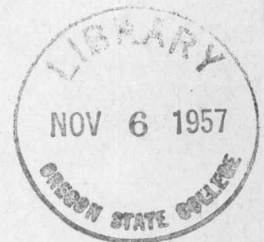


A RESCUE PLAN
FOR SKIING AND MOUNTAINEERING AREAS


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PREFACE

With the recent surge of interest in skiing and mountaineering, the need for a concise plan of search and rescue for lost persons has become more urgent. The forest officer has been presented with a problem which needs careful preparation to insure a successful solution. Specialized training will be necessary in skiing, mountaineering, and first aid techniques. In almost all cases the initial action will be conducted by or under the direction of a forest officer. This thesis is submitted with the aim of presenting a plan of preparation and initial action which will serve as an administrative guide and will aid in insuring a high degree of success in search and rescue operations.

The plan, which is summarized at the end of the thesis, is divided into a skiing rescue plan and a mountaineering rescue plan. This division was made necessary by the individual problems and techniques of the two sports. A few of the phases of mountain rescue may at first seem to be repetition of what is stated under skiing rescue; however, the repetition is deliberate for purposes of emphasis.

The paucity of listed references results from the relatively small amount of work done in this field. This thesis is the result of twelve years' experience in skiing and mountaineering rescue work. If it will be instrumental in saving even one life, the author will feel well repaid.

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A RESCUE PLAN FOR SKIING AND MOUNTAINEERING AREAS

INTRODUCTION

Recreation for the public is a primary use of many areas or regions of, the United States. Some recreation areas have been set aside for scenery alone; others for hunting or fishing; and still others are most used by skiers and mountaineers. In areas where skiing and mountaineering are popular pastimes, a person concerned with forest management has the added responsibility of rescue of lost and injured skiers and mountain climbers.

Upon first consideration, the problem of rescue of skiers and mountain climbers may seem to be inconsequential to the over-all plan of forest management. However, even a cursory glance at the statistics of skiing alone should be sufficient to warrant many hours of careful planning and preparation. Each year the number of persons skiing and mountain climbing is greater, and with this increase there is a proportionate increase in the number of accidents.

During the past ten years, rescue work in regard to skiing has been organized to the extent of having volunteer (and a few paid) ski patrols to aid the injured persons. While progress has been made in regard to rescue of skiers, mountain rescue has lagged far behind. With the increase in number of accidents in both these sports has come the

realization that a basic plan of rescue is needed for areas which are used for these forms of recreation.

A plan for search and rescue in skiing and mountaineering areas is presented in this thesis. The discussion is divided into rescue of skiers and rescue of mountain climbers. Basically, each type of rescue is closely related to the other. However, the fact that each has its own individual problems, which are of vital importance, necessitates this division.

RESCUE OF LOST AND INJURED SKIERS

Present need

Number of accidents. Any discussion concerning a rescue plan for lost or injured skiers must have as a premise a definite need for such rescue work. During the 1946-1947 ski season approximately three million persons were skiing. Of these three million, 4,356 suffered injuries ranging from fractured skulls, backs and limbs to sprains and abrasions.¹ The Mt. Hood, Oregon, area alone had 753 accidents for a total of 248,268, a rate of about three accidents for one thousand persons skiing.² Many ski resorts do not have so great a number of accidents, but the over-all serious nature of the increase in ski accidents is only too evident.

Reasons for accidents. Every accident that occurs must have a cause, and skiing accidents are no exception. By far the greatest percentage of skiing mishaps are caused by a lack of the proper knowledge of skiing. Over 90 per cent of the accidents in the Mt. Hood area happened to skiers who had no control over their skis. The skier who is injured while racing is in the same classification for he is skiing beyond his limits of control.

¹Arthur Perkins, M. D., Ski Injuries 1946-47 (unpublished report, National Ski Patrol System, 1947).

²Jim Simmons, Analysis of Accidents, Season of 1946-47 (unpublished report, Mt. Hood Ski Patrol, 1947), p. 1.

A second cause of accidents is fatigue. Muscles become tired after hard usage and coordination and speed of reaction become impaired. Thus, when an emergency or need for quick action arises, the tired skier cannot respond and in many cases becomes the victim of an accident.

Dangers to injured or lost persons. Fatigue and weather conditions, either separately or together, can cause one of the most serious problems with which a person concerned with rescue work must cope. The problem of the lost person can be serious because of the danger of death by freezing or exposure. The problem is of such importance that special plans, communications, equipment and training of personnel to search for lost persons must be included in the over-all rescue plan. In addition to exposure and danger of freezing, the hazards of shock and bleeding are present, making necessary a thorough knowledge of first aid, with special emphasis on application to winter and mountain conditions.

Present methods

Rescue of injured skiers is fairly well organized in most ski areas. In 1937 and 1938, the National Ski Association, recognizing the serious aspect of the increase in skiing accidents, aided in the formation of the National Ski Patrol System. Basically the system is a national organization of ski patrols whose primary objective is the achievement of greater safety in skiing. The attainment of this aim is fostered by education in safe skiing, improved first aid care, formation and coordination of ski patrols, improved

ski trails, and so forth.

The individual ski patrols vary in size from a few to well over one hundred members. The requirements for membership are an age of 18 years or older, a knowledge of first aid, and skiing skill. Immediately following World War II, some of the ski patrols relaxed their requirements to a point whereby the welfare of the injured skier actually was placed in jeopardy. In some cases boys of 14 years of age were permitted to run toboggans, and persons who had no first aid training whatsoever gave emergency treatment to the injured. Conditions such as these could easily be legally classified as negligence on the part of the person responsible for the administration of such a ski area.³

Since the inception of the National Ski Patrol System, a great deal of work and research has been done in regard to various forms and types of equipment. Much of this work centered around various types of toboggans, first aid kits, and various emergency kits. The results pointed toward the fact that the equipment to be used must be fitted to the terrain, snow conditions, and types of ski trails. Thus, some ski areas may use a regular toboggan and belt first aid kits; while other areas need special toboggans with superstructure and brakes and first aid packs with blankets, heat pads and special items needed to meet the particular conditions that will be found there.

³Charles M. Dole, editor, National Ski Patrol System Manual, 1941, pp. 67-72.

Some work has been done in regard to accident prevention. Most of this has been centered around ski schools, which tend to reduce accidents by teaching the proper methods of controlling the skis. Accident prevention by means of newspapers, radio and posters has been held to a very minor role in most areas because of the Forest Service policy of not wanting to frighten the public. Results that may be achieved by publicity will be discussed later in the proposed over-all rescue plan.

While the methods and planning for the rescue of injured skiers have been improving gradually over a period of years, the search and rescue methods and planning for lost persons have remained in an almost stagnant condition. The reasons for this lagging can be laid to the comparatively few lost persons and to the fact that the ski patrols are so occupied with rescuing injured skiers that very little emphasis has been placed on preparing for the rescue of lost persons. As a result, the plans and training are many times found wanting when the emergency arises.

Proposed rescue plan

An over-all rescue plan for ski areas should take into consideration accident prevention, pre-rescue work, and the actual rescue work for both injured and lost skiers. It is true that equipment, techniques and methods will vary according to terrain, snow conditions and trails; but the basic and necessary parts of the plan of rescue will be the same regardless of the area. The following paragraphs will present

a rescue plan which, with variations to fit location, is designed to increase the efficiency of the rescue of injured and lost skiers.

Accident prevention. A well-recognized fact is that it is far better to prevent an accident than it is to care for one. The first consideration of an over-all rescue plan must be accident prevention, for each time an accident is prevented, there will be less rescue work to be done. Probably the most effective accident prevention program would be a combination of publicity, ski instruction, and patrolling of areas.

During the ski season of 1939-1940, the Mt. Hood region was the subject of an experiment, which brought to light some interesting facts. For the season of 1938-1939, the area had an accident rate of 4.5 injuries per thousand persons skiing, one of the highest accident rates in the country.⁴ The Forest Service, Mt. Hood Ski Patrol and the Portland newspapers, realizing that so high an accident rate could give the sport a grave setback, decided to make a determined effort to lower the accident rate. The Portland newspapers constantly printed lists of skiing accidents and put on an extensive publicity campaign in the interests of safe skiing. In this way the skiing public was continually aware of the possibility of accidents. Two free ski schools were sponsored, also,

⁴News item in the Oregon Journal (Portland), April 19, 1940.

where the beginner could learn the proper methods of controlling the skis. Over four hundred novices took advantage of the free instruction. This meant that four hundred possible accident victims were congregated in one place learning how to ski and how to prevent accidents. The third phase of the accident prevention program was the offering of advice by the ski patrol. The members of the Mt. Hood patrol were constantly alert to find each person whose lack of skiing ability denoted that he was a possible casualty.

An analysis of the accidents for 1939-1940 gave an indication of the results of the accident prevention program. The accident rate dropped from 4.5 to 3.9 per thousand skiers in spite of the fact that more persons were skiing in the 1939-1940 season.

The course of action that the results of the experiment suggested has not been intensely followed for several reasons. The publicity program was dropped because of fear of frightening the public. This attitude is lamentable since the number of skiers increased rather than decreased. The sponsorship of free ski schools, pigeon-holed during the war because of a lack of funds and personnel, was reinitiated during the 1947-48 season but as yet results cannot be evaluated. The offering of advice by ski patrol members has lagged because of a shortage of personnel. The members of the patrol have been so busy rendering first aid that they have had no time to seek out the possible casualties.

In the light of previous investigations, a concentrated accident prevention program can be considered one of the

first phases of any long-range rescue planning. Publicity by press, radio, posters and public contact can be of inestimable value in making the public "safety conscious". After the idea of safety consciousness has been built up in the public mind, the free ski schools will enjoy a greater attendance and more persons who are potential accidents will learn the proper methods of skiing. The above two factors, plus courteous and tactful advice by qualified members of the ski patrols, will tend to lower the accident rate to a minimum.

Pre-rescue work. The next problem to confront the forest administrator after attempting to reduce the number of accidents is how best to rescue and care for those unfortunate skiers who are injured or lost. In rescue work, as in other phases of forestry, a plan of action is essential. This plan of action can be termed pre-rescue work. Its importance cannot be overemphasized for efficiency in rescue is almost directly proportional to the amount of careful thought, planning, and training put into the pre-rescue work. In order to insure a smooth-running and efficient rescue operation, careful consideration must be given to the following: knowledge of terrain (including accurate maps), communications, training of personnel, equipment types and usage, and a plan of action to be pursued.

Maps. As a basis of knowledge of terrain, maps should be available which show the ski trails, caches, telephones, and adjacent areas and show them accurately. Far too many maps look very good but have little accuracy, different maps of the same area varying in terminology and naming of landmarks.

An inaccurately labeled map can cause a situation whereby rescuers will be in the wrong area entirely. Many a toboggan has been dispatched to pick up an injured skier only to find that the person who gave the alarm had the ski trails confused. In order to have efficiency in rescue work, the trails must be accurately mapped and marked in addition to direction markers. A system of markers at one-quarter mile intervals on each trail giving the name of the trail and the distance from the start will, after being publicized, eliminate most of the cases where an accident has been reported as being on two or three trails at the same time.

To prevent confusion and duplication when a skier becomes lost and a large search is conducted, a large map of the area should be methodically divided into grid squares one-quarter mile on each side. The most probable squares will be searched first, the next most probable second, and so forth. Such a system will not only avoid duplication and confusion if each square is checked off as it is thoroughly covered, but more important, valuable time will be saved which may save the life of the lost skier.

Communications. The second consideration in pre-rescue work is the problem of communications. In most rescue work, valuable time and energy can be conserved by means of rapid and dependable methods of transmission of messages, orders, and so forth. In the average ski area, which comprises various slopes and trails, the Forest Service telephone has proved itself to be very satisfactory. On the open slopes the telephones should

be placed near the areas where according to past history the greatest numbers of accidents have occurred. Then if the telephone has been prominently marked, a minimum of time would be wasted between the time of injury and the arrival of adequate first aid and transportation. The trail telephones should be placed with the same considerations in mind. The average twisting ski trail should have a well-marked telephone every one or two miles, depending upon the terrain. Some persons assert that telephones along the trails are not necessary because a good skier can negotiate a ski trail at speeds up to 50 miles per hour, arriving at the bottom of the trail to report the accident in a very few minutes. The fallacy of this viewpoint is the unfortunate fact that all persons who witness or discover an accident are not good skiers, and it may take them up to two hours to negotiate three or four miles of twisting, treacherous ski trail.

The use of radio in rescue work will for the most part be limited to searching for lost persons. Small high frequency sets which can be carried in the pack have been designed. These sets have operated efficiently at extremes of weather and temperature and have solved the problem of communication when telephones have not been available. The type and frequency of the transreceiver must be fitted to the purpose and place where it is to be used. One of the great advantages of radio is that a means of communication is always at hand, and the searcher does not have to attempt to find a telephone, which may be two or three miles away.

Personnel training. The third phase in the over-all planning is to provide adequate training of all personnel who will be engaged in rescue work. This training will of necessity cover the fields of first aid, winter survival and the handling of equipment.

Thorough training in first aid is needed in all ski rescue work, for it would be of little avail to find the lost or injured person only to have him suffer further injury or die from the lack of proper first aid measures. The courses as given by the American Red Cross will furnish an excellent basis for ski rescue work. However, special supplementary courses of first aid for skiers must be given emphasizing first aid techniques and methods of transportation as adapted to winter conditions. The American Red Cross has to some extent tried to cope with these specialized problems by offering a supplementary first aid course based upon their booklet, "Ski Safety and First Aid". Most ski patrols require that all members attend an annual refresher course based upon this Red Cross booklet. This is indeed a step in the right direction, but more research yet needs to be done. It is safe to assume that skiing first aid will be given more emphasis as the need increases. It is almost inevitable that the increasing number of injuries will initiate a public clamor for constant improvement in first aid measures as related to skiing. With this demand as a stimulus, a higher quality of first aid can be expected as each year passes.

The second subject which will require careful training of personnel is winter survival. The rescuer may have a thorough knowledge of first aid yet risk the patient's life and his own as well. Storms can easily swoop in with such a suddenness and intensity that landmarks may be completely obliterated. At such times a knowledge of winter survival is of vital importance; for exposure, frostbite, and even death can easily result when injured, fatigued or lost persons are not sheltered from the wind and cold. Knowledge of the construction of wind breaks, snow caves and snow houses as well as the fundamental knowledge of woodsmanship must be acquired. As these techniques are described in detail in several books and booklets, they need not be discussed here.⁵ However, it cannot be overemphasized that careful practice under winter conditions is of utmost importance to insure safety and efficiency when the emergency arises. The first time a person builds a snow house, three to four hours may be expended to learn the proper method. This learning process is done far better before the accident than when shelter may be needed in the shortest time possible.

The third phase in the training of personnel is to be certain that every person involved has a thorough knowledge of the various items of equipment and how they are used. Constant practice in the use of first aid kits, toboggans, radio and other items is essential to efficient rescue work.

⁵See Appendix A

Equipment. The fourth problem in pre-rescue work is the equipment that will be needed. In determining the types of equipment to be used, due consideration must be given to terrain, snow conditions, numbers of persons using the area, length and slope of the trails. Toboggans will vary from the collapsible type to the highly developed sled with superstructure and brakes. The method of handling the sleds will vary from lowering very slowly to running at high speeds. Also first aid kits will vary from the belt type to the full pack type. These are problems which each area must solve for itself since the equipment must be adapted to the individual conditions.⁶

Once the equipment has been assembled, proper care must be given to insure greatest efficiency. Toboggans must be properly waxed, for a toboggan that will not slide is very tiring and annoying to the person using it. First aid kits must be checked constantly and replenished, for a half-full kit can, by the lack of necessary material, cause a situation of a very serious nature.

Patrol plan. The fifth consideration of the pre-rescue work is the plan of action. Adequate coverage of the area by trained personnel is necessary, especially in areas which have an extremely high usage. The various ski runs and trails should be patrolled at specified intervals during the day. The intensity of coverage and patrolling will vary with the

⁶See Appendix B

number of persons skiing, importance and danger of the particular run or trail and can easily be fitted to local conditions. On days of particularly heavy usage such as weekends, a "cleanup" at the end of the day is advisable. This can be accomplished by sweeping all trails just before or after dark to find the stragglers and escort them to safety.

In most areas a plan of action for night searching will be very desirable. This will vary somewhat, but basically the plan will be the same in almost all areas. In reasonably good weather the "lost" person should be allowed an hour after dark before search is initiated. Then after all the local taverns and lodges have been checked, the actual search should be started. If the weather is extremely bad or if a blizzard is imminent, the search should be started as fast as possible after a rapid check has been made of the local establishments. To delay a search for even an hour may prove fatal when a blizzard is in progress.

The search parties should be broken up into groups of two or three and kept reasonably well spread out. Extreme care and judgment must be exercised in dispatching searchers as only qualified men should be sent out into a storm after dark. Often one highly qualified man can take with him one or two good skiers who lack in over-all qualifications. In this way a greater coverage can be achieved.

The actual searching will consist of checking all ski areas and trails and of cross-covering the surrounding territory and terrain between the trails. In this manner, tracks

of the victim, abandoned equipment, or other traces will be most easily found and a concentrated search can be made of the area. This concentrated search should place emphasis on careful observation of the snow for tracks, which in spite of snowfall can often be followed by noting slight indentations in the snow surface. Also careful observation should be made in the vicinity of trees or other places where the lost person may have sought shelter from wind and cold. While the lost person's tracks are being followed, great care should be taken not to obliterate the tracks, for if the trail is lost, rechecking may be necessary.

If no evidence of the lost person is found by cross-coverage of the area, the previously prepared grid system of searching can be utilized. The method of application of the grid is described under "Maps".

In searching at night, aside from adequate clothing, first aid equipment and a compass, a good head light will be desirable. The light should be of the four or five cell headlight type. One of these lights will throw a beam 500 to 600 feet and with one extra set of batteries will provide light for an entire night's searching. The four cell headlight which is used for fire fighting by the Forest Service is not very satisfactory as it only operates on two batteries at a time and does not give sufficient light for safe skiing at night. At times it may be desirable to carry some food and a thermos of coffee or tea as an aid to the lost person after he is found.

Actual rescue work. The pre-rescue plan having been set up with accurate maps, adequate communications, trained personnel and the necessary equipment at hand, the application to rescue work amounts to merely following the plan. A high degree of success can be insured only by careful planning and training.

RESCUE OF LOST AND INJURED MOUNTAIN CLIMBERS

Present need

In contrast to ski rescue work, which has shown an improvement over a period of years, a definite lagging behind and an attitude of apathy has been evident in rescue work in relation to mountaineering.

At first glance the problem of accidents in the mountains would seem to be so inconsequential that it could be dismissed immediately. However, even before World War II as many as two thousand persons climbed Mt. Hood, Oregon, in a single season. The formation of the ski troops and the attendant publicity has given the sport of mountaineering such an impetus that it is now a major form of recreation in some areas. With the increasing number of mountain climbers, there has been a gradual increase in the number of accidents which have occurred until at present hardly a season will pass without one or more serious accidents in many of the mountainous regions. With the advent of the rising popularity of winter mountaineering, the added danger of lost persons has arisen. The serious nature and the high percentage of fatalities in mountaineering accidents present to the forest administrator many problems for which provision must be made.

Comparatively speaking, mountaineering accidents are as a rule of a far more serious nature than skiing accidents. The skier may fall and fracture a leg or a back, but ordinarily

he will receive first aid and transportation to a doctor or hospital within a reasonably short time. A mountaineer may suffer an injury of the same magnitude, yet because of inadequate supplies, exposure, and difficulty of transportation, it may be hours before he is brought to safety.

A typical example occurred on Mt. Hood, Oregon, in 1945. A climber slipped and fell into a crevasse at an elevation of about nine thousand feet on the south side of the mountain. As a result of the fall the man suffered a compound fracture of the femur, a serious injury. He was not reported missing for many hours; and by the time rescuers found him, over eighteen hours had elapsed. Another three hours were expended carrying the injured man to safety. Because of the long period of exposure between the accident and the application of first aid care, complications set in which forced the amputation of the injured leg. If the same type of accident had occurred in a ski area, the injured person would have been under a doctor's care within three to four hours, and in all probability the leg would have been saved.

Mountaineering mishaps have many causative factors. There are the natural mountain hazards such as falling rock or ice, crevasses and bergshrunds. Poor equipment and varying weather conditions are other causes of injuries. Falling rock and ice can attain terrific speeds in a short distance and the mountaineer must be ever alert to avoid these dangers. Accidents resulting from falling into a crevasse can be prevented in most cases by application of knowledge and skill in

the use of a rope. Poor equipment such as a frayed rope, split ice axe handle, bent crampon points, or a poorly tempered piton can easily be the cause of a fatal accident. Varying weather conditions are of special importance in winter. Many times in a matter of minutes a storm of blizzard intensity can descend upon a mountain obliterating all landmarks and perhaps causing the weary climber to wander for hours. If the climber lacks a thorough knowledge of winter survival, he may easily wander until too fatigued to construct a shelter and then die from exposure and freezing. Under storm conditions with visibility reduced to a minimum, the chances of survival are also lessened by the difficulty of searching for the lost person.

Present methods

The present methods of rescue work vary with the different areas, but as a whole a definite rescue plan is lacking. This lack of a plan can be attributed to two basic factors, the first of which is the comparatively few mountaineering accidents in the past. The increasing number of accidents recently should be an incentive to further careful planning. The second reason for a lack of a plan can be laid to the fact that for the most part mountaineering has had but scant cursory attention in the over-all plans for forest management. Very few of the personnel of the Forest Service have given consideration to mountain accidents, and for the most part mountain rescue plans have been left to be formulated at some nebulous future date. As a consequence few forest

officers have the necessary knowledge and training to handle this type of emergency. Therefore, when the emergency arises, various outdoor organizations are called for aid and then usually take charge of the search and rescue. This would be fine were it not for the fact that, by the time the organization can mobilize and reach the area, valuable time is lost which can mean the death of the lost person. Also too often the outdoor groups fail to have a logical search plan. Thus with no plan of action from which rescue work can be pursued, time and effort are wasted when time is of utmost value and efficiency should be at its peak.

For many years the national parks have followed a rigid policy of regulation of mountain climbing. One of the points of this policy is having all climbers check in when starting up the mountain and check out when coming down off the mountain. In recent years an attempt has been made in some national forests to follow this policy. Basically the idea is sound, for in this manner a search for lost or overdue climbers can be initiated as fast as possible. However, the registration process loses all value if it is not strictly enforced. Climbers should be impressed with the fact that they must register for their own safety. In return the forest officer who makes the registration must check the climbing register every night to see that all climbers have returned.

Generally speaking, present methods of mountain rescue work are valiant efforts but show in a glaring manner the results of a lack of planning and training. As a rule, after a person has been reported missing, a check is made of the

local restaurants and taverns. Then if the person is not located, the search will slowly get under way. Time is lost while a plan for searching is drawn up. Equipment must be assembled and well-qualified personnel must be found to lead the searching crews. All this is time consuming and it is usually dark by the time the actual search begins. Ordinarily the first night's accomplishment will be the attempted search of a few key points by undermanned parties. Many times even the few key points will miss being covered thoroughly because lack of knowledge of exact direction and distances results in the wrong area being searched.

If the lost climber is not found the first night, the search continues and on the following day aid is usually received from the various outdoor clubs or a central rescue organization. The entire area is then combed until the climber is found. However because of inaccurate maps and inadequate planning, the same area may be combed two or three times; thus the search is needlessly prolonged. As in skiing rescue work, the results that can be expected are dependent upon careful planning and training before the emergency arises.

Proposed rescue plan

An over-all plan for rescue work in mountaineering areas must, as in skiing rescue, consider prevention, pre-rescue work and the actual rescue in the field. The policy of accident prevention in relation to mountaineering, while being basically the same, will vary somewhat from accident prevention in regard to skiing. Publicity by newspapers and radio

is not as effective as in the case of skiing because of the relatively few mountaineering accidents to be used in making the public safety conscious. In fact publicity in regard to climbing accidents can have a very detrimental effect upon the further pursuit of the sport. Some mountaineering mishaps, being of a serious nature, are given so large an amount of publicity that the general public has to some extent acquired a distorted view of the sport.⁷

Prevention. Possibly one of the most effective methods of accident prevention would be the sponsoring or encouraging of mountaineering schools. With a small amount of aid or encouragement, many of the mountaineering clubs would be only too willing to sponsor a school where future mountaineers can learn the proper techniques and can acquire the fine judgment which comes from the right kind of practice. Correct instruction would pay dividends by producing a group of capable mountaineers who will have fewer accidents because of their skill and judgment.

Other considerations in the field of accident prevention should consist of those measures which would be of aid in preventing a condition which would necessitate a search for a mountaineer. Some of these measures would be having available the latest weather forecasts, disseminating accurate information, providing accurate maps, installing beacons and

⁷News items on Herrmann and Lorentz search in the Oregon Journal and the Oregonian (Portland), April 1-5, 1940.

sirens, and constructing emergency shelters at strategic locations.

Pre-rescue work. The second phase of the over-all plan for mountain rescue can be termed the pre-rescue work. The efficiency and success in saving lost or injured mountain climbers is almost entirely dependent upon the amount of thought, planning and training put into the pre-rescue program. As in skiing rescue, the importance of pre-rescue work cannot be overemphasized. When human lives are at stake, efficiency, knowledge and skill must be at the maximum.

Maps. The primary fundamental of any planning must of necessity be an accurate map of the area. To be of maximum benefit, the map should be a contour map with a scale of 4 inches to the mile as a minimum. The common topographic map with a scale of 1 inch to 62,500 feet may be sufficient for a general over-all picture of a forest, but it is too small a scale to be of great benefit in an intensive search. With an accurate map as a basis, an atlas can be compiled which will show trails, caches, adjacent areas, and other information which may be of value. In some areas an overlay showing locations of previous searches will point toward certain tendencies that may be invaluable in a time of need.

A methodical division of the area on the map into a grid can be recommended. As in skiing rescue, when each square is thoroughly searched, it can be marked off. The atlas coupled with information at hand will determine the probabilities of location. These areas should be searched first, of course.

Much duplication and confusion can be avoided by careful division of the area.

Communications. In mountain rescue work the problem of communications is somewhat different than in skiing. The telephone is not available as a rule and the small high-frequency transreceivers must be used. Searching parties high on a mountain on clear nights can use Morse code by means of flashlights. Whether or not to use radio communication will depend upon the individual conditions. However, one must constantly consider weight, for ten pounds extra at fourteen thousand feet can be a decisive burden.

Personnel training. Possibly one of the most important points of mountain pre-rescue work is the training of on-the-job personnel. In a national forest or park the only persons available to conduct a search usually will be the forest or park officers. As success in mountain rescue work is to a great extent contingent upon the knowledge and skill of the personnel engaged in the searching, it is evident that an intensive training is necessary for those forest officers.

In addition to the aforementioned skill in woodsmanship and winter survival, a thorough knowledge of the technique of mountaineering is a necessity for a person who will be engaged in or directing a mountain search. Many persons are of the opinion that mountain climbing is merely walking up a mountain and that no special training or knowledge is needed. An attitude such as this can only lead to disaster; for sheer rock walls, steep ice slopes, yawning crevasses and avalanches

have no consideration of compassion for a person's lack of knowledge and skill. Mountaineering training should embrace rock climbing, ice and snow climbing, use of pitons, and special rescue techniques such as crevasse rescue and lowering injured persons over steep walls. Most of the necessary techniques can be acquired by careful study of some of the excellent books on mountaineering coupled with faithful practice in the field.⁸ It is far different to climb a wall than it is to read how it is done.

The second subject in the training program is first aid, which has already been discussed in the ski rescue plan. In mountain rescue the importance of improvisation cannot be overemphasized, for in most cases the necessary bandages, splints, and stretchers have been left far behind because of their bulk and weight. A fall, a blow from a falling rock, an unintentional slide down steep snow ending in rocks--there are numerous situations in the records of mountaineering accidents in which broken bones have been the principal injuries. The proper first aid treatment under ordinary conditions is relatively simple to anyone with the correct training. High on a mountain, however, it is another story. Here with almost none of the standard equipment at hand, the first aider must use every bit of ingenuity at his command. The correct treatment must be given; equipment which is not available must be improvised. Careful thought on first aid

⁸See Appendix A

improvisation will pay large dividends when the emergency arises.⁹ The construction of a traction splint from two ice axes can be accomplished far more efficiently if it has been practiced indoors beforehand.

Cooperation with outdoor clubs. The next consideration in the pre-rescue work is cooperation with various outdoor clubs in the formation of a central rescue organization.¹⁰ An organization of this type can be of inestimable value by keeping up-to-date rosters of qualified mountaineers who would be available to aid in the event of a prolonged search. A central rescue organization can ^{help} excell also in regard to the problem of finances to meet the expenses of a search. Many times a fund can be established which can be used in emergency cases where money may be needed immediately. Having a plan of action, personnel and finances at hand will save valuable time.

Equipment. When preparing for a possible search, one must give ^ccareful thought to the equipment that is to be used and to the location of that equipment. In some places ^{area}very little ^{equipment}will be needed, while in others equipment for very technical mountaineering will be required. Individual conditions are the determining factor. Various technical mountaineering aids are listed and described in many of the books on mountaineering, a few of which are noted in the attached reading list.¹¹

⁹Ralph A. Wiese, "First Aid for Mountain Climbers," Mazama, 22:64-66, December, 1940.

¹⁰See Appendix C

¹¹See Appendix A and Appendix B

That the location of the equipment is of vital importance is evident. Ice axes, crampons, pitons, rope, compasses, and other items must be stored at the places from where the searchers logically will start. For areas which encompass several mountains or even a range of mountains, a central equipment cache ^{or caches} will be needed. The location ^{and amount} of the equipment must be carefully determined for each area after all pertinent factors have been given careful consideration.

In regard to proper care and maintenance of mountaineering equipment, one must be constantly alert to detect cracked ice axe handles, faulty crampons, crystallized pitons, frayed or weak rope, and other faulty equipment which may cause a serious accident. Constant inspection of the climbing rope is necessary, for even though the rope is not used, it will lose much of its strength through deterioration over a period of time.

Plan of action. The third phase of the over-all plan is drawing up the plan of action. With the trained personnel, necessary equipment and a plan of action all at hand, a high degree of success can be expected in mountain rescue work.

As a rule a search will be divided into an initial and if necessary a secondary phase. The initial phase will usually be conducted by a small group of well-trained personnel who are on the scene. As this will be the first action taken, speed is of vital importance, especially in inclement weather. Making a correlated use of the prepared atlas and the immediate information, a calculation of probability of

location can be made and then these areas will be the logical ones to be covered first. The coverage will be much the same as described in the ski rescue plan: a thorough cross coverage to locate tracks or abandoned equipment. Many times on wind-swept slopes, tracks can be found and followed even though a foot or more of snow has fallen.

If the victim has not been found or rescued within the first eight to twelve hours, a request for more personnel of high qualifications should be made to the central rescue organization or to outdoor clubs. With this request, the search will enter the secondary phase: a thorough combing of the area, grid by grid, until the victim is found. The problems of food, supply transportation and finances will arise with the secondary phase of the search. These can best be handled by the central rescue organization.

Actual rescue work. With the pre-rescue work carefully accomplished and a plan of action drawn up, the actual rescue in the field merely amounts to following the outline as set up for the area. Special care must be exercised to send only qualified personnel to high altitudes, for an untrained person can cause disaster to an entire party.

SUMMARY

The best summary of a plan of action to be pursued in the even of skiing or mountaineering accidents would seem to be a step by step outline of each over-all plan.

I. Skiing rescue plan

A. Accident prevention

1. Publicity of hazards by means of signs, newspapers and radio
2. Encouragement of ski schools
3. Patrol of ski areas--giving advice, etc.

B. Pre-rescue work

1. Maps

- a. Terminology standardized
- b. Area gridironed for search work

2. Communications

- a. Radio
- b. Telephone

3. Personnel training

- a. First aid
- b. Winter survival
- c. Equipment handling

4. Equipment

- a. Types
- b. Assembling and care
- c. Practice in use

5. Patrol plan

- a. Adequate coverage of area by trained personnel
- b. Clean up at end of day
- c. Provision for night searching
 - (1) Departure time
 - (2) Qualified personnel
 - (3) Equipment
 - (4) Methods--sweep trails, cross coverage of area

C. Actual rescue work--mainly putting pre-rescue
plan into action

II. Mountain rescue plan

A. Accident prevention

- 1. Essentially the same as for ski areas
- 2. Efficient method of checking in and out
- 3. Cooperation with outdoor clubs in training program

B. Pre-rescue work

- 1. Maps of area and atlas
 - a. Trails
 - b. Caches
 - c. Adjacent areas
 - d. History
- 2. Communications
 - a. Radio
 - b. Flashlights

3. Personnel training
 - a. Mountaineering technique
 - b. First aid
 - c. Winter survival
 4. Cooperation with outdoor groups
 - a. Central rescue organization
 - b. Roster of qualified members
 5. Equipment
 - a. Types
 - b. Location
- C. Rescue plan
1. Initial phase
 - a. Speed vitally necessary
 - b. Calculation of probabilities of location
 - c. Cross coverage of area
 2. Secondary phase
 - a. Requesting aid from outdoor groups through a central organization
 - b. Thorough combing of area until victim is found
- D. Actual rescue work--merely putting pre-rescue work and plan into operation

In conclusion, it would be wise to reiterate that success in rescue work is to a great extent dependent upon the amount of planning and training done before the emergency arises.

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APPENDIX

Permanganate
COLD SPRINGS BORO

COTTON CONTENT

APPENDIX A

READING LIST

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APPENDIX B

CHECK LISTS OF EQUIPMENT AS RECOMMENDED
BY THE NATIONAL SKI PATROL SYSTEM¹²

TABLE I

TOBOGGAN WITH MINIMUM BASIC EQUIPMENT

1 rigid toboggan or sled, eight to nine feet in length
 3 ropes, one for pulling and two for holding back
 2 leg splints
 2 arm splints
 10 triangular bandages
 Trunk straps or extra rope to tie victim on toboggan
 3 blankets, or 2 blankets and large pad
 Matches, hatchet, warning flags (to be tied on ski poles)
 Newspapers or pillows for immobilization splints

TABLE II

TOBOGGAN WITH IDEAL EQUIPMENT

1 rigid toboggan or sled nine feet long with fixed raised
 bar at foot for securing end of traction splint
 3 or more ropes for guiding toboggan
 1 Keller Blake leg splint
 1 leg splint board
 1 arm splint board
 4 or 5 blankets, or pad and zippered sleeping bag, or equivalent
 10 or more triangular bandages
 Straps to hold victim on (trunk straps are ideal)
 1 First-aid Kit containing: Mild tincture of iodine in appli-
 cator, tube; adhesive tape (3" x 5 yds.); 4 roller bandages
 (4" x 5 yds.); 1 pair scissors; 1 pair tweezers; 12 Ammonia
 inhalants or equivalent; 6" dowel for twisting traction;
 safety pins; whistle; extra rope or strong cord
 Traction hitch (patented)
 Hatchet and matches
 2 warning flags on 5' poles (suggested blue flag with orange
 cross)

¹²Charles M. Dole, editor, National Ski Patrol System Manual, 1941, pp. 37-38, 82-89.

TABLE III

APPROVED BASIC CONTENTS FOR PATROLMAN'S
INDIVIDUAL FIRST AID BELT KIT

4-6 triangular bandages
 1 unit, 2" gauze roller bandage (2 per unit)
 1 3" bandage compress (or 3" roller bandage)
 1 4" bandage compress (or 4" roller bandage)
 1 unit, 1" adhesive compresses ("band-aids," 12 per unit)
 1 pair scissors
 1 pair tweezers
 1 iodine applicator tube (2%-3½% iodine)
 1 unit, ammonia inhalants or ampules (at least 6 per unit)
 1 6" wooden dowel for traction (or 6" screwdriver, sheathed)
 30 feet or more of #12 cod line or equivalent (test, 100 lbs.)

SUGGESTED ADDITIONS

(for belt kit or supplementary back pack)

1-2 chemical heating pads
 2 sterile gauze squares (3" x 3")
 1 patented traction hitch
 1 whistle (to summon additional patrolmen, or other aid)
 extra rope
 large safety or blanket pins
 accident report cards and short pencil
 small waterproof container aspirin or anacin
 small waterproof container of matches
 small can "Sterno" or thick candle (for lighting fire)
 folding tin cup
 3-6 tea balls (hot stimulant in short order, with "Sterno"
 and cup)
 light "equipment first aid" kit (especially when on trail
 trips; at least one per party), including:
 1 short screwdriver to fit edge screws (plain or Phillips)
 1 short screwdriver to fit bindings or toe plates
 small container assorted edge and binding screws
 1 short steel file
 1-2 extra toe straps
 1 small tube plastic wood (to fill screw holes and nicks)
 1 sturdy pocket knife
 1 small roll tire tape (handy to reinforce split skis)
 1 metal ski tip (a "must" item for remote trail trips in
 deep snow regions)
 1 light ax or hatchet with sheath
 2 pair long, thick rawhide laces for emergency uses

TABLE IV

SUGGESTED BASIC CONTENTS FOR A WELL-EQUIPPED
FIRST AID ROOM MEDICAL SUPPLY CABINET

- 2-3 dozen triangular bandages
- 1 roll adhesive tape, 2" x 5 yds.
- 1 roll adhesive tape, 1" x 5 yds.
- 1 ounce bottle of 2%-3 $\frac{1}{2}$ % iodine
- 1 pint rubbing alcohol (for cleansing wounds)
- 1 dozen sterile gauze squares (3" x 3")
- 2 dozen 1" adhesive compresses ("band aids")
- 1 pair scissors
- 1 pair tweezers
- 1 1-ounce bottle aromatic spirits of ammonia
- 1 dozen ammonia inhalants
- 2 4" roller gauze bandage (10 yds.)
- 2 3" roller gauze bandage (10 yds.)
- 2 2" roller gauze bandage (10 yds.)
- 2 1" roller gauze bandage (10 yds.)
- 1 American Red Cross First Aid Textbook (The best of us forget!)
- 1 container Aspirin or Anacin tablets (24 5-gr. tablets)
- 20 Amytal tablets, 1 $\frac{1}{2}$ gr. each (Dose: 1 $\frac{1}{2}$ gr. to 4 $\frac{1}{2}$ gr. with
10 gr. Aspirin in a little water; no more unless doctor
gives O.K. This is a drug--do not overdose!)

Note: This list is a suggested, basic stock for a small slope-and-tow development serving perhaps an expected maximum of 100 skiers on a busy day. To estimate requirements for larger resorts, the basic medical equipment suggested above may be doubled for each additional 200 skiers that the resort expects to serve at any one time, and local areas, of course, may wish to add certain other items. It will be noted that this large kit contains many items purposely omitted from the patrolman's belt kit, as well as duplication of many of the more important of the patrolman's items. This duplication is desirable because when two or more accidents occur in quick succession, the patrolman's individual belt kits are speedily depleted, and he should have refills readily available. In particular, this is the reason for the comparatively large number of triangular bandages provided for above. If desired, for economy, bandages can be bought in bulk as 36 or 40-inch wide bolts of bleached or unbleached muslin, cut into 36 or 40-inch squares, and each square cut diagonally to make two bandages.

TABLE V

SUGGESTED BASIC CONTENTS FOR A WELL-EQUIPPED
FIRST AID CACHE ON AN OUT-LYING TRAIL

- 1 rigid toboggan or rescue sled, 8-9 feet long fully equipped with drag and hold-back ropes, straps or tie-in ropes, and full-length mattress pad (or extra blankets to be used as such)
- 3-5 large wool blankets and/or sleeping bag, full length opening
- 2 board splints, 5'-5'6" x 4" x $\frac{1}{2}$ "
- 2 board splints, 4'-5' x 4" x $\frac{1}{2}$ "
- 10 triangular bandages
- 4-6 chemical heating pad units
- waterproof match container
- small can "Sterno" or thick candle or any artificial fuel (for aid in lighting fire quickly)
- waterproof, rodent-proof can containing tea balls (hot stimulant) and possibly emergency food rations, depending on remoteness of cache and local conditions
- 1 tin cup
- Map of the area, preferably contour, showing all usable trails and "x-ing" present location; also mark on the map, or affix to it in list form, the location of the nearest phone, hospital, plowed road, doctor, etc. Remember, it may be a group of strangers to those regions, possibly lost, who will need this information desperately if any of them are injured.
- waterproof medical supply kit, containing (basic):
 - 1 applicator tube mild tincture iodine
 - 2 roller gauze bandages, 4" x 10 yds.
 - 6 ammonia inhalants, and/or 6 ammonia ampoules
 - 6 sterile gauze squares, 3" x 3"
 - 1 dozen 1" adhesive compresses (band-aids)
 - 1 American Red Cross First Aid Textbook
 - safety pins, assorted sizes
 - small pair scissors
 - whistle

SUGGESTED ADDITIONS: (depending on locality)

- 1 6' x 8' windproof sheet with corner ropes
- 2 pair crampons (if any possibility equipment must be used on steep, icy slopes and/or above treeline)
- 1 hatchet or light ax
- 1-2 pair snowshoes (Skiers, don't laugh! It's easier for nearly all those who ski poorly to control a toboggan safely on a steep trail in deep snow while wearing these than it would be either with or without skis.)

SUGGESTED ADDITIONS (continued)

Notes: These supplies should be kept dry under cover, or bundled in tarpaulin, in well-marked cache locations. If possible, the location of all first aid caches should be designated or marked on any winter maps issued for the area.

Duplication of much of the equipment also found in patrolmen's first aid belt kits is necessary because accidents too often occur on these trails when no patrolmen are available, and non-patrolmen, of course, are usually unlikely to have first aid equipment with them.

Since belt first aid kit supplies are more easily replenished than trail caches, it is suggested that the patrolmen, when caring for an accident near a cache, should use their own belt equipment wherever possible rather than exhaust the cache supplies.

Marking of the cache as intended for "Emergency use only" should protect its contents against all but the most malicious. Some patrols seal their caches with leaded sealing wire or something similar to forestall "peeking" on the part of the merely inquisitive. Anyone needing the supplies can break in, but others seldom bother. While the seal is intact, the patrol knows the cache is fully equipped.

Where trails are laid out in National Park lands, local patrol or resort agencies will find the U. S. Forest Service most cooperative in planning, equipping, and maintaining trail caches, and such caches, cared for by federal agencies, are often the best looked after of any.

The person or persons using a toboggan from a trail cache to transport an accident victim are not necessarily obligated to take the toboggan back to its cache, nor indeed are they always able to do so; but they are most definitely obligated to notify the responsible party at once so that arrangements can be made to return the toboggan, plus any used supplies, to its cache as soon as possible. Therefore, such toboggan should be plainly marked with the name of the organization responsible for the maintenance of that cache, and also should show the name and address of the individual to be notified of its use; otherwise a stranger may not know whom to notify, and valuable time will be lost, before it is returned. Suggestion: in addition to marking the toboggan, furnish a supply of pre-addressed postcards in the first aid box so that those using equipment can notify the responsible party of materials they have used up and that need to be replaced.

TABLE VI

SUGGESTED BASIC EQUIPMENT FOR WINTER RESCUE
PARTY IN SEARCH FOR MISSING PERSONS

Where the location and injuries (if any) of the missing person(s) are known, such knowledge will, of course, dictate the equipment requirements a rescue party must have. They will not differ greatly from the conditions already discussed. But the following is a suggested check list of items to be considered when winter rescue parties are formed to search for a missing person or persons, as is occasionally necessary even after dark. Therefore, where the location and injuries (if any) of the missing person(s) are uncertain, and searchers must comb forest and mountain trails:

1. Form as many groups of searchers as there are trails to be covered, and more groups if men and equipment are available; but each group should consist of not less than four men, who should have strict orders to stay together at all times or at least within sight of easy calling distance of one another, and each group should carry with it, if available and at all possible:

- At least two fully-stocked patrolmen's belt kits, or equivalent first aid supplies
- Four blankets, or sleeping bags if available
- Extra dry clothing for the ones you're looking for:
 - dry woolen socks, mittens, sweaters, parkas, scarf
- Food; emergency "energy rations" for the victims in any case, and for yourselves if the search is expected to last many hours. Raisins, chocolate, lean meat, etc.
- Thermos of hot coffee, soup, tea, etc., and a tin cup
- Can of "Sterno" or plumbers candle for lighting fire; or primus stove and fuel for it
- Matches in waterproof case
- Compass and topographic map; also, each group should have in it at least one, and if possible two, persons who are thoroughly familiar with the terrain and trails to be searched
- Two or more chemical heating pads
- A light ax with sheath
- A whistle
- A metal ski tip
- Extra rope, thongs, straps
- Crampons or snowshoes where terrain or conditions require them

Toboggans require so much time and effort to haul that unless it is known they will be needed, they had best be left at a central point or points from which they can be obtained

SUGGESTED BASIC EQUIPMENT FOR WINTER RESCUE
PARTY IN SEARCH FOR MISSING PERSONS
(continued)

if needed when the missing person(s) is located. On finding the missing one, two men of the group stay with the victims to tend them, make fire, etc., while the other two men together go for toboggan if needed or more help. If other groups are within call, or within sound of the whistle, they are summoned to add their supplies to those already on hand. Possibly a toboggan can be improvised quicker than one can be obtained; this should be considered where feasible.

APPENDIX C

EXAMPLES OF ORGANIZATION
FOR EMERGENCY RESCUEOregonOPERATING PROCEDURE
MOUNTAIN EMERGENCY COMMITTEE¹³

The Mountain Emergency Committee is organized to provide a group of qualified and properly equipped men to conduct a search in any type of terrain for a lost person or persons, or to effect a rescue of an injured person or persons. It does not expect to function until all local resources (i.e., the injured or lost person's own party, local forest officers, police officers, etc.) have been utilized and have proven inadequate.

Calls for assistance will be made by the public to AT 5257, the AAA Automobile Association office. That office will in turn call the chairman of the Mountain Emergency Committee, or if he cannot be reached, the first member of the committee who is available. If in the opinion of the chairman or the committee member notified, the Mountain Emergency Committee should function, he will call the representatives of the participating organizations, who in turn will call as many of the members of his organization as are needed. Before calling the Mountain Emergency Committee into action, the committee members initiating the action should if possible confer with other members of the committee to determine definitely that there is a need for action.

¹³Jim Simmons, Mountain Emergency Committee (unpublished report, 1947).

MOUNTAIN EMERGENCY COMMITTEE

CHAIRMAN

James M. Simmons

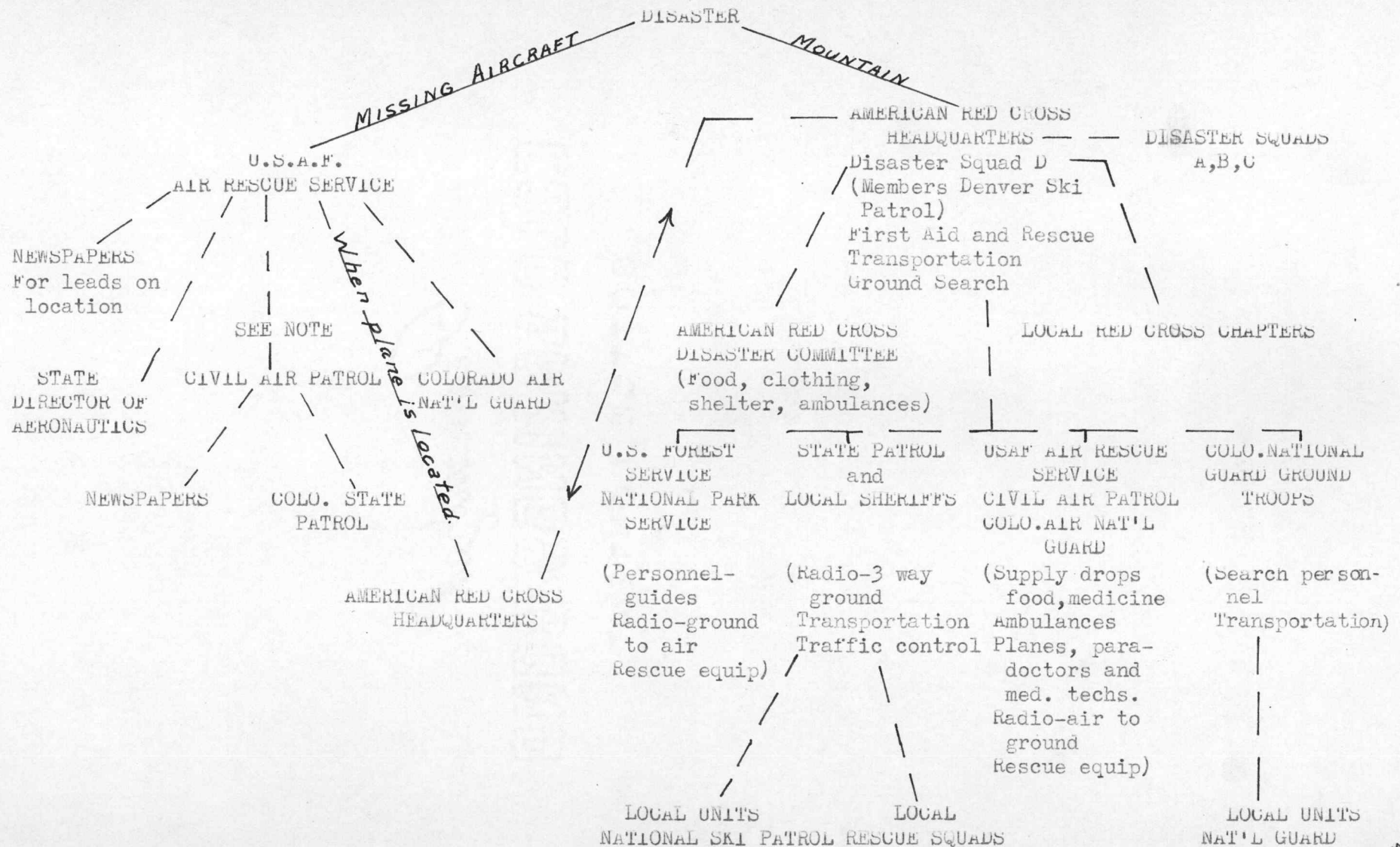
Res. phone WE 2328

Bus. phone EA 8115

<u>Participating Organizations</u>	<u>Chairman</u>	<u>Phone</u>
Oregon State Motor Assn.	Ray Conway	Res SU 1581 Bus AT 5257
United States Forest Service	Bill Parke	Res WE 9428 Bus AT 6171
Cascade Ski Club	Norman Lindjam	Res GA 7914 Bus BR 7910
Mazamas	Al Gerding	Res TR 7304 Bus SU 9144
Mount Hood Ski Patrol	Tom Bechtol	Res Gresham Bus BR 7631
Trails Club of Oregon	Ray Ellis	Res SU 6480 Bus AT 5318
Wy'East Climbers	Randall Kester	Res TR 2797 Bus AT 7531

(This list of participating organizations is followed by a detailed list of Forest Service officers in the various mountain districts. The remainder of the report is a roster of qualified men listed by each organization giving their name, address, telephone, experience, equipment, first aid status, means of transportation, and remarks as to leadership or special abilities.)

ORGANIZATION FOR AIR AND GROUND MOUNTAIN DISASTERS IN COLORADO



AIR SEARCH

GROUND OPERATIONS

NOTE: Units will be activated as needed