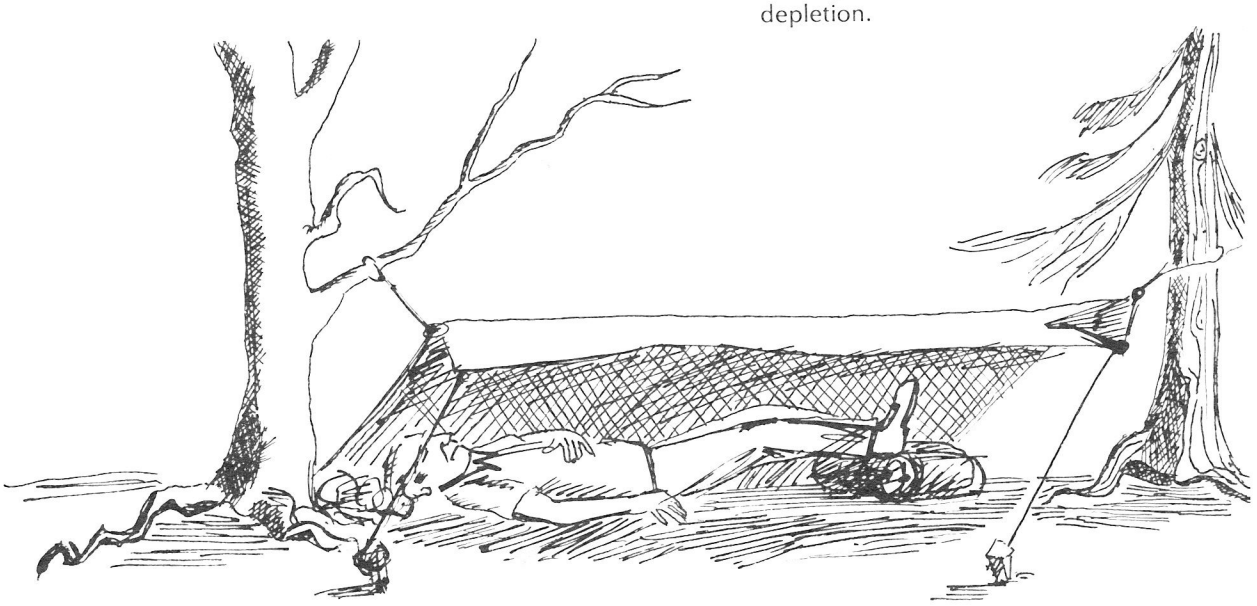
Treatment -

Immediate rest in the shade, moisten lips and tongue, provide water in frequent sips. Insulate from temperature loss and provide hot drinks. In severe cases, treatment may take several days. Medical attention should be obtained - severe cases are serious because they may lead to heat stroke.

Hyperpyrexia

Cause -

Insufficient sweat or sweat evaporation to keep up with heating effect of exertion, radiation, or air temperature. Lack of acclimatization. Water depletion.



Treatment for heat problems involves rest in the shade and consumption of salt and fluids.

Signs and Symptoms -

Feverish appearance, flushed skin, wandering mind, hard fast pulse, skin warm to touch. Oral temperature 100 degrees F (103 degrees F is dangerous).

Treatment -

Cease work, place in shade, wet and fan the skin. If salt depleted, administer fluids and salt. Treat as heat stroke if patient is in distress. Hyperpyrexia is a frequent forerunner of heatstroke.

Heat Stroke - A Major Emergency

Cause:

Due usually to fluid loss, evaporation of sweat decreases and is not sufficient to lower body temperature. What follows is a break down of the central nervous system that causes the sweating mechanisms of the body to cease. Sweating stops and temperature rises rapidly. The body temperature may climb above 106 degrees F.

Signs and Symptoms:

Rise in temperature, weakness, giddiness, flush skin follows by rapid strong pulse (uneven), stoppage of sweating, rapid rise in temperature and collapse.

Treatment:

Cool the person by any means possible: **Do it promptly and drastically,** death may occur within minutes. If there is a snow bank nearby, put him in it. If there is a cool stream, immerse him. Set up shade and apply ice packs if available. Drench his clothing with water and fan him to facilitate cooling by evaporation. Keep up the cooling until such time as the subject's heat-regulating mechanisms begin to function and body temperature returns to normal. Hospitalize the patient. Heat Stroke is a major medical emergency.

Long-term Effects

Once hospitalized, a heat stroke victim will be kept under observation for many days. Effects of heat stroke may include brain damage. The amount of damage depends upon (1) the amount of temperature rise and (2) the length of time the temperature was high. Cooling must be quick and effective. Any temperature above 102 degrees F is generally considered serious.

Once a person has suffered heat stroke, he may never again be dependable in hot weather conditions. He is more likely to have problems again than he was before the heat stroke. Some heat stroke victims are required, for their health to move to cooler climates.

Heat Strain

Cause:

Excessively hot or hot and humid environments. Heart and circulatory system are short - changing the body's other systems in favor of the cooling system.

Signs and Symptoms:

Tires easily, headache, mental and physical inefficiency, poor appetite, insomnia, sweating when at rest in the shade, high pulse rate, general physical weakness.

Treatment:

Drink plenty of water, seek cooler environment, and replenish salt loss. Limit exertion.

Sunburn

Cause:

Excessive exposure to the sun's ultraviolet radiation (tanned skin can also burn).

Signs and Symptoms:

Reddish skin, burns, blisters, swelling or puffiness of extremities (buildup of water), sweating decreased or absent in burned areas. Some hyperpyrexia.

Treatment:

Cool the skin, cover exposed areas and treat for burns and shock. Minimize exertion. Severe cases need hospitalization.

Sunblindness

Causes:

Prolonged exposure to direct or reflected sunlight

Signs and Symptoms:

Burning, watery or inflamed eyes, headache, pain and poor vision, blindness.

Treatment:

Protect from all light to relieve pain. Bathe eyes frequently with cold, wet compresses.

Prevention:

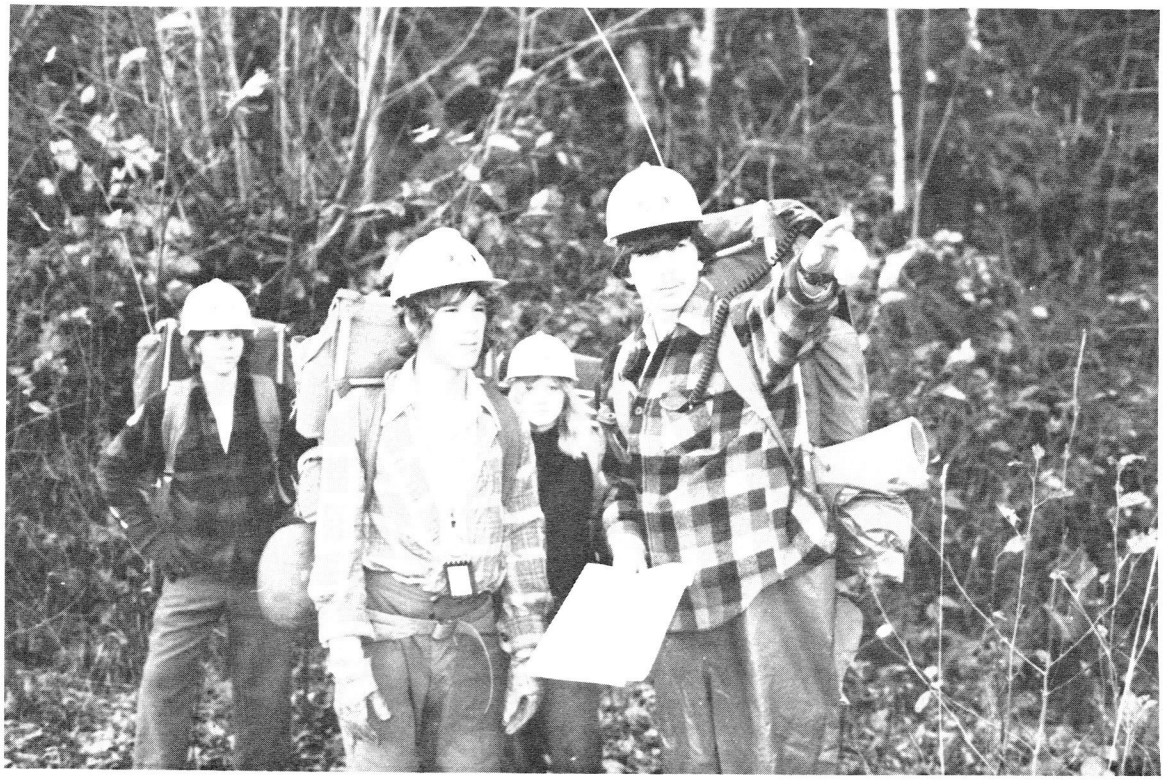
Good sunglasses with side screens. In an emergency a blue bandana over the eyes will reduce most light but still be sufficient to see.

PROBLEMS: DESERT SEARCH

You are encouraged to answer as many of the following questions as you can. The answers are on page 77.

1. (True or False) Most Americans who live in hot areas are acclimatized to the weather conditions.
2. (True or False) An unacclimitized person usually sweats more rapidly than the acclimitized person.
3. (True or False) An unacclimitized person usually needs more salt than an acclimitized person.
4. Name two symptoms of heat stress that can be easily monitered by oneself in the field.
5. Describe the proper clothing for desert operations.
6. List several advantages and disadvantages of searching at night in the desert.
7. Should canned foods be carried in desert areas? When?
8. When working in hot weather, is it more important to consume salt or water?
9. In hot weather conditions, why is it important to consume more liquids than that which is necessary to reduce feelings of thirst?
10. How can a person work hard for prolonged periods in the heat?
11. Describe the cause, symptoms, and treatment for:

Heat Syncope
Heat Cramps
Salt Depletion Heat Exhaustion
Water Depletion Heat Exhaustion
Hyperpyrexia
Heat Stroke
Heat Strain
Sunburn
Sunblindness



TEAM LEADER TRAINING

INTRODUCTION

There are three qualities that a successful team leader must possess:

1. A desire to lead: this must come from within. It must be strong enough that the team leader will not be discouraged by hard work or by errors. Desire cannot be taught from a book .
2. An ability to lead: this is a complicated combination of understanding, friendliness, firmness and confidence. Ability can be increased through experience but, like desire, it can't be learned from a book.
3. Training: the knowledge of when to do what. This **can** be learned, at least in part, from a book.

You see, therefore, that this manual contains only part of what is required to become a team leader. It contains the procedures, methods, and policies that a team leader needs to know. It can help him gain confidence through knowing what is expected of him. It is a good start, toward becoming a team leader.

Learn well! The team is the eyes and ears of a search. The functioning of a team will depend most upon the team leader.

TEAM LEADER REQUIREMENTS

The requirements to become a team leader vary from one ESAR unit to another. Generally they include the following:

1. Age 16
2. First Aid Training
3. Experience on search operations
4. **Demonstrated** leadership ability
5. Completion of team leader training course
6. Approval by the operation leaders or governing body of the ESAR unit

Many ESAR units have created the position of "assistant team leader" or "team leader-in-training". The criteria for this position includes leadership potential rather than demonstrated leadership ability. These people are given leadership opportunities on training exercises as part of their work toward becoming a full team leader.

PRINCIPLES OF LEADERSHIP

Authoritarian Versus Persuasive Leadership: There are essentially two forms of leadership. The authoritarian leader is characterized by the dogmatic use of power. The persuasive leader has an understanding of human behavior and uses this to motivate others; he considers the mental, physical, and moral capabilities of his followers and creates the kind of situation where others are willing to follow. The authoritarian leader rarely involves others in the decision making; the persuasive leader often does so.

There is a place for both kinds of leadership. In times of military combat, decisions must be made quickly; soldiers must respond without opportunity for questions or even without knowing why a certain order has been given. Authoritarian leadership is often necessary under emergency conditions.

However, in the day-to-day affairs of living, authoritarian leadership is often resented. In our culture, people want to know why they are being asked to do something. They want to be involved in the decision making.

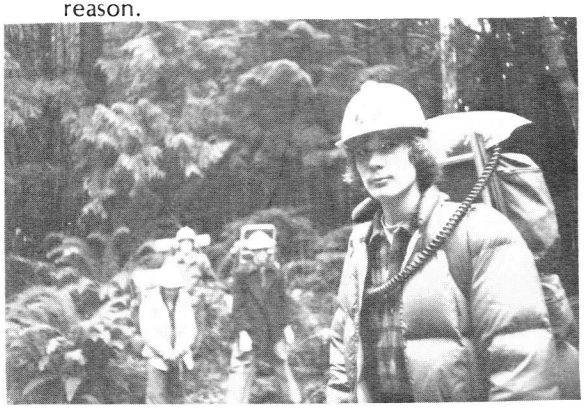
ESAR is a program based upon volunteer involvement. The organization has no real "hold" upon its members; the members are there because they want to be. **The most successful ESAR leaders are those who help to create an atmosphere where the others feel**

welcome and useful. In this, the persuasive leader is generally much more successful than the authoritarian.

While leadership depends mostly upon an understanding of human behavior, an understanding that can only be developed through practice in working with people, there are several principles that add to this understanding. A prospective team leader can cover some of the ground toward refining his leadership ability by considering them.

Principles of Leadership:

1. Know your job - This calls for experience in search and rescue skills as well as woodsmanship. Additional training in the duties and responsibilities of a team leader will also help; this will be provided by your unit to prospective team leaders. Some knowledge of the administrative organization of your ESAR unit is important; you should know the procedures by which organizational decisions are made.
2. Know yourself and seek improvement - Review, in your own mind, your actions and decisions as you return from a search. Seek out your strong points and continue to use them. Analyze and learn from your mistakes. Ask your leaders and friends for suggestions; if they feel you are seriously trying to improve they will respond constructively. Read other manuals, articles, etc. about search and rescue. Make yourself aware of things that are going on elsewhere than in your own unit.
3. Know your team members and be mindful of their welfare - recognize that each individual is different; be sensitive to their problems. Share in their joys and sorrows. By doing this, you win the confidence and respect of the team members. To neglect the welfare of each member would be to forfeit the trust of the team.
4. Keep your team informed - People work best when they know the reason for their assignment. This adds to the interest of each member and is reflected in their motivation to get the job done. It is usually not possible for the operations leader to brief each team member; he relies upon the team leader to pass along the information. It may take a little longer to brief the team but the time will be regained through the more efficient actions of an informed and interested group.
5. Set the example - This is a key element of persuasive leadership. If you work hard, your team members will more likely work hard. If your self-discipline is strong, the others will recognize it and follow. The pay-off is, through your appearance and conduct, you evoke praise, pride, and **the desire to copy.** You are the model for the rest of the team to follow.
   Specific suggestions include:
   (1) Maintain an optimistic outlook.
   (2) Conduct yourself so that you cannot be faulted.
   (3) Cooperate with the team in spirit as well as in fact.
   (4) Exercise and encourage initiative.
   (5) Be conspicuously loyal to the team and the operations leader.
   (6) Avoid the development of cliques for favorites.
   (7) Share dangers and hardships.
   (8) Show moral courage (take responsibility for mistakes, stand by your principles where the welfare of the team is concerned).
   (9) Make opportunities to praise team members and do so publicly. If you need to correct someone, do it in private.
6. Insure that the task is understood, supervised, and accomplished. Give clear concise directions. Take responsibility for confused directions even though the fault was with the other person. Supervise the team closely enough to see that the job is done properly; but don't supervise unnecessarily close so that it becomes resented.
7. Take responsibility for your action - The team leader is responsible for all his team does or fails to do. The team leader recognizes this and acknowledges it at all times. Any effort to evade this responsibility destroys the bond between the team leader, his team, and the operations leader.
8. Make sound and timely decisions - This requires judgement based upon logical reasoning. The finding of a clue can change the whole complexion of the search. Unexpected difficult terrain can mean that the team's assignment will have to be changed. These things should be worked out with the operations leader. If communications with the operations leader do not exist, you will have to use your own judgement. Team members can be encouraged to give their input into analyzing the situation. This is good practice for them and tends to keep up the interest in what is going on. It is, however, up to the team leader to make the final decision.
9. Employ your team within its capabilities - In difficult terrain, this is very much a safety consideration. If you have an inexperienced or tired team, keep your expectations within reason.



As Team Leader, the others will be looking to you to make the final decision.

Traits of Leadership:

The ideal leader will be a complex combination of many things. The following are some of the traits of effective leadership. No person will score high in all of them but, to some extent, a weakness in one can be compensated for by a strength in another.

1. Alertness - Vigilance and promptness.
2. Bearing - Denotes desirable physical appearance, dress and deportment.
3. Courage - Must be both physical and moral.
4. Decisiveness - The ability to make decisions intelligently, from information at hand, and announce them with confidence, clearly and concisely.
5. Dependability - Is the doing of one's duty with or without supervision.
6. Endurance - Both mental and physical, is necessary to continue and complete any reasonable task.
7. Enthusiasm - Is the positive zeal or interest in the task at hand. It is easily communicated to the team.
8. Force - The ability to impose one's will upon another painlessly.
9. Humility - Freedom from arrogance and unjustified pride.
10. Humor - Is the capacity to appreciate the many amusing or whimsical happenings of our everyday life **especially** those that pertain to oneself.
11. Initiative - Is the willingness to act in the absence of orders and to offer **well considered** recommendations for the good of the team.
12. Integrity - Is the honesty and moral character of the leader.
13. Intelligence - Is the intellect of the team leader which must be adequate to master the problems presented by his team involvement.
14. Judgement - Is the power of the mind to weigh various factors and arrive at a wise decision.
15. Justice - Is being equitable and impartial in all dealings.
16. Loyalty - Must extend both up and down. A team leader cannot expect loyalty from his team unless he is conspicuously loyal to them and to his operations leader.
17. Sympathy - Is the capacity of sharing the feelings of those with whom one is associated.
18. Tact - Is the ability to deal with all in an appropriate manner without giving offense.
19. Unselfishness - Is the studied avoidance of caring for or providing for one's own comfort or advantage at the expense of others.

Results of Leadership:

The measure of a leader is the results he obtains. A team leader can look at himself and his team. If the following are present, he has shown effective leadership.

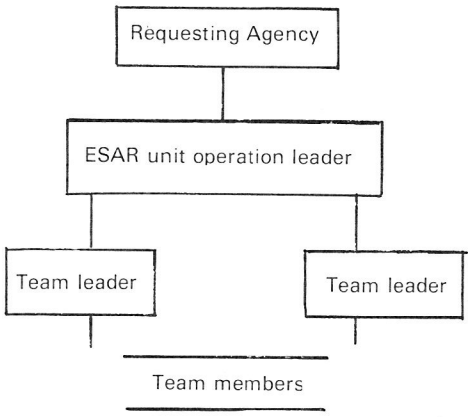
1. Discipline - There is a willing subordination of the individual for the good of the group. There is an obedience to command but one that preserves initiative and would still function in the absence of the team leader.
2. Morale - This is an emotional state characterized by voluntary effort beyond the minimum, and a personal sense of worth based upon pride and satisfaction in the accomplishment of a task.
3. Efficiency - The ability to accomplish successfully an assigned task in the shortest time, with minimum expenditures of means and with the least confusion.

If the team leader makes the habit of critiquing his own actions following every search, then the above 3 items can be used as criteria. Through this constant evaluation, leadership skills can be refined.

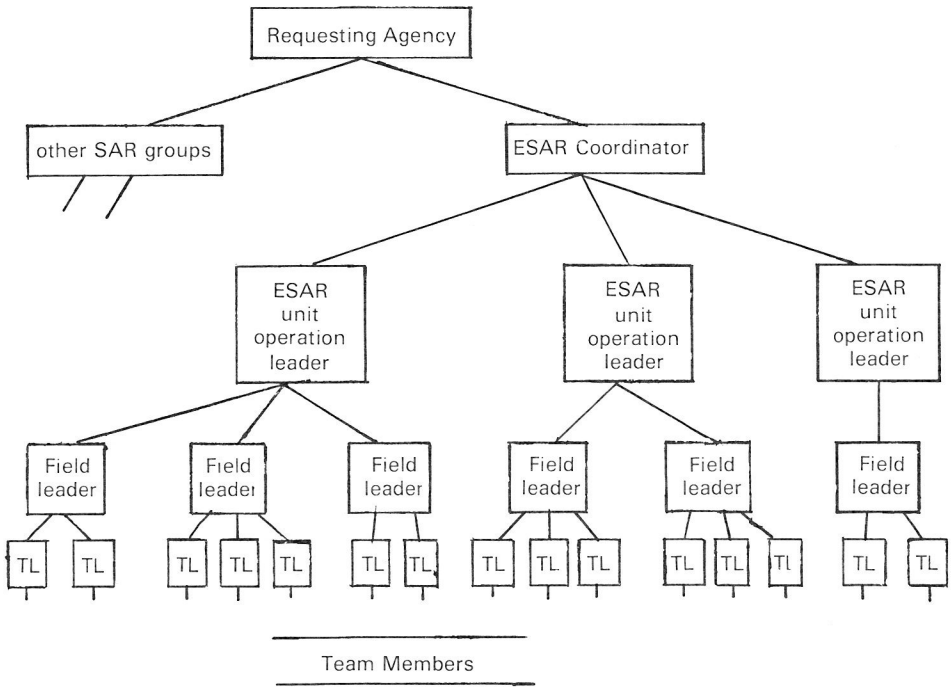
OPERATIONS:

The chain-of-command for ESAR operations may be quite simple or very elaborate. It usually depends upon the size of the search.

Chain-of-Command
Small Scale Operations



Chain-of-Command
Large Scale Operations



Requesting Agency -
May be a Sheriff's department, Park Service, or branch of the military. This agency will usually have one representative in base camp who is in charge of the total operation.

ESAR Coordinator -
He works with the representatives of the requesting agency and other search units. He plans how ESAR personnel are to be assigned. The ESAR Coordinator usually stays in base.

ESAR Operation Leader -
The leader in charge of one particular ESAR unit. He directs the activities of his unit's members. He usually stays in base.

ESAR Field Leader -
An ESAR leader. He accompanies the teams into the field and makes the detailed assignments of what teams search where. He must approve his assignments with the operation leader. On small searches there may be no field leader.

ESAR Team Leader -
Directs the team. He must carry out the job assigned by the field leader or operation leader. He will make the detailed assignments of duties within the team. He should keep team members informed and be mindful of his team members welfare.

ESAR Team Member -
He is the eyes and ears of the search. His duty is to carry out the instructions of the team leader.

The Team Leader:

The job of a team leader is very broad, but it can be summed up in one word - TEAMWORK.

Teamwork occurs when a leader inspires the individuals who compose the team into an organized course of action, where each team member is conscious of the rest of the team's reliance on him and his dependence on the rest of the team to achieve a successful search effort.

To achieve a coordinated team effort means constant vigilance by the team leader; he must be alert to detect any weakness in his team, for it is this weakness which will impair the effectiveness of the team and, like decay, the weakness, if not checked at once, will spread and cause a team to be ineffective.

Your team is as strong as the weakest member! Remember this! In every judgement you make, you must consider him.

The weakness that can render a team ineffective is usually caused by one of the following:

(a) A team moving too fast.
(b) Individual members of the team who start to gripe and slow down.
(c) A team leader's uncertainty and failure to assert authority.
(d) Lack of discipline
(e) A team leader or member who is ill.
(f) A team leader or member who is not properly equipped.

To overcome these points a team leader must recognize when they are occurring and react in a

manner to offset the weakness and bring the team back to full strength immediately.

(a) When gridding too fast, the grid line becomes crooked and there is a constant effort by those behind to catch up. It is here that search effectiveness is lost; the main task of searching is forgotten in the effort to catch up.

Remember - once a team is in motion it is imperative that the team move no faster than is necessary to scan the immediate area visually and quietly enough to hear a call for help. The efficient team is the one that has each eye and ear of each member concentrated on search - not catch up.

(b) Loss of desire when the going gets tough is difficult to detect and requires good judgement to offset this common team weakness. Find out the cause of excessive excuses, slow downs, rests, etc. Determine if you are moving the team too fast, or if you have a discouraged one. Once the cause is found, take steps such as a short rest and a change in position, lightening pack, etc. If the problem is with one member, **put him near you. This way you can help bolster him up and encourage him.** You will also be able to detect and counteract any discouraging effect he will have on others near him. Watch this - with inexperienced teams especially - discouragement can be very contagious.

Distinguish fatigue from loss of desire. Do not overtax a tired member. Rest him. If you do not do this the member may collapse. This will put your team out of the search.

Be sure you understand your assignment before you go into the field. Pass the information along to your team.

(c) and (d) "When the going gets tough, the tough get going." Team leader uncertainty is an almost certain way for him to lose his team's respect. It will cause a breakdown in order and discipline. Once assigned as a team leader assert your authority as a leader. Do it firmly and with assurance. Don't overdo it; unnecessary supervision can be resented. In some instances (route selection during a Type I search) you can involve team members in the decision making. Show the map, explain the task and ask their advice on how to proceed. This increases interest by promoting more involvement by each team member. The team leader, however, has the final say.

Think each decision over carefully before you voice it to your team and then when you do, speak clearly, calmly and with firm assurance. Self assurance is needed. Don't be overly discouraged if you make mistakes; but, make a point of learning from them.

Remember - once you have made a decision, stick with it unless there is a very good reason to change it.

(e) If a team member is ill, it will be necessary to get him back to an evacuation point. To overcome such necessities, check before you leave base for any team member who is not feeling well.

While your desire to search may be strong, it is unfair to the team or the lost party if you start a search when you are ill. Your own illness may knock out a full team's effort trying to compensate for your weakness.

(f) Lack of equipment or improper equipment. This can cause untold delays. The slip-shod's inability to keep up on grassy or damp slopes, the person who "travels light" and must depend on others for food, are examples. In this respect it is suggested that the team leader carry more food than he expects to use. An extra flashlight is also good. Sometimes a well-intentioned but inexperienced team member will tell you he has all the required gear; however, in the excitement of going out on his first search he left some things at home. When you encounter this, you will have to make up the difference from your own pack.

Remember - sometimes you will be coping with the worst nature can offer. Make sure your team is equipped before you start.

Areas of Team Leader Responsibility:

The search and rescue action for a team is normally divided into six steps:

1. The base of operations
2. The grid formation
3. The grid field movement
4. Incidents
5. Evacuation
6. Check in

It is during these steps that the team leader must take close inventory on himself, his assignment, and his team operation.

I. Base of Operations

This is normally defined as the area of registration, search headquarters, and the area to check out once a search has secured. This is also the place where the team leader will be assigned his team and where he will receive his search assignment.

It is important to remember that a base of operations is not necessarily a fixed position. We have experienced a number of occasions which have required the base of operations to be moved and in some instances have had a secondary base (usually for grid control).

1. Assignment of team
   (a) Meet each of your team members, know who they are, know their first names as well as their last, and when you meet them, look them square in the eyes, **introduce yourself, and shake hands.** It may

sound corny but it pays off in big dividends as the search progresses. **Don't underestimate the first impression you create.**

(b) If you are going to be gridding, assign each member in accordance with where you want them positioned. For example, compass man no. 1, ribbon man no. 7, radioman no.3, etc. Be sure and double check to see that each member knows his number.

(c) Evaluate your team strength and then place your strongest members strategically. Remember - your team may be composed of from 3-9 members and your assignment at any time can change. So plan in advance where you will place your compass man, stride man, ribbon man, records man, and also your own position.

(d) Make sure that you tell your team which persons in base are relatives or friends of the subject. Whenever in base, be sure to keep your team away from them. Refrain from joking or loud laughter when relaxing in base. While such releases are necessary, they should be done out of sight and sound of these persons. Check to see if members of the press are present. If so, be sure your team members are reminded to direct all questions to the operations leader or responsible agency. On large operations one person may be given the job of handling all press releases.

(e) Team control - try to discern if you have potential personnel problems such as the "know it all", "funny man", or "Mr. Muscles". Then take corrective action to assure these team members that **you** are the team leader. It would be best to take such persons to one side and explain this to them and why it is necessary. A word of caution - don't over control.

Use good judgement in your directions, be firm to maintain discipline but keep it loose enough to prevent resentment.

Many times when you have a fireball for a team member, you can use this energy at one of the more difficult positions such as ribbon man, or carrying the radio. You control the team, don't let anyone else take over. To do this you must gain the team's respect. Start this respect before you leave the base of operations and you can maintain it with good field search and rescue know-how.

(f) Know before you go. Write it down. Get the facts from the operations leader before leaving the base of operations. It is best not to be impatient at this time. When committed to the field operation either with or without the benefit of radio communications, it will be necessary for you to have all the facts to make decisions. You may not be able to call in for that little something you have forgotten. Radios have been known to fail or you might not have one. Let's look over the points you must know before you go.

What is your **team's area of search?** Be sure you know exactly what your field assignment is. If you don't have a map of the area, make an overlay from available maps. Since you may be exposed to either the complete area saturation grid (slow grid) or the selected area type grid (fast grid), it is necessary for you to acquaint yourself with topographical features, distances, roads, trails, etc. in order to know what to expect. On this basis you might want to take special equipment (rope, rubber boots, life-jacket, etc.) It is important that you know the overall search effort (if possible), what your relationship is to other search teams, what your team penetration depth will be. This is particularly important when you will not have radio communications or when there is doubt that radio communications will be effective .

Who are you looking for? The following is a copy of part of an investigation sheet used by many operation leaders. He will give you a copy of it or give you an opportunity to copy his. Should he forget, you ask.

SUBJECT NO. 1

Name_____

Home Address_____

City_____ Phone_____

Age _____ Sex _____ Height _____ _____

Physical Condition_____

Recent Ailments_____

Clothing (color)	Equipment:
Coat _____	Shelter _____
Raincoat _____	Pack _____
Shirt _____	Light _____
Pants _____	Map _____ Matches _____
Hat _____	Sleeping Bag _____
Shoes, what kind? _____	Food, how much? _____
_____	_____
Smoke, what kind? _____	_____
_____	_____

Other: Experience in woods, amount of preparation for this outing etc.

Where were they last seen? When? By whom? What were their intentions? When were they due out? Known predicament?

Write and Repeat to your operation leader, your team search assignment. Repeat the compass direction, if any, you are to follow in establishing any grid control line. This will insure that no verbal communication breakdown has occurred between your operation leader and yourself. Thoroughly understand your assignment and don't guess; if you have the least doubt, ask before you go.

Know the **duration** (24 or 48 hours) of your search and if you are to be in the field overnight. Check with each team member for 48 hour pack if applicable; check footwear and report any slip-shod team members to the operation leader. This is very important as your team effort may be impeded or even endangered if the search area is precipitous. Check for illness and if any team member is ill or has a physical weakness, advise the operation leader. Check for adequate grid ribbons, smoke flares and signals if needed.

Keep track of your team members and your location on a continuous basis.

2. Communications

Check your radio. Be sure it functions **before** you go. Check and know your call number. Know your time for radio check in. **Know the code for reporting serious injury or death.** If needed, prepare and know code words for aircraft, weapons, etc. Check and know your mode of operation if you receive no response on the radio (check the set for loose antenna or loose connections to the batteries. If you still hear nothing, send your message anyway. Repeat it twice - speak slowly. There is a good chance your transmitter will work even if your receiver won't).

Standard code words have been suggested for use by all ESAR units. A phrase using _____, means that you have found the subject and he is apparently deceased. _____ is used to tell the other person that confidential or sensitive information must be passed. It gives the others a warning to be sure that no unnecessary persons are present and could hear the radio message. The use of code words prevents the premature release of the information. Relatives of the subject may be present at base and listening to the radio. The code word will allow the operation leader to get off by himself before taking any more detailed information. Be prepared to describe the subject's condition and your location.

Be sure you have checked out from the base of operations and you have turned in a copy of your team roster.

II. The Grid Formation

After leaving the base of operations, it will be your job to properly line up your team in accordance with the type of grid to be used. Before you do line up and start out, let your team know the problem.

1. Pass on all the information you have received from the operation leader. This will get them in the spirit of the search as well as feeling part of the search team and not outside looking in. The operation leader expects you to share information with your team members. Be sure you do it.
2. If the grid is to be a maximum saturation type (Type III) then do the following:
   (a) Proceed to the assigned starting point and check in with your field leader (if any).
   (b) Line your team in a straight line in accordance with the job you have

assigned to each member. Be sure each member knows his job.

(1) If you are to set the grid control line, check with your compass man to assure he has the right bearing.

(2) Check with your stride man. He may also hang ribbons if he is assisting the compass man to set in the control line.

(3) Be sure the radio man knows the check in schedule. Be sure he has a watch.

(4) Assign ribbon men. If you are the first team through you may lay ribbons at both ends of your team. If not the first team, you will be laying at one end-picking up at the other. Let the whole team know if it is a "guide left" or "guide right" situation.

(5) Radio in to base the type of grid you are using as you start out.

3. If a Type II grid is selected (fast grid), do the following:
   (a) Assign positions to your team members. Stride off the distance between team members and make sure the spacing is what the operation leader assigned.
   (b) Put your stronger members at the outer limits of the grid lines.

III. The Grid Field Movement

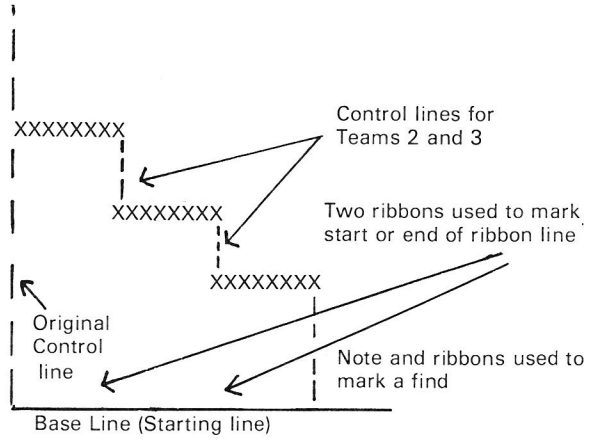
Here the team leader is faced with a number of problems. The biggest is team control. Once a grid team moves from any base line it is necessary to maintain an orderly advance. A straight line is best for either fast or slow grid.

1. Type II - May include drainage sweeps, trail checks, or ridge running.
   (a) Proceed in a single file line to the assigned grid area.
   (b) Be sure you are oriented correctly and you are in correct position to search.
   (c) Since a fast grid is usually based on the premise that the lost person is not injured and is traveling, it is a good idea to call out periodically. Stop the team first and wait momentarily for an answer. Repeat this two or three times before moving on.
   (d) Because you are moving your team rapidly, do not pass by areas where a person could fall or hide. Be reasonably thorough.
   (e) Stop your team as many times as you feel it necessary to maintain control and prevent an unorganized split or breakup. Because your team is spread out and moving fast, control is one of your most important jobs.
   (f) Stop your team whenever a member asks for this action. Then you personally investigate his reason for stopping the team.
2. Type III
   (a) Keep your line straight.
   (b) Stop your team as many times as necessary to maintain control and a straight line.
   (c) Keep your team quiet as possible during movement. This will enable you to hear the subject should he call out.
   (d) Periodically have your team sound off (call out their number). This will enable you to know where your team members are even though you can't see all of them.
   (e) Do not allow your team to become stretched out to an uncontrollable spacing.
3. Include in fast or slow grid:
   (a) Check in by radio at scheduled times.
   (b) Keep a record of where you have been and what you have recovered.
   (c) Do not deviate from your assignment unless cleared with your operation leader. **You are not to take direction from any local citizen or any authority in the area which will require you to deviate from your assigned search area unless you contact and receive permission from your operation leader or field leader.** If an unauthorized person makes such a request of you, politely advise him to check with the ESAR field leader or operation leader - they can make the decision.

If you meet other persons in the search area, ask them to keep an eye out for the missing person. Also ask where they have been and where they are going; this may become meaningful should clues later be found in those areas.

Terms Used in Gridding

The following terms are often used in gridding. You should know all of them.

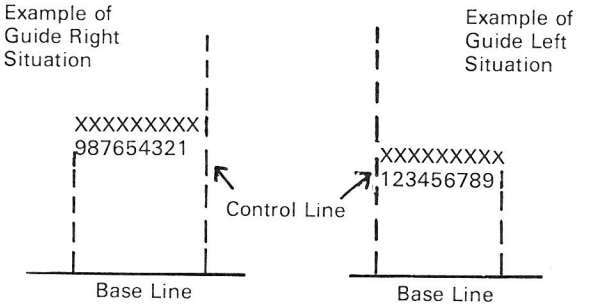


Visibility Distance:

The maximum distance where you can see all of the ground between you and the person you guide on. In a Type III search, if the visibility distance is 30 feet, the proper distance between team members is 30 feet.

Guide Right:

An order telling each team member to keep to the side of the man on his right. (This is because the control line is to right of the team.)

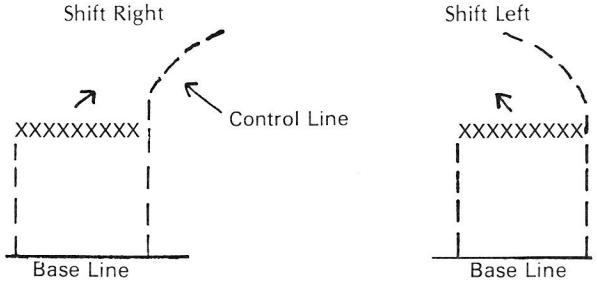


No. 2 man keeps No. 1 man on his right, No. 3 keeps No. 2 on his right, etc. Control line is to right of team.

Control line is to left of team.

Shift Right:

A command telling team members to move right as well as ahead. This is necessary when the control line veers to the right.



Note: Very often you will have a few inexperienced gridders on your team. Put them near you or some other experienced member. Teach them how to grid if necessary. Don't criticize - just instruct him how to do it properly. Criticism only builds resentment: patient instruction builds confidence and respect. Use the terms listed above and, if necessary, teach their meaning to the team members.

IV. The Incident

During the course of the search you will occasionally have instances where one of your team members has found an article, heard something or has seen something. **Do not pass such instances without close investigation.** This is particularly important when you consider that lost persons do many things. They can yell, throw away their equipment, hide from searchers, etc. You must look for the extraordinary.

1. What do you do if you find a clue or something unusual? Call base and give them the information.
   (a) Describe the clue fully
   (b) Location of find
   (c) If instructed by base, take the clue into your possession.
   (d) Mark the location with ribbons and a note.
2. What do you do if you find the lost party? This will depend on the condition of the lost one and will usually evolve into the following courses of action:
   (a) Subject seriously injured
   (b) Subject ambulatory
   (c) Subject apparently dead

In the case of (a), it will be the team leader's responsibility to take immediate action in seeing that the subject is given proper first aid to save his or her life. **Keep calm.** Be sure you give each of the team members something to do. If you have no radio, it will be necessary to send word out to the base of operations so that a doctor, air support, etc., can be activated. It will mean assigning three members of your team to go out by the shortest marked route to a communication point to contact base of operations. Emphasize that the 3 members going out must mark the route well with ribbons or string. It would be tragic for the subject if a returning team couldn't find its way back to you. In the meantime it will be your job to keep the balance of the team busy with first aid, building shelter, building fire, locating a helicopter site or finding an evacuation route.

Remember, in case of (a), the subject is often conscious. Keep his spirits up and be of good cheer yourselves. Be sure that the members going for help have the information on the subject's condition, your location, type of terrain, etc. This will be most helpful for decisions that base of operations must make.

Should the subject be unconscious, keep in mind that the first sense to return to him could very well be hearing. Refrain from talk about how bad off he is, what a tough evacuation it will be, etc.

When you radio in that you have found the subject, be sure you have facts before radio contact is made.

Then relay the information and answer any questions relative to the subject. **Note:** Do this away from the subject's presence. When using the radio remember the code words. On the radio or in the presence of the injured person, refer to him as the "subject", not "victim".

Make sure someone is assigned to reassure and tend to the subject continually.

In the case of b., it will be your duty to ascertain the subject's condition. Even though ambulatory, he may be in serious shock. You will need to take great care. If in doubt, try to entice and encourage the subject to sit or lie down. Then you can radio for assistance or send the 3 man team out for help. **Treat for shock.** Make the subject comfortable and prepare for evacuation, or a walk out if the subject's condition permits.

In the case of (c), where a subject is apparently deceased, have your senior first aid man check for any signs of life. Then ascertain if this is the lost party you were searching for. Check the description of clothing, shoes, hair, etc. If you have no radio, send a 3 man team out for help. In this case, assuming the subject is deceased, certain officials will have to view the remains. These officials may include the Sheriff's Department, coroner or medical examiner, state aeronautics or others. **Do not move the person unless you feel he is alive.** Secure the surrounding area from any further disruption. This is especially important if foul play is suspected in the cause of death.

3. What do you do if you come upon aircraft wreckage? In the event it is a military aircraft, you will have been briefed before leaving base of operations. Remember, **don't disturb the wreckage unless there is a life to be saved.** Never approach an aircraft that has explosives when you have been advised not to. Approach an aircraft only from the side, not the front or rear.

4. Points to remember:
   (a) In the event of violent death such as in an aircraft accident, your operations leader will try to prepare you mentally for the situation. It is well to think very impersonally if you are confronted with such a happening. The person is gone, it is our job to bring back the remains. This is not disrespect; it is proper perspective.
   (b) In the instance where your team is under the stress of searching for and evacuating the dead, there may be a marked tendency to joke or become loud. This really is an outward manifestation of an entirely different inside feeling of tension. Avoid the tendency yourself; remember the example you set for others. Remind the team members there may be friends or relatives of the deceased person present.
   (c) If a team member becomes ill during the search and evacuation of the dead, relieve him until he feels better. **Do not criticize.**
   (d) No ESAR member is required to work with a deceased person.

V. Evacuation

This is the search team's course of action: it involves the removal and stretcher transportation from a remote area to:

(a) Aircraft evacuation point.
(b) Vehicle evacuation point.

It is very important that once a subject has been treated properly with first aid that he be well padded when put into the litter. Once this is done, select six men to carry the litter. Meantime select who will carry extra packs, cut brush, locate route, etc.

In either type of evacuation, select the shortest and safest route and keep changing the team on the litter often enough so they will not burn out. Once at the aircraft site, prepare the landing area.

The approved ESAR litter packing technique is as follows:

1. Place a tarp in the bottom of the litter leaving half of it hanging out the side.
2. Place a sleeping bag in the bottom of the litter and part way up one side.
3. Place a second sleeping bag on the bottom and part way up the other side.
4. Put an open rectangular bag in the litter.
5. Carefully place the subject on the rectangular bag.
6. Close the top half of the rectangular bag over the subject.
7. Place a fourth sleeping bag over the subject (optional).
8. Bring the remaining half of the tarp over the litter.
9. Tie with ⅛" nylon cord in a zig-zag pattern across the litter. Tie off each time. Tie straps can be used if available.
10. Place padding under and beside the

subject's head. Put a strap across the head if head or neck injuries are suspected. Protect subject's eyes from falling vegetation, if evacuation will be through underbrush.

The fastest type of evacuation where adequate manpower is available is as follows: have six men carry the litter, a few men ahead locating and clearing the route, and the rest following the litter. The two fellows at the head move to the middle. The center two move to the foot. The two fellows who were at the foot of the litter drop off - wait for the litter and line to pass - and fall in at the end of the line. They should change sides before their next turn: this tends to even the wear on both arms. (See more complete description in the team member portion of this manual.)

Upon return to base, check in with the OL. He will want to plot your information on the operations map and to ask you questions.

VI. Check In and Critique

This is very important. The team leader is held entirely responsible for the check in of his team when he returns to base camp. This can occur either at the end of the day or the end of the total search. Anytime your team is to be disbanded it is up to you to turn in your team roster and count to the operation leader. More important is the fact that you have taken a roll call of your members and know all are accounted for before turning your roster in. If you don't check in, the operation leader must assume you are still searching or lost. When you do check in, he will assume all of your team members are also in from the field.

During the time of check in it is important that you tell the operation leader of any pertinent facts that occurred during the search.

These include:

(a) Areas covered and clues found
(b) Unusual incidents
(c) Uncooperative team members
(d) Sick or poorly equipped team member

When you check in from a search, this is not an automatic dismissal to go home. You must wait for a release from your operation leader. Tell this to your team members.

Your unit will find it helpful to hold a critique meeting to discuss the happenings and events of the recent search. Perhaps some equipment is to be accounted for. Your team's performance can be aired and any weak points checked.

Special Points of Consideration

(1) **Radio** - It is your link to the rest of the operation. Keep it inside a pack where it is protected from water and physical abuse. At night, remove the antenna and put the radio inside a sleeping bag if it got wet or cold. This will dry it out and keep the batteries warm.

Some team leaders prefer to carry the radio themselves. This has the advantage of keeping the team leader more informed because he can listen to the transmissions of other teams. It has the disadvantage of concentrating more responsibility on one person.

(2) **Hurry up and wait** - Often you will hurry from town to get to base. Then you wait around base for an hour or so before being sent into the field. Many times this cannot be avoided; it takes the operation leader a while to gather information and plan a course of action. Meanwhile use the time; get your pack ready, put your boots on, etc. When a decision is made, be ready to move. Encourage others to do the same.

(3) **Make no negative comments** about the people or performance of other rescue units. This only worsens peoples' feelings and can hurt ESAR. Don't allow your team members to make such comments. If criticism is warranted, discuss it with your field leader or operation leader.

(4) **Avoid technical terrain;** except for those fellows who have had climbing training, ESAR teams are to avoid cliff areas and to stay off glacial ice.

(5) **Deviation from assignment** - If the terrain or the finding of evidence or something else gives you reason to deviate from your assignment, get an OK from base. If you have no radio, you are to use your own judgement. You have the authority to deviate from your assignment if, in your considered opinion, there is sufficient reason. Even when you do have a radio, the operation leader relies heavily upon your judgement and suggestion; you are where the action is - he may be several miles away.

(6) **Stigma of being lost** - When you find a lost person, be aware that he may be sensitive to the label of "being lost". rather than say "I'm glad we found you", it would be preferable to say "we were concerned that you might have been injured." The stigma of being lost can be great. Reference to it can be avoided by justifying the search on the basis of fear of injury rather than fear that he was lost.

PROBLEMS: TEAM LEADER TRAINING

No answers are given to these questions in this book. With some questions there is no "right" answer. With others, the answer will vary according to the expectations of the units leadership. Discuss these questions with other TL's, FL's, and OL's from your unit; get their opinions and reactions.

1. Describe how you would handle a team member who is complaining too much.

2. You assign another member of the team to lead the way up a trail. Later you discover that he has taken a wrong turn and the whole team has walked 2 miles in the wrong direction. How do you handle this with the team member who was leading? How do you handle it with the OL?
3. The TL discovers that one of his team members is carrying a bottle of beer. The TL's immediate choice is to report it to the OL or to not report it. Discuss the immediate and long-term implications of both options.
4. How do you distinguish fatigue from loss of desire?
5. Describe several methods a TL can use to create a good first impression with his team members. Assume he hasn't previously met these team members.
6. List some of the things a TL should do with his team prior to leaving base camp for the field.
7. A deputy sheriff comes up to a TL in the field and asks the TL to search a different area than was assigned. What should the TL do?
8. Describe what sequence of steps the TL should take when one of his team members finds an unconscious lost person.
9. While checking an area on a Type I search, the TL begins to sense that, if the lost person passed through this drainage, he probably would have gone in a certain direction. This opinion is based upon the lay of the land and density of the underbrush. If the TL is right, the lost person would be outside of the area of search for that day. The team's radio is broken. List some of the options available to the TL. Describe some of the advantages and disadvantages of each.

ANSWERS TO PROBLEMS

ANSWERS: CONFINEMENT, DETECTION, AND EVACUATION

1. Any 3 of the following: trail blocks, road blocks, lookouts, camp-ins, track traps, or string lines.
2. Three members.
3. It may later become important for other searchers or law officers to return to that location.
4. Wait silently for a potential reply.
5. Radio that information to base and check to see if there is another team in the area. It may be the other team answering you.
6. False - Any team member can halt the team. Only the TL can re-start the grid.
7. Use compass to keep on parallel paths (OK for short sweeps). OR use string lines.
8. Thoroughness or a high Probability of Detection.
9. They feel they may miss the subject if he is in their path. This is true, they may miss him. It is a calculated risk that the OL, not the team, is responsible for.
10. 94 per cent.
11. A 60' spacing.
12. The number of team members on the grid line. This excludes the TL if he floats behind the team.
13. Team No. 1: 5 Guide 15
    Team No. 2: 6 Compass 30
    Team No. 3: 7 Guide 30
    Team No. 4: 5 Guide 40
    Team No. 5: 3 Compass 60
14. Team No. 1: Guide left
    Team No. 3: Guide right
15. Team No. 4
16. Member No. 3
17. False - In areas of open terrain, night searches have proved quite productive. Even in other areas, any night search will always be more effective than no search at all.
18. STOP! Disturb nothing. Notify your TL; he in turn will call a police officer to take a look.
19. You wouldn't. Technical or dangerous rescues are better left to those persons highly trained in the subject.
20. For: The team will cover greater width. Against: The team will move more rapidly because the TL will be better able to spot and correct problems.

ANSWERS: WILDERNESS NAVIGATION

Map 1

1. a. 342 degrees or 320 degrees M
   b. 4 13/16 mi. or 25,400
2. Sec. 13, T23 N, R 8 E
3. a. 234 degrees T or 212 degrees M
   b. 4 1/16 mi. or 21,450'
4. a. b
   b. 2
5. a. 2000'
   b. 247 degrees T or 225 degrees M
6. a
7. Pt. D
8. a. 2700'
   b. 317 degrees M
9. SW¼ of Sec. 24, T 24 N, R 8 E
10. Pt. F

Map II

1. 3
2. a. Peak A
   b. SE¼, Sec. 3, T 29 N, R 11 E
3. Between 1300' and 1400'
4. A pass between peaks B and C
5. Approximately 60 degrees T
6. NE¼, Sec. 3, T 29 N, R 11 E
7. Pt. D
8. SE¼, Sec. 2, T 29 N, R 11 E
9. SE¼, NE¼, SW¼, SW¼, Sec. 2, T 29 N, R 11 E

ANSWERS: HYPOTHERMIA

1. The lowering of the body's core temperature.
2. A non-specific term often confused with hypothermia.
3. Moderate wind, wetness, and cool (but not necessarily cold) temperatures.
4. Rational thinking is one of the first things to be lost as a person goes into hypothermia. George probably just forgot the cap was in his pack.
5. See text for answers.
6. Conduction.
7. By putting on a hat. Most radiant energy is lost through the head.
8. Eat small amounts often. Also, don't overlook the need to drink water.
9. A state of mind characterized by determination to get home on schedule no matter what the cost. It is usually motivated by fear of losing face and associated with the use of bad judgement.
10. The difference relates to fatigue and shelter. A person with adequate energy reserves and sufficient shelter need not fear sleep; his brain will wake him if he cools. The more exhausted person or a person with inadequate shelter, however, needs to stay awake and exercise to maintain body heat.
11. See text for answers.
12. External heat would cause the cool surface blood to circulate into the core. This further reduces the core temperature and increases risk of cardiac fibrillation.

ANSWERS: DESERT SEARCH

1. False
2. False
3. True
4. Pulse rate - A rise in rate indicates stress.
   Sweat rate - A rise in rate indicates stress.
5. Loose fitting clothing which covers almost all of the skin area (especially the head and neck). Light colors are best. Wool is desirable

because it tends to keep sweat evaporation at skin level.

6. Advantages - It is physically easier because of the lower temperature. Because the terrain is open, flashlights or moon light will be more effective than in wooded areas.
   Disadvantages - There is less light. It is easier to miss the subject or a clue. Hazards such as wash-outs are harder to see.
7. Yes - If there is little water in the search area. Dehydrated foods will require water to reconstitute; it's easier to carry the food with water already added (cans).
8. It is important to consume **both** salt and water. Either without the other only worsens the situation.
9. Thirst may go away after only ¼ of actual fluid loss has been consumed.
10. He can't. Beyond a certain point the body's sweating ability cannot keep up with the demand for cooling.
11. See text for answers.

RESOURCES

SEARCH AND RESCUE OPERATIONS

(1) ————————, *Helirescue Manual,* 1972, Washington Dept. of Emergency Services, 4220 E. Martin Wy., Olympia, WA, 98504, 36 pages.
A rather complete description of helicopter procedures as they relate to Search and Rescue. Much of the information in the helicopter procedures section of this manual was drawn from this resource.

(2) Kelley, Dennis, *Mountain Search For The Lost Victim,* 1973, Box 153, Montrose, CA, 91020, $5.00, 283 pages.
This is one of the most comprehensive books available on search management. The sections on strategy and tactics are very useful and could be applied by almost any ESAR group. Other chapters include the Victim, Responsible Agency, Base Camp, The Searcher, Training, and Contingency Analysis. Though the data reported is mostly from Southern California, it is the statistical approach which is new. Ten years from now, this book and one other (8) will probably be regarded as the turning point in the maturing of land SAR in the U.S.

(3) Kelley, Dennis (Publisher), *Search and Rescue Magazine,* Box 153, Montrose, CA, 91020, Published 4 times per year. $7.00 per 2 yr. subscription.
This magazine is the trade journal for Search and Rescue. Articles include recent equipment developments, research, SAR events, general SAR, news, and fiction. This magazine is the major medium by which SAR information can be exchanged throughout the country. It is essential reading for OL's and other leaders of ESAR units.

(4) Kelley, Dennis, *"Search Theory", Search and Rescue Magazine,* Box 153, Montrose, CA, 91020, Winter, 1974. Pages 13-17.
A description of a SAR theory based upon quick response, confinement, night searching, emphasis upon keeping searchers in the field, and the importance of looking for clues.

(5) May, William G., *Mountain Search and Rescue Techniques,* 1973, Rocky Mountain Rescue Group, Inc., Box Y, Boulder, Colorado, 80302, $4.00, 301 pages.
An excellent over-view of non-technical and technical rescue methods. Other sections cover such topics as responsibilities, equipment, search, map systems, communications, and others. This book provides a good resource for the ESAR OL who wishes to familarize himself with the scope of Mountain Rescue Operations.

(6) ————————, *National Search and Rescue Manual,* 1973, U.S. Govt. Printing Office, Washington D.C.
This manual covers the organization of SAR efforts on the national scene from a primarily military viewpoint. Though loaded with terminology and abbreviations, this book definately erases the impression that SAR is a simple and local concern. Sections on air and water search are good. The portion on land search is a little dated. Because of the over-view it provides, this manual is recommended reading for ESAR OL's.

(7) ————————, *San Diego Mountain Rescue Team Training Manual,* 1974, Box 267, La Jolla, CA, 92037, $10.00.
A fairly technical manual especially suited to operations in Southern California but adaptable to many other areas. There is considerable emphasis upon organization. Sections include: Forms, General Procedures, Radio, Technical Rescues, Baja Operations, Land Search, Tracking, Desert SAR, Snow and Ice, Aircraft, Survival, First Aid, Maps, Scuba, and Training Aids. A good reference for OL's.

(8) Syrotuck, William G., *A Statistical Analysis of Lost Persons in Wilderness Areas, Number Two,* 1973, Arner Publications Inc., 8140 Coronado Lane, Rome, NY, 13440, $1.75, 26 pages.
An analysis of 92 case histories of lost persons. Attention is given to such variables as direction of travel, distance traveled, terrain type, weather, and survival. Because this report has strong implications for search planning, it should be required reading for OL's and FL's.

(9) Syrotuck, William G., *Some Grid Search Techniques for Locating Lost Individuals in Wilderness Areas,* 1974, Arner Publications Inc., 8140 Coronado Lane, Rome, NY, 13440, $1.75, 24 pages.
A survey of grid patterns and overlaping and duplicating grids. Consideration is given to probability of detection and manpower requirements. Highly recommended for ESAR OL's.

(10) Wartes, Jon, *An Experimental Analysis of Grid Sweep Searching,* 1974, Western Region ESAR, 790 Lucerne Dr., Sunnyvale, CA, 94086, $1.00, 50 pages.
A comprehensive report of field research conducted on grid searching. Results are tabulated to show differences in grid spacing, day-night comparisons, differences according to the type of object being sought, time comparisons, and performance as a function of previous practice. This report supports the observation that, while close grids tend to be thorough, open grids tend to be most efficient. This has powerful implications for search planning. Should be required reading for ESAR OL's and FL's.

(11) Wartes, Jon, and Rengstorf, Bill, *The Use of String Lines for Search and Rescue,* 1973, Western Region ESAR, 790 Lucerne Dr., Sunnyvale, CA, 94086, $.50, 12 pages.
A description of how string lines can be used for search area confinement, segmentation, and grid control. Also included are diagrams and parts list for building an aluminum can to serve as a string dispenser. This report is important reading for ESAR OL's and FL's.

WILDERNESS NAVIGATION

(12) Kjellstrom, Bjorn, *Be Expert with Map and Compass: The Orienteering Handbook,* 1967, Charles Scribner's Sons, New York, NY, $3.50, 136 pages.
A good description of basic map and compass. Practical ideas for cross-country navigation are given along with suggestions for setting up orienteering courses.

(13) Ratliff, Donald E., *Map, Compass and Campfire,* 1970, Binfords and Mart Publishers, Portland, Oreg., $1.50, 63 pages.
A very comprehensive review of map (especially Township and Range) and compass. Sections on making fire and emergency measures are also included.

BACK PACKING AND GENERAL OUTDOOR SKILLS

(14) Manning, Harvey, *Backpacking: One Step at a Time,* 1973, Recreation Equipment Inc., 1525 11th, Seattle, WA, 98122, $2.95, 356 pages.
A very readable book covering the basics of outdoor travel and camping. Topics vary from how to walk and routefinding to the new outdoor ethic. Sections on outdoor equipment are especially good.

(15) Manning, Harvey (Editor), *Mountaineering: The Freedom of the Hills,* 1973 Seattle Mountaineers, Box 122, Seattle, WA, 98111, $9.95, 430 pages.
The standard text book for basic climbing courses, this well-known book describes the essentials of rock and ice climbing as well as a common sense approach to safety.

COMMUNICATIONS

(16) Granger, Jim, *Revised ESAR Communications Plan,* 830 NE 81, Seattle, WA 98115, (Now being prepared, expected to be ready in mid 1975.)
A logical survey of the radio bands (low band, high band, UHF), the various services within each band (business, special emergency, etc.) and projections of equipment availability during the coming years. Intended for use by leaders of newly forming ESAR units, this report contains many tips and suggestions on planning of communications system. Also included is a description of the proposed communications plan for use by ESAR units nationally.

HYPOTHERMIA

(17) *By Natures Rules,* Produced jointly by Seattle Mountain Rescue, SAFECO Insurance and Jim Lawless. 16MM motion picture with sound and color. 28 min.
Describes hypothermia hazard, conditions under which exposure occurs, prevention of hypothermia, early detection and field treatment. Excellent film. For free loan of films within the U.S. contact: Photo and

Sound, 1205 N. 45, Seattle, WA, 98103, 206-632-8461. For film sales contact: Jim Lawless, 1545 NE 130, Seattle, WA, 98125.

(18) "EMS - 02 Thermo-Gen", *Search and Rescue Magazine*, Box 153, Montrose, CA, 91020, Winter, 1974, Page 36.
Description of a portable unit to supply heated oxygen to hypothermia subjects.

(19) "Heated Oxygen Hypothermia Treatment", *Search and Rescue Magazine*, Box 153, Montrose, CA, 91020, Spring, 1974, Pages 17-21.
Description of a portable unit to supply heated oxygen to hypothermia subjects.

(20) Lathrop, Ted, *Hypothermia: Killer of the Unprepared*, 1972, Mazamas, 909 NW 19th, Portland, Oregon., 97209, $1.00. 23 pages.
An excellent description of hypothermia. Prevention of hpothermia is stressed. Many examples of hypothermia deaths are given; each example illustrates several aspects of hypothermia symptoms, treatment, or prevention. Highly recommended.

HYPERTHEMIA

(21) *Thermal Wilderness*, Produced jointly by Seattle Mountain Rescue, SAFECO Insurance, and Jim Lawless. 16MM motion picture with sound and color. 28 min.
Describes conditions under which heat exposure occurs, prevention, early detection and field treatment of heat disorders. Excellent film For free loan of films within the U.S. contact: Photo and Sound, 1205 N. 45, Seattle, WA, 98103, 206-632-8461. For film sales contact: Jim Lawless, 1545 NE 130, Seattle, WA, 98125.

(22) ————————, San Diego Mountain Rescue Team Training Manual, 1974; see (7) above, Desert SAR section.

SURVIVAL

(23) _____, *Outdoor Living; Problems, Solutions, Guidelines*, Tacoma Mountain Rescue, Box 696, Tacoma, Wa. 98401, 99 pages.
A very good survival manual for backpackers. Covers survival in all aspects from snow to desert.

(24) Fear, Gene, *Surviving the Unexpected Wilderness Emergency*, 1973, Survival Education Association, 9035 Golden Given Rd., Tacoma, WA, 98445, $3.95, 192 pages.
An excellent resource. Though detailed in the physiological and mental aspects of survival, it is also very readable. Specific survival and preventative suggestions are given for all types of environments.

FIRST AID

(25) ————————, *Cardiopulmonary Resuscitation*, 1974, American National Red Cross, Washington D.C., 41 pages.
Standard Red Cross text for CPR. Highly recommended for all ESAR members.

(26) Mitchell, Dick, *Mountaineering First Aid*, 1972, Seattle Mountaineers, Box 122, Seattle, WA, 98111, 92 pages.
A very readable summary of first aid from a mountaineering point of view. Highly recommended for all ESAR members.

(27) ————————, *Standard First Aid and Personal Safety*, 1973, American National Red Cross, Washington D.C., 268 pages.
The standard text for all ESAR members.

(28) Wilkerson, James A., *Medicine for Mountaineering*, 1967, Seattle Mountaineers, Box 122, Seattle, WA, 98111, $6.75.
Covers the range of first and second aid as applied to mountaineering situations. An excellent resource to be included as group equipment on long hikes or rescues.