

PLANNING FOR YOUR CAVE ACCIDENT

by Dick Graham

PART 1: AWARENESS AND CONSEQUENCES

INTRODUCTION:

Last weekend, as I was helping the third victim out of a cave this year, I began wondering what could have been done to prevent eight of us from missing supper and a lot of sleep. The relative ease of the rescue afforded me time to change my thinking from placing blame to analyzing the situation.

The injury was fortunately minor, the caver's leg had been severely bruised by a rock falling in a breakdown room—the kind of injury that could happen to almost anyone. The immediate cause was carelessness of the victim.

Or was it? Maybe the rock did not even need him to use it as a handhold. Maybe it was ready to fall under the weight of a bat. Maybe the victim was unnecessarily tired by working harder to haul cave gear since there were only two cavers in the party.

Whatever the reason for the accident, it had happened and we were there to help him out of the cave. Had we brought enough equipment? Enough food? The right kind of food? Enough people? Too many people? The more I thought, the more I realized there were a lot of aspects to cave safety and rescue—enough, in fact, for a series of articles in a newsletter.

When you read these articles, don't expect answers. All I can offer you, based on my 25 years of caving, are opinions and suggestions that may start you thinking more about cave safety, or at least planning for accidents.

BEING AWARE— REDUCING THE RISK:

Yes, that's right! The title of this series is not "PLANNING TO AVOID ACCIDENTS," or "HOW NOT TO HAVE A CAVING ACCIDENT?." You are going to have an accident sometime if you go caving. What you hope is that you never have a serious accident. It is possible to avoid serious accidents. I have been caving for 25 years in a variety of caves and have never had an injury causing more than temporary,

minor pain or requiring a visit to a doctor. Most of the experienced cavers I cave with have never had a serious injury.

But I have sprained an ankle four times outside of a cave—once while walking across a smooth street! I slipped getting out the bathtub a few months ago. It would have resulted in a minor bruise if my right heel hadn't shattered a large wall mirror. I spent half the morning in the emergency room while the nurses worked on getting all the pieces of glass out before sewing me up.

Nothing anywhere near that serious has ever happened to me or anyone else in my group in a cave; the only reason I can think of is that I am more aware of potential dangers while in a cave than while crossing a street or getting out of a bathtub. And this is, in turn, at least partly because I'm aware that even a minor injury can have serious consequences if it occurs deep underground.

Awareness of dangers implies first a knowledge of dangers, and second, the ability to use all your senses to constantly assess the potential for danger. Both knowledge and ability come with experience. A beginning caver may know about obvious hazards such as loose breakdown and deep water. An experienced caver will know that loose rock can appear deceptively sound in gypsum areas, and that deep water is no problem if one is prepared for it.

Experiences teaches also that chert ledges should be used cautiously, that a rope thrown down a virgin pit should have a knot in the end of it, and that eating complex carbohydrates before and during a long cave trip keeps one warmer and more alert. I can't give a complete list here. These examples merely demonstrate that the knowledge of dangers comes from experience. But knowledge of possible dangers in a cave does no good unless one is aware of one's surroundings.

When you move through a cave, are you aware of the loose rock under the feet of the caver up hill from you? Did you notice that the rope should be left in a certain position when you rappel? Do you constantly look for extra hand- and foot-holds when you move through a

chimney with loose rock? Your senses should be turned up to near maximum as you move through a cave so that you can constantly evaluate your surroundings for hazards. Hazards include not only what is in your immediate area, but what is near other cavers near you, since a screw-up by someone else can affect you. If you aren't 100% aware of your surroundings as you move, slow down enough so that are. You will also enjoy the cave more.

Don't rely on someone else to be aware for you. Only you know your own limitations. What may be safe for someone else may not be safe for you. A climb that is easy for someone with strong arms and a low center of gravity may not be easy for someone with weak arms and a high center of gravity. A move across shaky breakdown may require a better sense of balance than you have. Being alert in a cave cannot eliminate the possibility of something going wrong, it can only reduce the probability.

What about the hazards you can't see? Did you eat enough to ward off hypothermia? Did you bring enough food to keep up your energy level? Did you bring enough clothing to stay warm? What about the other members of your party? Is their lack of food or clothing going to put you in danger? It takes more planning to prepare for these dangers that you can't see, planning that should start well before you enter the cave.

CONSEQUENCES— YOU ALWAYS HAVE A CHOICE:

Now that you have read the previous paragraphs you are aware that you are in a dangerous situation, with your handholds slowly breaking away and your feet slipping down the steep mud slope. Since you were always aware of your surroundings before you got into this situation, you must have used up the extra handholds that you had spotted, so it looks like you are going to fall. What happens if you do nothing? Do you need to fall to the right or left? Backward or forward?

The alert caver is always aware of the consequences of something going wrong, and how to minimize the serious of those consequences. You should continuously evaluate the consequences of an accident as you move through a cave. The important thing to remember is that you should choose only those actions

that have progressively less serious consequences as you move farther from the entrance.

A relatively minor injury, like a sprained ankle, may be only an inconvenience just inside a horizontal entrance. It may cause a major rescue at the bottom of a deep, vertical cave. As you move into a cave, you should take progressively fewer risks. If the consequences of a wrong move are serious, choose another route. Remember that one choice you always have is to turn around and head out of the cave.

Don't rely on someone else to make the best choice for you. Only you know your limitations. A route that has minor consequences for someone else may have major consequences for you. Only you can evaluate how well you can climb a rope with only one leg; only you can tell how difficult the chimney will be if you injure one arm. An experienced cave diver may lose the dive line and be able to find it in minutes; an inexperienced diver may never find it. Remember that the consequences of something going wrong depend on the individual and her location in the cave.

PART 2: PLANNING

Part One dealt with some aspects of short-range planning. Now let's look at some aspects of long-range planning. I'll start with an example of how long-range planning would have averted a bad situation.

In February 1992, three cavers rappelled into the 90-foot Crookshank Pit, got soaking wet in the 40-degree water, and went into the Canadian Hole section of Friars Hole via the Rubber Chicken Highway. Even in warm, dry weather, most cavers going into Canadian Hole wear either a wetsuit or heavy-weight synthetic underwear under nylon coveralls, but two of the cavers were wearing cotton coveralls; one of them had no synthetic clothing.

The leader of the trip managed to get out of the cave at 6:00 am the next morning and wake up two people who organized a rescue of the two "cotton" cavers who were too cold to climb the rope. They were waiting in the best place they could find: A large gravel bank in a moist passage near the bottom of the pit where the air temperature was about 40 degrees. They were hauled out of the pit four hours later.

Since the leader had been in Canadian Hole before, he presumably was aware of the conditions of the cave, so this potentially fatal situation was caused by lack of long-range planning. To go anywhere in the 40-odd miles of Friars Hole you have to crawl and get wet. The water levels vary by season and recent local rainfall. The Snedegar Sump is usually closed in winter and spring, blocking the connection between Crookshank and Snedegar.

The Canadian Hole section of the cave is always the coldest, and the long, frequent contact with damp rock and mud drains heat as fast as wading in cold water. The most important item to consider in planning a trip to Canadian Hole is clothing, the second-most important is food. Clothing should not absorb water or mud and should dry as fast possible. Warm underwear is a necessity. In other caves, like Lechiguilla, warm clothing may not be so important. Here is a list of items to consider in long-range planning. I have elaborated on clothing because I am constantly amazed at the ignorance of most cavers on the subject.

CLOTHING:

Clothing provides warmth and abrasion resistance. If these requirements vary in the cave, then a variety of clothing must be taken. If you have to hustle for three hours to get to where you will start mapping, you will want to wear minimal clothing until you get to the beginning of the survey and then put on warmer clothes. I almost always carry an extra synthetic shirt in my pack in case I get wet or cold for some unplanned reason.

Cotton is reasonably warm when it is dry, but is useless when wet for two reasons: 1) Its insulating value drops to almost zero; 2) It retains water which slowly evaporates, cooling the body even more. You do not have to wade through water to get cotton wet; perspiration will suffice. Remember that in cold caves, **COTTON KILLS!**

Wool or acrylic sweaters can be purchased for less than \$5.00 at thrift stores or yard sales, so there is no excuse for not being warm. Capilene, polypropylene, or other synthetics are even better than wool, but they are more expensive. Generally the ideal outer layer for a wet cave is a nylon caving suit, costing about \$100. The good suits are very abrasion-resistant, do not hold water, and do not allow water to pass through.

Wetsuits are advisable only for frequent immersion in water or immersion for more than a few seconds. Wetsuits socks, available at many boating stores, can be worn in all but the warmest caves. They can be found in thicknesses from 1/16 to 1/4 inch and cost from \$15 to \$25.

Gloves are often a neglected item of clothing. Most people use gloves for abrasion resistance, but in a cold, wet cave they should also be used for warmth. You have to experiment to find the best gloves for your hands in the types of caves you frequent. Remember that when wet, cotton gloves cool your hands more than no gloves at all. My blood circulates so poorly that I sometimes wear rubber gloves to where I begin surveying, and then switch to neoprene gloves.

FOOD:

The variety of food I have seen eaten in caves is mind-boggling, and most people swear by a particular type of disgusting food, but the right food for a cave trip should be based on nutrition, not whimsy. The amount of food to eat depends on the energy you will be required to expend on the trip. Even a small amount of food can be valuable in the event of a delay in getting back to the surface, and no cave trip is immune to delays.

The best meal before a long cave trip consists mainly of complex carbohydrates and some protein. I prefer pasta with tuna fish added. Others like potatoes or oatmeal with something like cheese or butter added. During the cave trip you may be burning up to 500 calories an hour. The best way to replace calories burned is with simple sugars and carbohydrates, not fat or protein. Not only do fat and protein take longer to convert into calories, but they are more difficult to digest.

On important reason to eat during a cave trip is to keep warm. Eating and drinking a small amount once or twice an hour is better than eating and drinking a large amount less frequently. If you wait until you get cold to start eating you will have to wait between 30 and 90 minutes before your body can burn the sugar to get warm.

Another important reason to eat is to keep the muscles fueled. Frequent eating of small amounts will keep you from feeling worn out and reduce the chance of

muscle cramps. Your body will also be able to cave longer.

Now, what does the above have to do with safety? Two things: 1) Keeping constantly warm reduces the possibility of hypothermia; 2) Fueling muscles means that moving through the cave is easier, you will have more strength when needed, and you will be more alert to your surroundings. In hypothermia or exhaustion, coordination and judgement are two of the first attributes to be degraded. Many a cold, tired caver has gotten hurt while hurrying to keep up with faster companions.

EQUIPMENT:

A list of cave equipment is too long and depends too much upon the type of cave to describe here, so I will just mention some important points to consider related to safety. The equipment that everyone thinks of for cave trips consists primarily of three light sources, hard hat, and pack.

Each of your three sources of light should be practical for getting you out of the cave safely. A candle or cyalume is not a practical light source for moving through a cave. On your next cave trip when you get as far as you are going, remove your primary light source from your helmet and get out of the cave. Can you do it safely? Easily? If not, think about other light sources.

A piece of equipment that is useful under a wide range of circumstances is a length of one-inch tubular webbing 30 to 50 feet long. I prefer webbing instead of rope because it packs smaller and is easier to grab with hands. I almost always carry a 50-foot piece for use as a belay, a hand-hold across a slippery ledge, or a way to rig rope to irregular projections. It has also come in handy for an arm rappel when I needed to get down a difficult climb.

If you buy tubular webbing, be aware that there are two kinds: The good kind is constructed from a continuous circular stitch; the bad kind is made by folding a two-inch piece and fastening with a chain stitch and is not as strong or as durable. I buy mine from Bob and Bob because they always have the good kind.

In general, whatever the equipment or clothing or food you use, you should know the limitations of it: Will

your pack fall apart in West Virginia crawlways? Will the hanger you are about to rig break under the load? How long has the hanger been there? Is it made of stainless steel? Was it set correctly? How many hours of useful light do you have left on those batteries? Will your electric light dim gradually or cease to function immediately when the batteries wear out. Will your clothing keep you warm if you wade through pools of water. Does the food agree with your stomach? Is the rope long enough?

You should also know if the equipment was designed to do what you want it to do: Will your rappel device work on 7/16-inch rope that is very stiff? Very flexible? Will it work on 8-mm rope? Will your ascenders work on sleazy rope? There are questions that must be asked AND ANSWERED before you enter the cave. Failure of any equipment in a cave is a potential safety problem. If your pack falls apart, how will you carry the equipment that was in the pack? How much will it slow you down? How much more strenuous will the trip be? How much more difficult will the climbs be?

My last bit of advice concerning safety is: Test new equipment under safe circumstances. When I was caving in Huntsville, the Grotto got several calls each year to pull people out of pits. Many of them had slid down wire or clothesline and then discovered they could not climb back up! It would have been a simple matter for them to try climbing hand-over-hand in a tree before attempting a pit and causing so many people grief.

About a year ago I tried righting from a heel hang on a rope rigged at the rappel tower in Raleigh. I was able to get back up, but with only a tremendous effort that would not be possible at the end of a cave trip. That experience prompted me to devise a safety sling from my foot ascender to my seat sling so that I would never have to worry about falling completely backwards while climbing a rope. I had to practice several top ascender failures to get the sling just right, but now I know that if my top ascender fails in a cave, I can easily continue the climb. During the practice sessions, I also discovered that the safety sling was useful for other situations because it gave me two ascenders attached to my seat sling.

Remember that failure of any equipment is a potential safety problem. What about the new light you just got for your hardhat? Can you use it effectively? Does it

point in the right direction? Will it stay on your hand? TEST IT FIRST!

EMERGENCY STUFF:

The practical long-range planner will pack emergency equipment to handle any situation. The two dangerous situations that occur most frequently are: 1) Lack of food; and 2) hypothermia.

Therefore, it make sense to have emergency equipment to deal with these situations: That is, food and stuff to keep you warm. Other than standard clothing, the best items for warmth are a space blanket or garbage bag, carbide light or candle, and a balaclava. A flame placed under a garbage bag or space blanket will keep you warm or raise your temperature if you are cold.

Other good items to carry are: Aspirin; inflatable splints for ankle, arm, and leg; extra gear for vertical rescue; hammer for enlarging small passage to facilitate rescue; flexible stretcher; extra rope; etc.

If you have a problem fitting all that into pack, you will have to prioritize items according to what disaster is more likely to happen and what is more likely to be needed. If you can't carry into the cave all of the emergency gear that you think you may need, you should at least have it near the entrance. After being involved in two rescues in less than a year, I now always have extra rope, pulleys, vertical gear, and clothing in my van.

CONDITIONS IN THE CAVE:

Conditions in the cave dictate the MINIMUM equipment you will need. To plan a safe trip you need to consider what the conditions could BECOME if there is a change in the weather, if you get lost, or if the leader decides to use another route. If you don't know what the conditions in the cave will be, ask someone before you go. Don't go unprepared!

SUMMARY:

Know the cave conditions before you go. Know how bad they can get.

Plan for the conditions and bring the right equipment, food, and clothing for worse conditions.

Have reasonable emergency gear for the worst conditions nearby.

Know how your equipment, food, and clothing will work under those conditions.

Know how your body will work in those conditions.

PART 3: AFTER THE ACCIDENT

What do you do after you have your accident? If you have read parts **One** and **Two** of this series, maybe you are prepared. Let's see.

Suppose that you are a couple of hours back in a cave when you sustain an injury that restricts movement, but is not serious or life-threatening, such as a badly sprained ankle. Getting out of the cave requires breakdown hopping and a few climbs so you decide to wait for a rescue team. What happens next? The person who goes for help takes two hours to exit the cave, and another half an hour to notify NCRC.

The nearest cavers are notified half an hour later. It takes them one hour to prepare their gear, another two hours to drive to the cave, then two hours to get to you. So you have been sitting there eight hours! How cold and stiff are you after not moving for eight hours? Did you bring enough clothing to keep warm for eight hours? What about food? Would you have been better off trying to get out without outside help? I can't answer that question definitively in this article. Read on and you will discover why there is no simple answer.

If at least one other person in your party knows how to belay, maybe he can use your 50 feet of webbing to help you up the climbs. If you have boots that go above the ankle, you might get additional support by tightening the laces. If it is going to take eight hours for an outside rescue team to get to you, it is worth trying a self-rescue for half an hour to see how far you get. During that half hour, you will probably discover how easily (or how painfully) you can move, how much you can rely on your caving buddies, and how long it would take you to get out of the cave. You will also realize if you need special equipment, clothing, food, or medical supplies.

You should also notice if a larger or more experienced group of cavers could help more than the people in

your party. For example, even more experienced people will not be able to help you through contorted, tight passages; you will have to negotiate those on your own. If you test a supposedly secure belay and discover the belayer cannot hold you, you probably need help from experienced cavers. If those around you seem more upset about your accident than you, you should ask for outside help. If the cavers in your group are having trouble helping you past simple obstacles and you know there are more difficult obstacles ahead, ask for outside help.

But what if you have a more serious injury? Before considering a rescue, you need to attend to the injury. Do you or does anyone in your party know first aid? Do you have the equipment to treat the injury? If the answer to these two questions is no, you will probably be permanently disabled by the accident or die. Think about it.

Let's suppose that someone in your group knows first aid and has the right equipment to treat the injury temporarily. Can you survive eight hours waiting for a rescue team to arrive? What happens after they arrive? It may take eight hours to get out of the cave. Will you like the 16 hours it takes to get to a hospital?

You have four chances to avoid death or permanent disability from a bad caving accident:

- 1.) Be aware - avoid the accident in the first place;
- 2.) Know first aid;
- 3.) Carry the necessary equipment;
- 4.) Cave with competent cavers.

I hope that if you think of these sobering scenarios before you enter a cave, you will alter your behavior to avoid, or reduce the seriousness of, accidents.

PART 4: YOUR RESPONSIBILITY

INTRODUCTION:

Now that you have read parts One through Four, you know that you should: Have the right clothing, food, and equipment for the cave trip; be constantly aware of your surrounding; move carefully through the cave; always evaluate the potential for accidents; estimate the consequences of any move; etc. If you are on a solo trip, whose responsibility is it to ensure that you

adhere to the above rules? The answer is simple in this case—it is your responsibility!

Suppose that before the trip, a friend gives you the latest Bulgarian rappel device that he says is the best in the world. If you use it for the first time on your solo trip and break an ankle because of problems with the device, should you blame your friend?

The answer is “no” for several reasons: 1) Even if your friend is an “expert” vertical caver, he may not have anticipated the circumstances under which you were going to use it; 2) Even if the device is the best in the world, you should become familiar with it under ideal conditions before using it on a solo trip; 3) It may not work for you because of your weight or type of rope (i.e., thin, thick, flexible, stiff); 4) It may not fit with the rest of your vertical equipment. The same reasoning applies to any piece of equipment you intend to use on a solo trip, whether it is your light, pack, clothing, food, etc. On a solo trip, everything is your responsibility.

Now instead of being alone, suppose there are two other slightly more experienced cavers with you. Do you automatically give up your responsibility for yourself and hope that they will watch out for you? Before you answer, ask yourself if you can trust them to watch out for you. Do they know enough about you to know what to look out for or when you may need help?

Without a designated leader, you should treat the trip as a solo trip and assume responsibility for yourself. What you gain from caving with other people is (you hope):

- 1) An increased awareness of what the cave is doing,
- 2) Someone to initiate a rescue and help if you are injured,
- 3) Extra equipment (e.g., Someone else to haul survey gear, rope extra light, repair parts, etc., and
- 4) Easier climbs (someone to “give a leg up”, belay, etc.)

Perhaps the ideal cave trip, in terms of safety, occurs when all members of the group are experienced, cautious cavers who have caved enough with each other so they know each other's strengths and weaknesses and can effectively help each other. Such a group caves more efficiently and more safely when every member assumes responsibility not only for himself but for everyone else.

“Experienced” means learning enough from cave trips, conversations, and reading to be able to cope effectively with an situation that may arise, and avoiding bad situations before they arise. Depending on the individual, acquiring this experience may require anywhere from one to several years. (I know people who have demonstrated that they will never achieve this state.)

But all of the above relates to “middle ground.” Let’s examine the extremes.

A GOOD BEGINNER:

Suppose first that you are a beginner and show up for your first horizontal or vertical trip. What responsibility do you have? First and most important, you have the responsibility to act as “responsible” as possible and use common sense, and you have the responsibility to know your limitations.

The safest action is to assume that the trip leader will not be able to watch and protect you every minute. Even if you are lucky enough to get the best trip leader in the world, you can make her job much easier if you demonstrate that you are responsible for yourself as much as your experience allows.

Second, for the trip leader to help you, you must be sure she is aware of your condition at all times so she can correctly evaluate your need for assistance. For example, if you do not understand instructions about belay signals or which direction to go, or if you are so cold that you are shivering, it is your responsibility to notify the leader.

Third, you should inform the leader ahead of time of any limitations you have (e.g., you have to be home at 9 pm or you have claustrophobia or your knee dislocates easily).

Fourth, you should pay attention to the leader.

Fifth, you should inform the leader when you are asked to go beyond your limits, even if it appears that everyone else is blindly following her. But more important, your responsibility is to evaluate the leader. Can the trip leader reduce your risk or seriousness of accident? Do you trust her to handle any emergency? Do you trust her to take care of you after you are injured and make the right decisions regarding your probability of survival?

No matter what level of experience you possess, you should always evaluate the trip leader if one is designated. Don’t assume that just because someone is assigned to be a leader that he knows how to take care of a group. A person can be an “experienced” caver, but not care enough to watch out for the other people in a group. So how do you evaluate a leader? What constitutes good leadership?

A GOOD LEADER:

A good leader is one who assumes responsibility for everyone in the group. This means that he makes sure that everyone has the proper clothing, food, equipment, etc. for the trip, constantly watches the cavers moving through the cave to evaluate their strengths and weaknesses, to be aware of potential dangers for each one, and to be sure that no one is putting someone else in danger.

The good leader is the person who constantly estimates the consequences of all moves not only of himself, but also everyone in the group. The leader is responsible for everything mentioned in Parts One through Three of this series, not only for herself, but for everyone in the group!

Since it is impossible to watch everyone’s actions all the time, the leader must quickly evaluate everyone in the group so he knows who must be watched more closely and who can cave more independently. The more independent beginners are those who have a sense of balance, good coordination, awareness, ability to learn quickly, and intelligence (in that order of importance). Thus it is impossible to safely lead a group of novices through anything but a trivial cave unless they have some experience that enables them to be independent.

I have discovered that it is impossible to determine one’s ability to be independent without watching the person to evaluate him. The above-mentioned desirable characteristics cannot be judged by sex, size, weight, or age. I have been impressed by the abilities of some overweight women over 40 and underweight 15-year-olds trying caving for the first time. I also have been turned off by the lack of common sense of some muscular men in their twenties.

WHO IS THE LEADER:

Well gosh, that's simple to answer, isn't it? (If it were, I wouldn't have asked). If you are a participant on an organized trip, someone may be officially designated as the leader.

But suppose that the arrangements are slightly less formal. What happens if someone in a school outing club organizes a caving trip? THE ORGANIZER IS ASSUMED TO BE THE LEADER. This may not be the intent of the organizer, and if not, he should state clearly who the leader is and who has responsibility for what. The organizer may have responsibility for trip arrangements up to, but not including, the cave trip, such as who is riding in which vehicles, where everyone is staying, and where everyone is eating.

No matter who is officially designated as the leader, the legal precedent is that the person who has the most experience has the responsibility for the group. Suppose you are a Lew Bicking Award winner with 30 years caving experience and you go on a convention cave trip with some dodo for a leader. If the leader does something irresponsible that results in an injury—like rigging the rope over sharp lava and telling people to wear cotton and then leading a trip through a long, cold, wet cave—you could very well be sued for negligence for not preventing the problem. It is your legal responsibility to act to the best that your experience will allow.

SUMMARY:

It is your legal responsibility to act to the best that your experience will allow.

PART 5: ANALYSIS OF THREE INCIDENTS

INTRODUCTION

This last part of the series looks at three incidents with respect to issues raised in the first four parts. The incidents occurred in Crookshank, the Portal, and My Cave. All three caves are in West Virginia. The first two were chosen because I was involved in the rescue. The last was chosen because it has bothered me ever since I heard that someone died.

At first I thought this analysis would be easy since I have already laid the groundwork in the previous parts;

the incidents are similar in that they were caused primarily by error in judgement of the leaders, and secondarily by error in judgement by the victims. Maybe. The first problem is identifying who was the leader.

LEADER OR ORGANIZER

The question does not have a simple answer. In fact, this question may point to the cause of many cave accidents. To discuss it though, I first need to define the terms and repeat a definition from **Part 4**.

A leader is the one who accepts the responsibility for the actions and safety of the group and is acknowledged as such by the group.

An organizer is the one who plans the trip.

Experience is the amount of knowledge learned from enough cave trips, conversations, and reading to be able to cope effectively with any situation that may arise, and avoiding bad situations before they arise. It is not measured solely by time underground or number of cave trips.

Imagine four scenarios of beginnings of cave trips:

- 1.) Some friends (of roughly equally caving ability) get together for a few beers and decide to go caving. The plans are worked out by the group.
- 2.) Some friends (of roughly equal physical ability but slightly different caving experience) get together for a few beers. One person suggests a caving trip; the others agree. The first person decides what cave to visit and when.
- 3.) During a university outing club meeting, one person announces that she wants to go to a particular cave and is looking for other people to go.
- 4.) An experienced caver invites a much less experienced caver to go caving.

What are the expectations of the people involved in these different scenarios? In the first scenario, no leader or organizer is explicitly specified. In the second and third, an organizer is implied and people in these groups may also assume that the organizer is the leader. In the fourth, the experienced caver will be recognized as the leader by a caver who perceives himself as definitely less experienced; the experienced caver may not be recognized as the leader by someone who perceives himself as equal in experience or having greater experience.

These varying perceptions could have fatal consequences for the cavers involved. No matter who is the stated leader of a trip, the most experienced caver is the one who really has the responsibility, although for political reasons the experienced caver may not have the authority. With this background, let's look at the three incidents.

CROOKSHANK

I have already described the incident in Part 2: In February 1992, three cavers rappelled into the 90-foot Crookshank Pit, got soaking wet in the 40ø Fahrenheit water, and went into the Canadian Hole section of Friar's Hole via the Rubber Chicken Highway. Even in warm, dry weather, that section of the cave is cold and very damp. The trip they had planned would have taken at least eight hours under favorable circumstances. When they returned to the bottom of the drop on the way out of the cave, they lacked the energy to climb out and had to wait at the bottom for a rescue. The two victims were wearing clothing inadequate for a warm-weather trip into the cave: Water-absorbent coveralls and not enough warm underwear. Let's look at the various categories of the causes of the rescue.

Lack of Long-Range Planning:

1.) The most obvious deficiency is the improper clothing worn. It should have consisted of a water-resistant outer layer over wool or synthetic underwear. When Canadian Hole was being explored and mapped in the late 70's and early 80's before the advent of waterproof nylon coveralls, the usual clothing was a full wetsuit. For mapping in the rest of Friar's Hole, most cavers wore or carried part of a wetsuit or wool. Because of the frequent and prolonged contact with cold, damp mud or rock, a Canadian Hole caver usually stays wet.

2.) No additional dry clothing designed to be warm in damp conditions (e.g., wool or synthetics).

3.) No emergency equipment to cope with cold, damp conditions. If they had left space blankets, food, and proper clothing inside the cave, they could have gotten themselves out. (At the beginning of the rescue, the trip organizer volunteered extra clothing. It was not used because it was all cotton.)

4.) No "easy" way out of the cave. The organizer was informed the night before the trip that the horizontal exit through the Snedegar's Sump would probably be impassable due to high water.

Lack of Short-Range Planning:

1.) As soon as the group reached the bottom of the entrance pit, they should have realized their clothing was not going to be adequate for the planned trip. They should have changed plans and gone on a shorter trip.

2.) If they thought that they might be able to go out the horizontal route, they should have checked that first.

After the Incident Occurred:

1.) The two victims probably made the right decision in not attempting to climb the rope, since difficulty on the rope would probably resulted in death.

2.) The person who climbed out asked competent cavers for help rather than trying to handle it himself.

Responsibility:

So who had the responsibility to look after the long-range planning, short-range planning, and other problems?

The organizer of the trip was familiar with the route and conditions in the cave. He was the only one with adequate clothing. He also planned the route into the cave and was definitely much more prepared than the other two, and he was the one who made it out, indicating that he was more experienced than the others. He should have noticed that the others were inadequately dressed. Now put yourself in the place of one of the victims.

Imagine that, wearing cotton underwear and coveralls, you rappel 90 feet, half of it through 40-degree water. You arrive at the bottom very wet with an least an eight-hour trip through a cold, damp cave ahead of you. What would you do after everyone has rappelled? First, it is your responsibility to notify the rest of the group of your condition. Second, you would probably suggest strongly that the duration of the trip be reduced

drastically. If I were in the place of one of the victims, I would want to head out of the cave immediately.

What would you do? Was the organizer of this trip also the leader? Or was this trip organized as in **Scenario Two** above? If there was no leader, is the responsibility left up to the group or as a group of individuals?

THE PORTAL

Two cavers entered the Portal sometime Saturday morning. They rappelled the 33-foot entrance drop, slid through the small hole at the bottom (the portal), climbed down the 8-foot drop immediately on the other side, wormed through 150 feet of tight canyon, and entered a walking passage. They followed this for 1600 feet to a 19-foot drop requiring a rope.

About 400 feet from the bottom of the drop is a very low, wet, awkward, 300-foot stream crawl. Since they did not know of the partial bypass around the worst of the crawl, they stayed in the stream for 300 feet, where they encountered less than four inches of air space. Although the bypass is lower than the stream crawl (between one and two feet high), the water is never deeper than a few inches.

Beyond the low, wet area, the stream passage continues 800 feet to the top of a canyon, where the stream rapidly drops 60 feet. The two cavers walked, stooped, and crawled on the ledges to along the top of the canyon for 600 feet to a 20-foot climbdown to a dry passage. They followed this passage for 1200 feet to where it ends in an intersection with a crawl. There they turned left, stooping and crawling 700 feet to a large breakdown room.

While climbing on breakdown in this room, one of the cavers fell, injuring his leg. He was unable to stand without a great deal of point. The leader left the cave and went to a nearby location where cavers usually congregate on the weekends. There he found five cavers, two of whom were familiar with the Portal, and told them that the victim had an injured foot or ankle. NCRC was called and informed that the local group would attempt to bring the victim out if his injuries were not severe.

We arrived at the entrance after 7 pm and re-rigged the drop to make lip negotiation easier. The drop inside

the cave was also re-rigged. We arrived at the breakdown room to find the victim on a short, sloping ledge. While securing him with a belay, it became apparent that he was fully conscious and coherent, and not in shock. He was cold, but not hypothermic, and not experiencing severe pain.

After he was belayed, I determined that the only apparent injury was a severe bruise to the left thigh. He then was lowered to the floor. The bruise made it impossible for him to stand without assistance, since the muscle could not be tensed without a great deal of pain. He was offered a variety of clothing and food, including hot soup, after which we assisted him out of the cave.

Initially, he had to lean heavily on someone to walk, and he had to lie on his side to crawl. By the time he was back to the 20-foot climbdown, he could walk on this own with a strong limp. When we returned to the vehicles, he was walking with only a slight limp and the swelling had decreased markedly.

Analysis

Since the details of the occurrence of the injury are not known, I will only comment on what happened after the accident.

It is always easy to criticize the actions of others after an event has happened. The “criticizer” is usually at a typewriter in a comfortable environment, perhaps with a beer or two and a bag of munchies at his side, and so it may be hard for him to commiserate with a couple of hungry, tired, cavers a long way from the entrance when one of them is injured and the other has to leave him by himself to go for help. Nevertheless, that is what I will try to do.

Long-Range Planning

First, the two people on the trip could not efficiently handle by themselves the situation that occurred. A group of three would have allowed one person to go for help while one waited with the injured caver. This not only provides a psychological boost for the victim, but is essential to treat shock or hypothermia or bleeding. Also, two people would have had a better chance of assisting the victim out of the cave without resorting to outside help.

Second, experience with minor injuries or first aid would have allowed the cavers to correctly evaluate the injury and plan a self-rescue. Lack of such experience can be fatal to cavers, especially on “non-tourist” trips. In fact, many companies having employees in possibly hazardous jobs train their employee in first aid and CPR for no charge. Two companies I have worked for have this policy, even though only a small fraction of their employees could be in a dangerous situation on the job. Caving is potentially more dangerous than working as an electrician or lab technician, and it makes sense for all cavers to know first aid.

After The Accidents

Ideally, the leader would have been a very experienced, strong vertical caver with an extensive knowledge of first aid and vertical and horizontal rescue techniques. He would then have been able correctly to evaluate the injury and single-handedly help the victim up the three drops and out of the cave. However, given the experience and knowledge of the two cavers, the leader had no choice other than to get outside help as quickly as possible.

So how do you judge the trip leader? Should all leaders have first-aid training? Or better yet, should they know wilderness first aid and rescue training? What about the other people in the group? Should they require that their leader have first-aid training?

Footnote:

I was tremendously impressed by the efficiency of the NCRC organization: Two ambulances arrived at the cave immediately after we did. I was also impressed by the dedication of the Greenbrier County EMT’s who waited outside the cave for 4 or 5 hours in case they were needed, or in case they had to recall the ambulance.

MY CAVE

My father started driving a car in 1925. There were no driver education courses back then, and few laws related to driving. He learned how to survive by trial and error, by watching other people, and by tips from friends. He must have learned well, because in almost 70 years of driving he has not caused an accident or received more than a minor dent (in a car he was driving).

I know my father well; his safety record is not due to luck; it is due to his ability to observe what is going on around him, his good eyesight, and his ability to make quick, accurate decisions. And maybe also his tendency to accept responsibility for his actions. Also, back then he had the luxury of taking months to realize that knowing how to start and steer a car is not the same as knowing how to drive safely—unsafe acts then did not have the serious consequences they have now with faster speeds and dense traffic.

We do not have the luxury of learning safe vertical practices the way my father learned to drive. Mistakes can have serious consequences. Some few people with the same characteristics that helped my father may not need formal vertical education, but the accident at My Cave illustrates that some people do need it.

I am indebted to George Dasher for the account of the accident and his many helpful comments. His well-written, sensitive description was published in *The West Virginia Caver*. If the following account is well-written, it is because I have plagiarized some of his phrases.

The Accident:

On the 23rd of July 1989, four people started on a through trip that many people had done: in the Elk River entrance, down Outhouse Drop, walk upstream in big passage a short distance, left into the Dune Room, and out the Dry Branch entrance.

It was to be a short, easy Sunday trip in a familiar cave. All but Outhouse Drop was easy, dry, horizontal caving. A leisurely trip takes three hours. All had been in the cave before, but not down the drop. All had rappelled and ascended 40- to 60-foot pitches. Outhouse Drop starts as a 75-foot mud slope followed by a 75-foot drop initially against the wall, then free, into a large walking passage with a small stream flowing mostly under the rocks.

Downstream from the bottom of the drop, opposite from the way the four cavers planned to go, another stream enters from high on the left, forming a normally small waterfall that can be heard from the bottom of the drop. That water and the water in the main passage flow a short distance to a sump marking the downstream end of the cave.

Usually you can get a good view of the water and the sump and stay dry.

The four cavers had probably done the cave before without getting wet at all.

On the way to the upper entrance, they had to wade the normally dry Elk River, even though it had not rained near the cave. One person slipped and fell in, getting soaking wet. They made the rest of the way to Outhouse Drop uneventfully.

At the top of the drop, the four cavers were no longer in familiar cave--the waterfall below was roaring and the place was very noisy.

The leader rigged the rope and someone else descended. What the first rappeller found was totally unexpected: the roar of the waterfall was louder, the mist in the air made seeing difficult (I can guess at this because of my experiences in other caves in the area), and the normally dry, walking passage had turned into a huge river! In fact, there was very little dry land on which to stand. The prusik knots were in a pack at the top of the drop. Because of the geometry of the drop and the noise, communication with the top was impossible.

Unaware of the difficulty below, a second person descended, landing waist-deep in the water. The first person down was wearing a caving suit with wool and polypropylene underneath. The second person, already wet to above her waist from her fall in the river outside, was wearing cotton and was probably hypothermic. She brought down the pack with two sets of knots in it, but apparently neither she or the other person knew it. She decided to swim to the other side of the passage to a position from where they knew they could get out of the water and go out the lower entrance without further complications.

The water was barely flowing, since it was backing up at the constriction at the sump, and was only 30 feet wide. She swam halfway across and then sank unexpectedly and quickly to the bottom, where her body was later found by caver divers. At the top of the drop, the leader figured out that something must be wrong, sent the fourth person out the upper entrance for help, and descended the drop. He and the first person down the drop swam across the water and made their way to the Dune Room, where they waited for the rescue when their lights went out.

Short-Range Planning:

There were many short-comings of short-range planning by this group.

First, the victim was wet before she entered the cave, inviting hypothermia, especially since she was inadequately clothed for caving while wet. Second, the fact that the normally dry river bed had flowing water should have signaled to the group that underground water levels might be up.

All the people I know who cave in the area know that water levels can rapidly rise more than 80 feet in the winter and spring. In fact, the water rose twenty feet during the body recovery.

Third, the victim should have waited for assistance before swimming.

The decision to plunge right into the water is understandable because both people on the bottom were probably near panic and not taking the time to think rationally. However, if they had thought logically about their situation, they might have decided to look in the packs and discovered the prusik knots.

The strongest person on the bottom then could have climbed up and gone for help. If they had prepared for the swim by eliminating heavy gear or trapping air in clothing, the victim might still be alive.

Fourth, the first person down the drop should have had climbing gear. A quick evaluation of the incident might lead one to believe that a succession of minor problems led to the drowning. However, of all the actions taken or not taken, by the cavers that day, there is ONE SINGLE ACTION that could have prevented the situation that led to the drowning.

Long-Range Planning:

If the first person down the rope had been prepared, via training or experience, to deal with the problem, he would have climbed back up and the whole group would have exited the cave via the upper entrance. This action comes under the category of long-range planning because every proficient vertical caver knows well before he or she gets on a rope that all manner of problems can occur during a descent. For example,

the following have occurred either to me or someone I cave with.

- Anatomy or clothing caught in the rappel device, jamming rope;
- Thoroughly tangled rope part way down the drop;
- Dangerous animals or plants (bees, snakes, poison ivy, etc.);
- Inhospitable bottom (bloated cow, bat guano slurry, raging river, etc.);
- Rope too short to reach bottom;
- Cold water encountered during rappel;
- Rope going around or through an obstacle; and
- Rope damage discovered during rappel.

These are not rare events—they are common problems that all experienced vertical cavers have heard of and know how to deal with. The first two rescuers at My Cave rappelled down to the deep water and turned right around without getting into trouble because they were prepared. They realized that the first person down a drop must be prepared for anything.

I don't like being the first person down a drop for several reasons. I don't like the extra work of checking and clearing all ledges and padding the rope. I didn't like continually checking how the rope is hanging. I don't like having to constantly look down to make sure I don't rappel into the knot at the end of a rope that doesn't reach the bottom. I don't like having to watch the bottom to be sure I can get off in a friendly spot. I don't like being the one to untangle the rope when it piles up on a ledge. I would much rather spend my time enjoying the sights on the way down, secure in knowing that the first person down did a good job.

Many vertical beginners don't have a clue that the first person down a drop has so many potential problems to deal with. People whose primary vertical experience is on a rope in a tree or in a simple open-air pit usually don't realize that there is a big difference between knowing how to rappel and climb, and knowing how to rappel and climb safely. In his vertical training at Convention, Dave McClurg is careful to point this out. The chapter on rappelling in *On Rope*, by Padgett and Smith, mentions some of these problems and how to deal with them.

Summary:

The primary cause of the death at My Cave was the inability of the first person down the rope to deal effectively with the situation he found.

The responsibilities of the first person to rappel are often ignored or unknown by many vertical cavers.

There is more to vertical caving than just knowing how to rappel and climb. You should know how to rappel and climb safely and be prepared for unexpected situations while on rope.

The driver of a car can't just jump in the back seat and tell an inexperienced person to drive without a lot of very close supervision.

What would you have done differently in the three incidents presented here if you were the organizer, the leader, or just a follower?

CONCLUSION

These three incidents illustrate the types of problems that can occur while caving. The Portal incident illustrates what can result from a moment of being unaware of a potential danger. The victim probably had only a few seconds to avoid the accident. The incident was compounded by a lack of first aid knowledge and a small group (only two people). The Crookshank incident illustrates that even with hours to evaluate potential dangers, experienced cavers can make potentially fatal decisions. The My Cave incident demonstrates the danger of superficial vertical training. What would you have done if you were involved in any of these three incidents?

Most readers may already have experienced a "minor" injury that was initially painful. If you have, how did you treat it? Where there enough people in your group to handle the situation effectively? Do you usually cave with people trained in first aid? Do you even know if your fellow cavers have emergency medical training? Do you know the telephone number of the NCRC?

The Portal incident is presented here for two reasons. First, I have first-hand knowledge of it. Second, it represents a typical incident that could happen to almost anyone. Would the group you usually cave with have

handled the incident as well as the two in this case? Better? Worse? What would you have done if you were the leader? Would you have remained calm enough to deal effectively with the situation and evaluate the injury correctly? Could you have convinced the victim that the injury was only a bruise? How would handle a hysterical victim? Or one in shock? If you leave a victim in shock, he may die before a rescue party arrives.

What would you have done if your group had rappelled into Crookshank Pit on that cold day? How would your group have handled it? Who assumes the responsibility in the group you cave with? Is it one person or the group? Do you always agree with the decision? If you are the only one who does not have the proper gear or you get cold or you think the group is doing something dangerous, do you speak up? If the other people are really your friends, they will listen to you and consider what you have to say.

What if you are usually the leader? Do you listen to everyone? Do you evaluate individual potential hazards before someone gets into trouble? Do you notice if everyone has the correct gear? Some people will say they are fine when they are actually in trouble. Can you spot the early symptoms of hypothermia in yourself? In someone else? Do you usually take extra clothing and food as a precaution?

A person died in My Cave because neither she nor the group she was with considered the possibility that the

cave conditions would be other than they always had been. Do you ever consider or plan for the eventuality that conditions may change? A sudden storm can easily raise water levels in river caves extremely fast. Do you know which caves are prone to flooding? Do you check weather forecasts?

If you are a vertical caver, do you attempt to check conditions on the bottom of the rope before rappelling? Are you sometimes the first one down a drop? Are you prepared to change from rappel to prusik while on rope? Do you clean the lip before rigging the rope to avoid nasty surprises?

What would have happened if you had been the first person down the rope in My Cave? Would you have gone down the drop? Would you have had ascending gear? How would you have signaled to those above that they should not come down?

These three incidents have been presented not to criticize those involved, but to illustrate the types of problems that can occur and to start cavers thinking ahead about how they will handle problems that arise.

When you have an accident, how serious will it be? What will you do?

You will wish you had planned for it.