NSS NEWS

DECEMBER 1989—Part II

American Caving Accidents

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SINGLE ROPE TECHNIQUE:

AMERICAN, EUROPEAN, and in between

by Steve Knutson

First, let me say that no one can nor should tell another what system or style of SRT he should use — personal strengths, local caving environments, equipment availability and other factors will dictate. One must try different personal setups and rigging systems to discover what is best suited. Rather let us look in a general, rambling way at the present SRT scene, for it is now a bit confusing — European techniques have found a place in American caving.

I — Personal Rigs

By personal rig I mean the harness(es) and ascenders used by an individual. There seem to be three main set-ups in use.

1) Mitchell. I define as a Mitchell, any rig using a chest harness with a device for the main line to run through, intended to hold one upright and close to the rope. Then, there are two or three ascenders or knots, one just above the chest device (with the caver standing normally) and attached by sling to one foot, a second ascender at just above knee level and attached by sling to the other foot, and a third (optional) on a short sling to the seat harness, and held in reserve. All ascenders should also be linked by sling to the seat harness for safety, should part of the rig fail.

Thus rigged, the caver has one hand on the upper ascender, one on the lower (or the sling to his seat harness) and ascends in a ladder climbing motion, one foot stepping up after the other, the ascenders being pushed up with each step. This works very well in free space. Against walls, especially on sloped drops or the sloped portion of a drop, one switches to a "Texas," where the main line is released from the chest device, and the upper ascender and/or the third ascender are used so that the caver sits in his seat harness, supported by the upper or third ascender, while he pulls up the lower ascender. He then steps up supported by the lower, while he slides the upper one up, sitting back on seat support as soon as the upper completes its motion, to conserve energy. Thus it is easy to ascend slopes. Obviously, one can switch back and forth on complex drops. Jumar-type ascenders are usually the ascender of choice.

2) Rope Walker. Here an ascender is attached to or just above a foot; a second is at knee level and attached by sling to the other foot (and safetied to the seat harness). A bungee cord can aid the performance of the knee ascender (and sometimes is used on the foot ascender as well). A chest harness and device to hold the main line is employed to hold the person upright; this can take the form of a sling running diagonally across the chest, over one shoulder and down the back, attached to the seat harness in front and back and with an ascender attached at the shoulder. Thus the caver ascends free space with an upright, walking motion. Slopes are done with the main line out of the chest device or the shoulder ascender sling off the shoulder, allowing one to stand upright on the slope. Gibbs ascenders are the device of choice.

3) The Frog. This is a combination of Texas with the ascenders switched, and the old Inchworm technique. In the Frog, with the caver in standing position, one ascender is at belly-level and attached as closely as possible to a low-set seat harness. The second ascender is just above the first and attached by separate slings to both feet. One ascends, as in the fashion of the old Inchworm, by doing a "squat" and standing back up. That is, you sit, supported by the seat (lower) ascender, and slide the upper ascender up — then you stand up. A bungee cord in figure-8 around the shoulders is attached to the seat ascender to pull it up as you stand. Then you sit down and repeat the process. Since you have no real chest harness, the method works without modification for free space or slopes.

Before we can evaluate these, we must realize that their strengths and weaknesses will be relative to the rigging system used — European or American.

II — RIGGING SYSTEMS

European.

Europeans have evolved a style of rigging quite different from the American. The basic premise is that the main line should not touch rock as it hangs, or at least that there be no bad contact, rope to rock, where the rope would fray in ordinary use. Thus, a rope will be rigged initially so that it hangs out away from the edge of the drop rather than passing over the edge in an angle. Then, if a ledge is encountered, or a sloping descent becomes a freehanging descent, the rope will be re-anchored so that it will not wear at the ledge or breakover. Thus, a single pitch might be broken up into a number of rope portions. In addition, a rope may be suspended in a desired position by a "re-directional," where it is not actually anchored, but sits in a carabiner attached by sling to an anchor, so that the rope is held away from edges or waterfalls or whatever. Obviously, in ascending or descending, each of these obstacles must be passed.

American.

The American style seems to have evolved relying on the toughness of rope to handle wear and with long, free drops in mind. The rope is anchored at the top and allowed to run over the edge and down, a single rope for the full depth of the drop. If wear is expected or observed, a rope pad is employed to protect the rope.

III — EVALUATIONS

A. Rigging

The European style will allow the use of smaller diameter ropes and rope with inferior abrasion characteristics. It will also extend the life of any rope and is good for project or expedition situations that will be long-term and where occasional replacement of ropes would be impractical. Obviously, Americans have used this style, on occasion, to hang a rope so that it misses a waterfall or other obstacle.

This style also allows the ascent of a multi-anchored pitch by several cavers at the same time. In some situations this would save time and keep the party together. Rocks dislodged by a caver above would be an additional hazard, however. In the low-probability case of a rope failure, of course, the whole party might be jeopardized.

The American style saves greatly on the time spent rigging, equipment used rigging, time spent each time the pitch is descended, and, in some cases, time spent ascending. It is also inherently safer, since each reanchor and re-directional that is passed in the European style, is a point where you can err and be at risk. With American caving rope, at least, and in sizes down to 9 mm, at least, there is quite obviously no need to reanchor a rope just because it runs over a lip or hits a ledge. Quite often, such points show no appreciable abrasion. With American caving rope there have been, to my

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Cover Photos © by Ron Simmons
Grim Crawl of Death, Great-Ex Cave, Wyoming
Lost Worland River, Great-Ex Cave, Wyoming

knowledge, no rope failures. Dangerous spots are signaled by obvious wear and fraying, and the situation is corrected.

One seems forced to the conclusion that the utility for the European style is the following:

1) Project or expeditionary caving where rope replacement is impractical
2) Where you can't get good quality caving rope
3) Where you want to go to very small rope sizes — say 5 - 7 mm

B. Personal Rigs:

The Ropewalker is easily the fastest and most efficient style, followed by the Mitchell and, way behind, the Frog, for ascent of a free drop. In a European-style rigged pitch, the Frog becomes quite handy, but obviously wastes energy between reanchor points. Passing a reanchor is easy for the Frog, with both ascenders above the waist, but it is almost as easy with the Mitchell. Obviously, a chest box like the Simmons double-roller or Fritzke Alpine box is best, in that one can get the main line out while leaving the upper ascender in. The Ropewalker is not recommended for anything but free ascents since the foot ascender is hard to get at for passing reanchors.

The Frog is very good for hauling loads, since both legs are used in the move that hoists the load. It also seems to be the lightest and most compact rig. Europeans claim that they have many pits that are very narrow and that the Frog is good for this, but I can't see why it would be better than anything else, unless the pit is no narrow that a chest box would get in your way.

My personal conclusions are these: With American caving rope of 9 mm and up, a re-anchoring of the rope is seldom necessary. A Mitchell is quite usable in European rigging and superior to the Frog on any free pitch or portion, but you must be able to convert to a Frog to have equality in hauling loads. A Ropewalker is not advisable in many technical situations. A Frog must be convertible to a Ropewalker to gain parity with the Mitchell. A Frog is not advisable on American-rigged pitches since it is impossible for it to pass some breakovers.

In general, remember this: Whatever your personal preference, if you get around much at all, you had better be ready to deal with European rigging. There is an obvious utility for it and it is now part of the American scene.

AMERICAN CAVING ACCIDENTS - 1988

This is another compendium of safety incidents in American caving. Some have asked why it has the title 'American Caving Accidents' — why indeed?: That was the name of it when I got editorship and no one told me I could change it. So I have chosen to interpret 'American' as meaning 'the Americas' and I feel free to include anything from north, central and south America.

As some now-forgotten statistician pointed out, 'accidents' has to mean 'incidents' and I choose to accept any potentially educational safety incident (that is, it doesn't have to result in injury or aid for the victim). I should emphasize that this volume is not intended just for the dry documentation of incidents; its real value, in my opinion, is its ability to educate. If you read ACA, your safety consciousness will be affected.

It is apparent that some readers don't know how to properly evaluate the reports in ACA. The key is to look at the reference. If the only reference is a newspaper article, the facts may be in error. If the references include reports from cavers, the reliability increases. Actual rescue logs are probably the most reputable. In any case, the important things are to put yourself in these situations and imagine how you and your gear would handle them, and to realize that these accidents **do** happen.

1. RESULT OF INCIDENT	**1986**	**1987**	**1988**
CODE - RESULT			
AA - Fatality (body evacuation	4	3	4
A - Injury reguiring evacuation or aid	10	15	11
B - No injury — required evacuation or aid	21	14	20
C - Injury — no evacuation or aid required	10	15	14
D - No injury — no evacuation or aid	19	16	12
Total	64	63	61
Total AA, A, B, C	45	47	48

2. CAUSE OF INCIDENT			
CODE - CAUSE			
a - acetylene or gas explosion	3	0	1
b - bad air	3	2	1
c - caver fall	24	14	20
d - drowning	1	2	0
e - equipment failure or lack	14	17	19
f - flood	1	3	3
h - hypothermia	1	2	0
i - illness	0	0	1
l - losing the way	8	5	3
r - rockfall	12	16	7
s - stuck caver	2	1	0
x - exhaustion	0	1	1
o - other	3	3	8
3. SCUBA	9	7	10

1988 Incident Summary

The total number of reported incidents in 1988 was 61, just a bit down from the 64 and 63 of the previous two years. Still, the total of AA, A, B and C incidents with consequence, was 48, a bit above the 45 and 47 of '86 and '87. This is good news — the number of incidents seems to have leveled off and we are not seeing an increase, even though the total number of cavers is probably increasing.

The number of fatal incidents was 4, with three of these (Mar 26, Jul 11, Sep 24B) involving falls. One (Mar 26) was apparently crawling too fast(!) and couldn't stop when a drop was encountered; the second (Jul 11) was free climbing unbelayed around a 20' pit and fell; the third tried to down-climb a deep pit, without a belay and wearing tennis shoes. The fourth was an equipment failure (Jun 4) when a climbing pole collapsed.

In CAVE DIVING there were the usual fatalities, but for the first time these involved NSS cave-certified divers. I don't think this means anything more than that this is, indeed, an extremely dangerous activity and even highly trained divers are not immune.

In '88, the categories of equipment failure and caver fall were dominant, with a marked decrease in rockfall incidents from the previous two years. Let us summarize the categories in order of prevalence.

There were 19 EQUIPMENT FAILURES. This included 5 cases of weak or failed lights (Jan 14, Jan 29, Apr 5, Dec 18A,B) 3 harness failures — broken foot loop (Apr 23), chest sling failure with inversion (Aug 8), chest harness buckle failure (Aug 19), and 3 incidents of fouled rappels — two chin straps caught in figure-8's (Mar A,B) and a shirt caught in a rack (Jul 10).

In addition there was a rack whose retaining nut came off (with the bars on the nut side) but fortunately with no consequences, though the bars fell off when slack was released at the bottom (May). A carabiner attaching a rack to the seat harness broke while on rappel (Mar C) but the caver was able to grab the rope above the rack and hang on. A scaling pole collapsed causing a fatality (Jun 4), a caver was trapped when trying to climb a cable ladder and inverted with a foot caught in a rung (Jun 12), and a stove malfunctioned causing severe burns (Jan B). **Note that we never seem to have any rope failures but that harness and other gear does fail.**

The other major event was CAVER FALLS, of which there were 20. Most were short (Jan A, Feb 7, Mar 6,11,28, Spring, Apr 2, Sep 3, 10, 26, and Dec 10) with injuries ranging from very minor to injured knees and dislocated shoulders (Sep 10, Dec 10). There were six falls of from 20 to 75 feet including three fatalities (Mar 26, Summer C, Jul 11, Sep 24B). In addition there was one out-of-control rappel (Nov 26) with too few bars on the rope resulting in burned hands. A broken leg resulted from a downclimb with a poorly tied handline (Dec 10) and mild injuries were suffered in a fall taken while looking for a place to go to the bathroom.

Note that none of these falls was the result of a failed belay.

The "OTHER" category came next with 8 incidents. There were two snake encounters (Jan 4, Summer E) and such other bizarre happenings as rough seas in a sea cave (Oct 14) , an eye gouged by wire in an entrance dig

(Jul 23), a sling handline removed by others during a trip (Summer D), a water pump in a cave pool shorting out, causing shocks to cavers in the pool (Summer A), a knee dislocated while crawling (June 18), and a chaotic cave baby-sitting trip (June A).

ROCK FALL (7) fell from its previous high position but still included two cases of cavers nearly or temporarily trapped by large shifting rocks (Jan 17, Summer G), two near misses (Jan 3, Sep 24A), minor injury from rockfall down a talus slope (Summer F), a caver hit on the helmet by a rock (Sep 24C), and a bad leg bruise from a rock while ascending (Feb 27).

There were three incidents of being LOST (stranded) (Mar 5, Jun 16) including one involving a pull-down through-trip (Summer B).

EXHAUSTION took a minor toll with one caver having to be evacuated (Sep 13) and one climbing a rope, having trouble with ascenders and becoming inverted (May 2).

Three categories had only one incident - a near miss FLOOD (Jul 17), BAD AIR (Jun B) and a gas EXPLOSION (Oct 8), though the last two were closely related and deserve special consideration in our increasingly polluted environment.

I would like to thank all those who contributed reports and information, and especially Ray Hardcastle for setting aside incident material from his NSS News column work. It helps considerably if grotto newsletter editors would send issues containing safety incidents to me. Thanks to those who already do. This publication belongs to the cavers of the Americas — it is only as good as the material you send in:

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If anyone has any good action caving or rescue slides, I need such for the ACA covers. Send good dupes by the end of September for consideration. For action photographers, this may be your only chance to see your work on the cover of the NSS News! I also appreciate, and try to make appropriate changes, regarding thoughtful criticism. Nothing in the NSS is perfect and if we don't think critically, things will never get better. I feel that someone who believes criticism is nothing but 'negative thinking' is someone with no thoughts to offer, or some vested interest in the status quo.

Criticism of the facts presented in these reports, however, is basically futile — if you have knowledge of an incident and fail to report, you have no right to complain when the report doesn't include your facts.

PREVIOUSLY UNREPORTED

CODE—CAVE NAME	STATE	DATE
Ca—Miller's Cove Cave	Virginia	9-76
Bf—Fisher Cave	Tennessee	2-24-87
Ac—Sotano de San Agustin	Oaxaca, Mexico	3-31-87
Ble—Alabaster Caverns	Oklahoma	7-30-87
De—Starlight Cave	Alaska	9-2-87
Ce—El Capitan Cave	Alaska	9-87

1988 INCIDENTS

CODE—CAVE NAME		
Cc—Puente Natural	Oaxaca, Mexico	January A
Ae—Sistema Huautla	Oaxaca, Mexico	January B
Dr—Sotano de los Planos	Puebla, Mexico	1-3
Bo—Cueva de la Venta	Mexico	1-4
Be—Maple Run Cave	Texas	1-14
Br—Thunderdome Cave	Tennessee	1-17
Be—State Trooper Cave	Kentucky	1-29
Cc—New River Cave	Virginia	2-7
Cr—Nita Ka	Oaxaca, Mexico	2-27
Ac—Scott Hollow Cave	West Virginia	3-6
Ac—Buckner's (Trap Door) Cave	Indiana	3-11
Bl—Porter's Cave	Virginia	3-5
AAc—Cave in Diablo Canyon	New Mexico	3-26
Be—Cueva Cheve	Oaxaca, Mexico	March A
Ce—Cueva Cheve	Oaxaca, Mexico	March B
De—Cueva Cheve	Oaxaca, Mexico	March C
Cc—Lechuguilla Cave	New Mexico	3-28
Ac—Neff's Canyon Cave	Utah	Spring
Ac—Onyx Cave	Arizona	4-2
Be—Ape Cave	Washington	4-5
Ci—Crystal Cave	Utah	April
De—Valhalla Pit	Alabama	4-23
Cex—Rattling Cave	Tennessee	5-2
De—China Pig Hole	Missouri	May
AAe—Cottonwood Cave	New Mexico	6-4
Bo—Reed's Cave	South Dakota	June A
Db—Hick's Cave	Kentucky	June B
Bce—Rubidoux (Indian) Cave	Missouri	6-11
Be—Scott Hollow Cave	West Virginia	6-12
Bl—Cave in Cash Canyon	Tennessee	6-16
Co—Lost Creek Cave	Tennessee	6-18
Bo—Whigpistle Cave	Kentucky	Summer A
Bl—Fossil Mountain Ice Cave	Wyoming	Summer B
Ac—Daniels Cave	Alabama	Summer C
Do—Cass Cave	West Virginia	Summer D
Do—Lady's Descent Cave	Texas	Summer E
Cr—Crystal 67 Cave	California	Summer F
Cr—Unspecified Cave	Arizona	Summer G
De—Grapevine Pit	West Virginia	7-10
AAc—Levi Cave	Tennessee	7-11
Bf—Carcass Cave	New Mexico	7-17
Co—Cave on Steven's Farm	West Virginia	7-23
Be—Lechuguilla Cave	New Mexico	8-8
Be—Hell Below Cave	New Mexico	8-19
Ac—Fort Stanton Cave	New Mexico	9-3
Ac—Ain't Barbwire Cave	Arizona	9-10
Bx—McFail's Cave	New York	9-13
Dr—Crystal 67 Cave	California	9-24 A
AAc—Pig Hole	West Virginia	9-24 B
Dr—Widow Cave	Oklahoma	9-24 C
Bc—Counterfeiter's Cave	Missouri	9-26
Cc—Gage Caverns	New York	10-8
Ca—Hick's Cave	Kentucky	10-8
Do—Deathtrap Cave	California	10-14
Df—Keystone River Cave	Tennessee	11-19
Ace—Hoya de Guaguas	Mexico	11-26
Ace—Indian Grave Point Cave	Tennessee	12-10
Ac—Middle Millerton Lake Cave	California	12-10
Cc—Fisher Ridge System	Kentucky	12-11
Be—Salt Peter Cave	Missouri	12-18 A
Be—Salt Peter Cave	Missouri	12-18 B

DIVING INCIDENTS

AA—Orange Grove Sink	Florida	2-7
AA—Little Dismal Sink	Florida	5-15
D—Orange Grove Sink	Florida	5-28
AA—Blue Springs	Florida	6-11
AA—Arch Spring Cave	Pennsylvania	6-18
AA—Chacalal Cave	Mexico	6-19
AA—Little River Springs	Florida	7-3
AA—Orange Grove Sink	Quebec, Canada	7-19
AA—Ottawa River System	Florida	9-5
AA—Emerald Sink	Florida	12-15

PREVIOUSLY UNREPORTED INCIDENTS

Ca-acetylene explosion — September 1976
Miller's Cave, Virginia

Al Stewart reached the register in Miller's Cave, Roanoke County, Virginia via the climb-down from the balcony of the Ante-Room. The register was a large plastic tube with a screw-on cap. When Stewart opened the register, it exploded in his face. On a prior trip, a caver had found the register book damp and had applied fresh carbide to dry it out. Stewart was wearing glasses and had only his beard singed and the end of his nose blistered. (Al Stewart "A new cave hazard" in **Michiana Caver** Oct. 1976).

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Bf-flood-trapped — February 24, 1987
Fisher Cave, Tennessee

Around noon on Saturday, February 21, four cavers entered Fisher Cave in Cannon County, Tennessee. These were Phil Frates (36), Roger Fleming (36), and Fabienne Staussen (29), from Nashville and Dave Metzger (33) from Philadelphia. The entrance, some three feet by four feet wide, was dry when they entered, but a steady rain began and sumped the entrance and the small passage leading to larger, higher chambers beyond. When the group tried to exit, they discovered their predicament and went to a dry chamber about 400 feet in, to wait for the floor to recede.

When they didn't get home by 7 p.m., friends and relatives called the Sheriff's Office. Their car was found on a road near the cave so a callout of emergency services was initiated. Crews arrived by 9 p.m. Sunday, but could do little.

About 24 hours later, Steve Hudson, an expert cave diver from Huntsville, used scuba gear to dive through the flooded entrance and bring food and clothing in a waterproof container to the four. The group was found to be mildly hypothermic in the 55-60 degree cave, so the food and clothing was well-received.

Tuesday evening the water level had fallen so the group decided to try to go out. At about 10 p.m. emergency workers at the entrance heard their calls and with help from rescuers, the four were out by midnight.

References:

1) Renee Elder and Phil Williams "Nashville Spelunkers Rescued" **Nashville Tennessean**, Feb 24, 1987.

2) Alan Bostich "Stories, game passed trapped cavers' time" **Ibid.**, Feb 25, 1987.

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Ac-caver fall — March 31, 1987
Sotano de San Agustin, Oaxaca, Mexico

On Tuesday, March 31, an American expedition was packing out of Sotano de San Agustin near Huautla, Oaxaca, Mexico. The team had camped at -650 m to do a sump dive that connected San Agustin to Nita Nanta making the combined cave the third deepest in the world.

Dan Broussard (39) and Bill Steele were the last to leave camp. Several hours later, they had reached Camp II at -600 m. Broussard described his feeling then as "worn out." The exit from the cave was being done in more than one trip, so he lightened his pack of several pounds of photo gear, clothing and first aid supplies.

They proceeded up the Fishure with the usual spraying waterfalls on most pitches. It seemed to go well and Broussard, in the lead, was able to move to each rope in turn and continue up after yelling " off rope" to Steele, below.

Broussard reached the top of the Fishure, a shelf above the first waterfall. From the shelf one descends 7 feet to a ledge leading directly to the old Camp I. A short rope with a loop is rigged at the 7-foot pitch to provide a foot hold part way down. Broussard untethered his pack and lowered it to the ledge. He then lowered himself over the edge and placed his foot in the loop; with his weight on the rope, he could no longer get his fingers around it for a handhold. As he began to lose his balance, he apparently lost consciousness and doesn't remember the fall. He did fall, and since his only support was his foot in the loop, he went over backward, his back and head finally hitting the edge of the ledge. His foot then came out of the loop and he fell another 6 feet into the stream above the waterfall.

Broussard regained consciousness, pushing his face out of the water. The pain in his back was so severe he thought it had been broken. After several minutes, he crawled and climbed up to the dry shelf of old Camp I.

Steele arrived and they decided it would be best to continue out. They were at -200 meters. Broussard ate several candy bars and packed a minimum of gear. Six hours later, he reached the Sala Grande entrance chamber. There was still two long rope pitches to do but Broussard was exhausted. He crawled over to the Sand Room and collapsed.

Steele covered the victim with a space blanket and put a belt-generator carbide lamp under it to provide heat. Steele continued out and reached the surface camp house at 2 a.m. Everyone was tired from their trip out, so he returned to Broussard alone, armed with two sleeping bags. Broussard is a diabetic, but had forgot his evening injection of insulin.

The following day two rescuers arrived, but Broussard was able to make it up the last two pitches under his own power in about two hours.

Reference: Don Broussard **Personal Communication** Aug 29, 1989, 5 pgs.

Analysis: X-rays later showed that there had been no broken bones. The pain was due to pulled or strained back muscles. Broussard attributes his fall to carelessness when tired, but an insulin imbalance/low blood sugar may have contributed.

In my own caving, I dislike loops for footholds, and ladders or etriers rigged or used for descent. I think a short rappel is much more controllable. In a 7 foot descent, an arm rappel would have sufficed. Broussard suggests that another loop above the foot loop could have provided a handhold, or he could have used a Jumar.

Broussard's Bell motorcycle helmet was dented and fractured in a 1.5 inch by 2.5 inch area. The chin strap had a chin cup to help keep it in place. He feels that Steele's space blanket and carbide lamp kept him from the clutches of hypothermia.

The real lesson here is that when one is tired, even the simple things become difficult — cavers and their companions should keep this in mind.

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Ble– lost, equipment failure — July 30, 1987
Alabaster Caverns, Oklahoma

On Thursday, Tommy (13) and Travis (10) Meritt were with their parents at Alabaster Caverns State Park in Oklahoma. Shortly after noon they told their mother they were going to play at a natural bridge. Later they encountered a cave entrance. Inside they found a string and, with help from their flashlight, followed it. About 100 feet in, apparently out of sight of the entrance, their flashlight failed; when they tried to follow the string, it broke. At first they were very frightened but started singing songs and calmed down.

Meanwhile they had been missed and the mother had called the Sheriff. Some men were sent out and searched the main caves to no avail.

The lost boys tried moving around but fell in some water and started getting cold. They managed to climb up a bit higher to where it was not wet and there they waited.

More searchers were organized including cavers from the Central Oklahoma Grotto. They boys were found, cold and afraid, a little before midnight.

Reference: AP untitled, **The Dallas Morning News**, August 1, 1987 (in **Texas Caver** June 1988, p. 69).

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De-equipment failure — September 2, 1987
Starlight Cave, Alaska

In August the Allred family was exploring a new cave on Prince of Wales Island off the coast of Alaska. The cave was Starlight Cave and had an entrance pit 100 feet deep. Kevin and Carlene took turns solo caving and

mapping the 2,200 foot cave.

When Carlene's turn came, she completed the mapping chores but had some difficulty exiting the pit. She was very experienced but had been away from vertical caving for seven years. She used a 3-Gibbs rope walker, but free-climbed the first 50 feet, up a slope with logs and brush on it. Above this there was still brush to contend with and it kept dislodging the ascender loop from her right foot.

A knot had to be passed at the 75 foot level and she found that one of the keeper cords of one Gibbs had broken during the slope climb. The part it attached fell away when she removed the ascender from the rope to pass the knot. This landed on a ledge not far below and she was able to retrieve it.

Her chest ascender came off entirely and by itself because the carabiner was not locking.

Reference: Carlene Allred "Starlight Cave and El Capitan Cave Trip Report" **The Alaskan Caver** Vol 8, No. 6 April 1988 p. 3.

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Ce-equipment failure September 1987
El Capitan Cave, Alaska

In August two cavers were visiting El Capitan Cave, a known cave, on Prince of Wales Island at the north end of El Capitan Passage, in Alaska. They took turns visiting the cave and babysitting their three young children.

Carlene Allred was in the cave on her turn and surveyed down a side passage to the large, branched main passage. The cave was phreatic and maze-like. At the end she found a small muddy room with a crawl continuation half-filled with water. She could feel a draft, so she struggled through the barely passable crawl.

It indeed opened up on the other side of the pool, but her carbide lamp started getting dim, even though it had been recharged not long before at the main passage where she had left most of her gear and spare carbide. There were scuff marks on the floor so she expected to find an easier way back to the main passage and proceeded. She wandered about following those marks with ever-diminishing light and finally got lost. At one point she slipped down a muddy wall, "peeling back" a fingernail in the process and had her carbide light go out. She got out her penlight, but this worked in a flickering fashion at best , so she activated her cylume stick — her last source of light. Soon she stumbled across the the survey tape she'd left at the original pool crawl. She proceeded back to her pack and exited.

Reference: Carlene Allred "Starlight Cave and El Capitan Cave Trip Report" **The Alaskan Caver** Vol 8, No 6 April 1988, p. 5.

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1988 INCIDENT REPORTS

Cc-caver fall January
Puente Natural, Oaxaco, Mexico

As part of an expedition, a cave called Puente Natural was being explored for a possible connection to nearby Cueva Cheve. One day five cavers went on a push trip. Just beyond the 100 meter entrance pit, Carol Vesely and Nancy Pistole came to a 5 meter climb-down. This had not been rigged by cavers ahead of them, but they found it difficult enough to need a rope so they rigged one. Later the group ran out of rope and one returned to this drop to bump the rope ahead. This was to be the last push trip so they expected the rope to be replaced by the better climbers of the group on the way out.

This did not happen. On the way out, two exited with the rope and Pistole, in the following group of three, had to free climb the pitch. Part way up a knee dislocated and she fell ten feet into three feet of water. The knee relocated naturally and she was able to get out without further incident. (Carol Vesely **Personal Communication**, March 1989).

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Ae-stove equipment failure January 1988
Sistema Huautla, Oaxaca, Mexico

In late January a sizable crew entered Sotano San Agustin of the Sistema Huautla in Oaxaca, Mexico. They proceeded to the Sala Grande de la Sierra Mazateca for a nine-day camp. This effort was mainly in support of the Huautla Project cave movie.

Bill Steele pumped up a MSR Whisperlite stove to start dinner only to have it explode in a ball of flaming fuel and vapor. Bill was wrapped in flames — amid much shouting and thrashing, his companions rushed to his aid, extinguishing the flames. Steele had suffered painful burns on his back and right hand — the skin "hanging in tatters from his palm."

They applied what first aid they could, including Tylenol III for pain. Accompanied by two cavers, Steele started out.

At the Gorge, just above camp, they found that rain had swelled the stream. At formerly easy swims, they had to cling to the walls to make their way against the current. Halfway up they encountered two late-coming expedition members who fortunately had rerigged some drops to avoid the heavy water flow. Steele and his companions made it to the surface in 11 hours.

References:

1) Jay Arnold "Sistema Huautla, The Movie" **D.C. Speleograph**, April 1988, p. 3-4.

2) Bill Steele **Personal Communication** June 1988.

Analysis: The stove was one using gas and was filled with Mexican unleaded. This stuff (Coleman fuel, white gas, etc.) is very volatile and flammable. This is not a unique occurrence. Even kerosene can be dangerous — a kerosene stove, over pumped and suddenly released, can put out a great rush of flammable vapor.

Steele suffered second and third-degree burns but no permanent damage. The pain was intense — he occasionally screamed in pain on the way out — and it is remarkable that he was able to exit under his own power, up rope drops of 77, 35, 8, 60, 15, 110, and 150 meters plus 17 short rope climbs and a couple of "arduous" face climbs in the Fool's Day Extension. And these riggings were often complex with rebelays, knots, rope pads, and bolts.

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Dr-rockfall January 3, 1988
Sotano de los Planos, Puebla, Mexico

On Sunday, January 3, Louise Hose (35) and Marc Tremblay made a first descent of the Sotano de los Planos, a 220 meter deep surface pit. The upper part of the pit was found to be in a thrust fault with friable walls. They used 9mm rope and put in 13 rebelays on the sloping pit wall. At the bottom was a second drop for which they had no rope. They began to ascend, sketching and measuring the first pit.

Their method was for Tremblay to ascend a rebelay, drop the tape to Hose and the segment would be measured. They would then continue, climbing in tandem with a rebelay in between. After a 72 meter segment, Tremblay passed the rebelay just above him and continued up. Noticing a small, loose rock, he swung to the side to dispose of it — as he did so he grabbed the wall, pulling loose a 1 x 1 x 1.5 meter rock which went crashing down the pit. He yelled "rock" and Hose, at the next lower rebelay, pulled herself as close to the wall as possible. The rock went by one or two meters to one side.

Fearing rope damage, she continued the climb in a delicate manner. They exited without further incident.

Reference: Louise Hose **NSS Incident Report** undated, 2 pp.

Analysis: When using rebelays, speed in ascent is achieved if cavers ascend in tandem, one rebelay apart. It obviously also increases the rockfall hazard.

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Bo-snake entrapment Jan 4,1989
Cueva de la Venta, Mexico

On January 4, three cavers, Cynthia Vann, Ray Hardcastle, and John Pint were scouting for caves and decided to visit La Venta cave, a lava tube with 75 "neatly spaced" entrances, near Tequila volcano. Because it was only a scouting trip, they had only a 6-volt flashlight and a small disposable flashlight, virtually spent. In the longest section of the tube the way was conveniently lit by the many entrances. They came to an unlit section, a canyon only a foot wide at floor level and widening to five feet at shoulder height. They proceeded but the lead person's single light failed to reveal a large dormant snake which the second person stepped on and the third, Hardcastle, had to leap to avoid.

The first two ended up on the downcave side of the enraged, six-foot-long snake which was hissing and striking with an obvious reach of two feet. They soon found the walls too slippery to chimney across, so Hardcastle left the cave and fetched a pole. With this he was able to hold the snake down while the other two scrambled past. Then Hardcastle released the writhing serpent and they all ran for it.

Reference: John Pint "Trapped in La Venta Cave" **Subterranea** No. 1, March 1988 p 4 (Espeleoclub Zotz, Cd. Granja, Jalisco, Mexico).

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Be-equipment failure January 14, 1989
Maple Run Cave, Texas

On Thursday, January 14, Bobby Kline (11), Shawn Richardson (11), Aaron Clemons (10), Brandon Davis (10) and Matt Burdon (10) decided to go caving "to collect stalactites." They all lived in the Maple Run subdivision of Austin, Texas. On skateboards, a bicycle and a scooter, they headed for nearby Maple Run Cave. At 5 p.m., equipped with a single flashlight, they entered. Another boy waited outside, watching the vehicles, giving the others an hour and a half to explore before he went for help. Thirty minutes later, they reached a room about 100 feet from the entrance. The room, about 30 feet long by 15 feet wide and six feet high, was entered through a small hole. They were now lost, the weak flashlight unable to reveal the way out. They huddled together in the cold and prayed.

The boy at the entrance eventually went for help and at 8 p.m. parents called the Travis County Sheriff's Office. Fire Department and emergency services crews responded as did cavers from Austin. Cavers found the boys and brought then to the surface at around 9:10 p.m.

References:

1) John Harris and Berta Delgado "In deep trouble — boys saved from cave adventure" **Austin American-Statesman** Jan 15, 1988 p 1, 11.

2) Ed. "Five Boys Rescued from Cave" from **School Weekly**, in **Subterranean Sun**, Nov 1988, p 6.

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Br-rockfall January 17, 1989
Thunderdome Cave, Tennessee

On January 17, five cavers went to Thunderdome Cave in Tennessee (FE281) to survey the Libby's Hellhole section. They were in two teams, one to survey and one to rig drops. They entered at noon with Mike Doughty and Mike Rogers rigging while Jim Richards, Jack Thomison and Mike Russell surveyed.

The second drop rigged, of 24-foot depth, is in a canyon about five feet wide, narrowing to two and a half feet at the lip where several large, loose boulders were wedged. It was possible to remove all but two of these and the rope was rigged so that it did not rest on the two boulders.

The survey was completed and the cavers headed for the entrance. Doughty and Russell climbed the two drops successfully; Thomison and Rogers climbed the second (24-ft) and Rogers waited there for Richards while Thomison proceeded out.

When Richards got to the lip, the notch where the rope rested gave way, releasing a 75 to 100 pound rock which came to rest on Richards' right leg, painfully pinning him to the wall. He called to Rogers who was some distance away, coiling a rope. Rogers came over, safetied to the rope with a Jumar , and helped Richards lift the rock so that he could free his leg. They proceeded out without further incident.

Reference: Anon. 'Thunderdome Cave Accident Report' undated, 2 pp.

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Be-lost, equipment lack January 29, 1988
State Trooper Cave, Kentucky

On the evening of January 29, two male teenagers from Bowling Green, Kentucky decided to explore State Trooper Cave, located in that town. Dressed in street clothes and without helmets, they entered the stream cave and waded into it for some distance. Finally they turned back and were only 250 feet from the entrance when both of their light sources failed — both candles went out. They felt their way to a rock near a rimstone dam and waited for help.

The following day, four local cavers entered the cave and at about noon, encountered the lost pair and led them out. They had suffered only mild hypothermia but obviously couldn't have lasted much longer. Apparently they had told no one they were going caving.

References:

1) David Bauer "Spelunkers guide lost teens from Trooper Cave" **The Daily News** (Bowling Green, KY) Feb 8, 1988, p. 3.

2) Philip Reeder "The State Trooper Cave Rescue — The Untold Story" **Adventures of the Green River Grotto** No. 15, June 1988, p 15.

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Cc-caver fall February 7, 1988
New River Cave, Virginia

On February 7, cavers going to New River Cave in Virginia encountered a caver who had "taken a fall near the entrance" and had a head injury but proceeded out without real assistance. (Dave Bolter "New River Cave, Tawyny's Cave"**RASS Register** May 1988, p 8.

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Cr-rock fall Febraury 27, 1988
Nita Ka, Oaxaca, Mexico

While exiting Nita Ka from their deepest point of penetration, -525 m, Mason Estes was ascending a rope when a rock fell, striking him on one knee, resulting in a bad bruise. There was swelling and severe pain, so they terminated the survey and exited the cave. (J. Smith, **Personal Communication** March, 1989).

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Ac-caver fall March 6, 1989
Scott Hollow Cave, West Virginia

On Sunday, March 6, three cavers, Bob Addis, Randy Ferrell and Steve Mosberg were exiting Scott Hollow Cave in West Virginia. They had spent some 15 hours exploring and surveying. The entrance pitch is a 10 to 12 foot chimney leading to the bottom of a ladder leading to the surface. The group had apparently got spread out and two reached the surface. The third, Stephen Mosberg (34) reached the top of the chimney but as he reached for the bottom rung of the ladder his foot slipped from the opposite wall and he fell to the bottom of the crevice.

Mosberg suffered a fractured left ankle. He soon determined that it would not support his weight. He also had minor abrasions on his forearms. He called for help but his companions were not within hearing. After three or four minutes, Ferrell returned and soon a rope was rigged to assist Mosberg up the drop.

References:
1) Randy Ferrell "Trip Report: Scott Hollow 3/5/88" **Parkersburg Subterranea Flyer** Vol. 4, No. 4, p 9-11.
2) Stephen Mosberg "NSS Accident Report" 2 pp, undated.

Analysis: Mosberg attributes the accident to carelessness on an easy climb due to fatigue and being overanxious to reach the surface. It is easy to understand why his companions were not immediately available for help, but such separation of a party is not to be commended. If Mosberg's injuries had been worse, quick aid might have been crucial.

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Bl-lost cavers March 5, 1988
Porter's Cave, Virginia

Several Boy Scouts were exploring in Porter's Cave, Alleghany County, Virginia and apparently became confused and unable to find their way out. The local volunteer rescue squad was summoned when the group failed to exit on schedule, but the lost cavers were found and led out before the rescue squad arrived. (Ted Andrus "Porter's Cave - Video Trip" **RASS Register** May 1988).

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Ac-caver fall March 11, 1988
Buckman's (Trap Door) Cave, Indiana

On Friday, March 11, at about 1 p.m. five students and an instructor from Western Michigan University entered Trap Door Cave, near Bloomington, Indiana. The trip was part of a course called "Risk Taking for a Change."

In this course exercise, a person would be given a candle and a general overview of the layout of the cave, including the location of a flashlight, and sent in; the instructor would be in the cave observing.

David Paul (20) entered and was stoop-walking and/or crawling along a wide, muddy ledge next to a twelve foot drop when he lost his footing and fell to the bottom. His left arm was broken so the instructor went for help.

The authorities were notified and a local volunteer fire department member arrived followed by the Bloomington Hospital ambulance service special rescue team. The rescuers were told that the accident site was too small for any additional people so they rigged a haul line at the entrance climb. The instructor, presumably with help from his students, tied a rope around the chest of the victim and dragged him to the entrance climb where he was hauled out and then transported to Bloomington Hospital by the rescue squad. He was treated for a fractured left humerous.

References:
1) Will Ott "Accident Report" undated, 3 pp.
2) Ed. "Caver Hurt" **The Herald-Telephone** Mar 12, 1988.
3) J. Hamblin, **Bloomington Hospital Ambulance Service Run Sheet**, 018921, Run 4508, undated.

Analysis: The accident site was actually spacious and it is not known why the rescue team which had reportedly been NCRC trained and had NCRC members in service was not brought to the accident site. Ott speculates that there was panic on the part of the instructor.

This is not ordinary cave exploration and such "experience" games could surely by played just as effectively and much more safely without involving the fragile and non-renewable cave resource.

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AAc-caver fall March 26, 1988
Cave in Diablo Canyon, New Mexico

On March 26, a large group of hikers were traversing Diablo Canyon, fifteen miles northwest of Santa Fe. At 6:30 p.m. some did a 20 minute rock climb to reach a cave entrance on the canyon wall. At the entrance several headed in. Adam Blum (22) led the way and was apparently going very fast through a crawl when he came to a drop-off and couldn't stop. He fell about 75 feet, suffering severe head injuries.

His companions soon reached him; some began cardiopulmonary resuscitation while others went for help. An hour later, Blum was pronounced dead by paramedics. Rescuers from various departments removed the body late Saturday night.

Reference: Victoria Alba "Santa Fe man dies in rock-climbing accident" **The New Mexican** March 27, 1988.

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Be-equipment failure March, A
Cueva Cheve, Oaxaca, Mexico

As part of an expedition to pursue the exploration of this very deep cave, a group headed in on a photo and survey trip. On the second drop (30 feet) about 1,000 feet into the cave, Carol Vesely was rappelling and about ten feet down when the chin strap from her Joe Brown helmet got caught in her figure-8 descender. She had one spare ascender attached to her seat harness and this was clipped in and the strap released. At that point she was unable to release the Jumar and unable to get her other ascenders out of her pack. A companion lowered her an additional Jumar and sling and she was able to continue.

References:
1) Carol Vesely, **Personal Communication** Mar 1989.
2) Peter Bosted "Mexico" **SFBC Newsletter** May 1988, p 6.

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Ce-equipment failure March, B
Cueva Cheve, Oaxaca, Mexico

On the trip mentioned above, the group continued. At the fifth drop, of 20 feet, Peter Bosted was rappelling and caught his chin strap in his figure-8 descender. He had a "spelean shunt" on his harness in the form of a modified Gibbs ascender. This required two hands to put on the rope and one hand was required to hold the main line — he couldn't tie off the figure-8 with his chin strap caught in it! He did manage to hold the rappel control rope (main line) in his teeth and get the shunt on. He thus got the chin strap free but suffered a chipped tooth in the process.

On a later trip a caver got a TSA caving suit hood caught in a rack and used ascenders to get free.

References:
1) Carol Vesely **Personal Communication** March 1989.
2) Peter Bosted "Mexico" **SFBC Newsletter** May 1988, p 6.

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De-equipment failure March, C
Cueva Cheve, Oaxaca, Mexico

On the above mentioned expedition, Mark Minton was rappelling a drop near the entrance when the locking carabiner holding his rack to his seat harness got sideways so that the stress came on the gate. The gate had already unlocked itself. Suddenly the 'biner broke; Minton had his left hand on the rope above the rack for balance and by reflex, grabbed on. He held on while he whipped a Jumar attached to his seat harness and clipped it to the rope above the rack. (Mark Minton, **Personal Communication** March 1989).

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Cc-caver fall March 28
Lechuguilla Cave, New Mexico

On March 28, a Lechuguilla Cave expedition was in progress. Anne Strait was doing a climb when a foothold unexpectedly broke. The sudden fall,

though short, caused torn cartilage in a knee. She exited under her own power, but was limited in mobility for some time. (Anne Strait, **Personal Communication** April 1989).

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Ac-caver fall — Spring
Neff's Canyon Cave, Utah

A group was descending Neff's Canyon Cave in Utah. At the top of Corkscrew Pit a caver was making an exposed traverse across a mud slope when he was forced to stop to wait for a companion. Two cavers watching this warned him of his precarious position, but he indicated he was fine. A second later, he slipped, sliding uncontrollably down the slope, being arrested by the caver he landed on, who "desperately" grabbed a handline that held him and tangled it in the falling cavers legs, keeping him from going down the pit. Though he did suffer a knee injury, he was able to exit the cave assisted by his companions. ("An Accident and a New Room?" **Underground News**, Vol 15 no. 1, Jan-Aug 1988, p 12).

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Ac-caver fall — April 2
Onyx Cave, Arizona

At the A.R.A./S.W.R. meeting at Onyx Cave in Arizona, a large group of cavers visited the cave and spent a long time exploring. Most had exited. The free climb up to the entrance room was only ten feet, but the first step is very long and had usually been aided by a rock that was now missing. An etrier had been rigged to provide footholds. With Sue Sparrold at the top of the climb and another caver in the entrance room, Anita Pape began the climb. One foot was in an etrier loop a couple of feet off the ground when her hands slipped from their holds on the flowstone and she fell backwards, landing on her shoulders and head. She yelled and Sparrold in turn yelled to the other caver to go and get help; then she climbed down to Pape.

The victim was in pain and a spinal injury was feared. Cavers outside soon responded and the Southern Arizona Rescue Association of Tucson was called. At 8:46 the victim complained of a severe headache and it was discovered that a bandanna tied around her head had been so arranged that her head took the fall on the knot inside her helmet. Shortly after 10 p.m. a C-collar and backboard plus vertical gear arrived and a doctor soon after.

The victim was strapped to the backboard by 10:40 and, with the haul rigging done, she was evacuated, reaching the entrance by 11:50.

References:

1) Sue Sparrold "Watch out for that Impacted Bandanna" **Arizona Caver** June 1988, p 2-3.

2) Ray Keeler "Patient Site Log" **Ibid.** p 5-6.

Analysis: Etriers as climbing aids are very tricky. They are really for use in aid climbing, but end up hung on short pitches as a sort of handline or ladder. No cable ladder or etrier should be used without a belay. There have been numerous accidents similar to that described above.

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Be-equipment failure — April 5
Ape Cave, Washington

On Tuesday, April 5, a group of eight people visited Ape Cave, about ten miles northeast of Cougar, Washington. This lava tube is developed for public visitation with stairs leading down into the cave. The group proceeded along the unitary tube, but Paul Wolfe (18) and Ryan Jones (20) got ahead of the rest. They came to the Skylight, an entrance south of the main upper-end entrance and climbed out. They realized they did't want to do this and re-entered, but the rest of the group had passed by. The two proceeded south, heading back toward their original entrance point but their flashlight batteries died, so they stopped and waited for help about 300 yards from that entrance.

The rest of the group exited and notified authorities. Personnel from the North Country Emergency Services responded and found the missing pair, uninjured, at about 10 p.m. Tuesday. (Ed. "Pair Rescued from Cave After Lights Fail" **Columbian** (Vancouver, WA) April 6, 1988).

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Cl-illness — April 1988
Crystal Cave, Utah

In April, Dale Clark and three companions visited Crystal Cave near Wendover, Utah. The cave has no natural entrance and is entered via a mine tunnel. During the trip a bat and a large rat were encountered and Clark dipped his mini-mag flashlight in the clear pool to demonstrate the pool's existence to the others. They then proceeded in another direction, requiring a climb up a ledge. Clark put the flashlight in his mouth to use both hands on the climb. They continued without further incident.

Two days later, Clark experienced a severe case of diarrhea that persisted for weeks, through numerous tests and prescriptions by doctors. This was finally cured by Bithional, leaving him with a condition called spastic colon, causing pain and diarrea whenever severe stress occurs. The protozoa apparently was ingested either from water via the flashlight-in-the-mouth trick or from rat and bat droppings via the hands to the nose or mouth.

Reference: Dale W. Clark "Lose Weight the Crystal Cave Way" **The Inner Mountain News** 20:4, Nov 1988, p 34-36.

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De-equipment failure — April 23
Valhalla Pit, Alabama

Late in the evening of Saturday, April 23, Roger Ling was ascending 230 foot Valhalla Pit. He switched his light off and climbed in the gloom of faint light from companions below. About 170 feet up he took a step with his left leg — there was a "pop" and the leg suddenly supported no weight. He crouched on his right leg wondering, then fearing what had happened. Obviously, the webbing of part of his system (a Mitchell rig — two Jumars and a box) had failed. If one piece failed, could the rest be far behind?

He switched on his electric and observed that the webbing had worn completely through where it was tied to the foot loop. He re-tied the broken end and continued, without further incident.

He realized he had failed to inspect his gear for the past two years and the one-inch webbing had gradually worn against the two-inch webbing of the foot loops. He was not in real danger since both Jumars were safetied to his seat harness, but if the other had failed as well, he would have been left hanging. Remember that webbing is woven and loses all of its strength through surface abrasion and should be replaced regularly.

Reference: Roger Ling "Living Dangerously" **Speleonews** June, 1988, p 50-51.

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Cex-fatigue, equipment failure — May 2
Rattling Cave, Tennessee

On May 2, Two cavers visited Rattling Cave in Cooke County, Tennessee. The cave has a 130 foot entrance pit with a mile of passage leading from the bottom. The pit was rigged so that the first ten feet was against the wall, the rest free, using two one-half inch ropes.

This was the third trip for one caver, the seventh for the other. They usually ascended using a "frog" (a seat ascender and an upper ascender with a long sling to both feet), but were using a Mitchell or Rope Walker this trip — they had one set of vertical gear between them.

After two hours of exploring, they returned to the entrance pit and one started up. Twelve feet up he complained of fatigue but continued. He got 110 feet up and complained that he was too fatigued to continue. At this point, the vertical gear jammed. The climber voiced the opinion that he could free it if he removed his chest harness. Against advice from the caver below, he unclipped. Apparently the ascenders were not safetied to his seat

harness — he lost his grip on the rope and inverted, still held to the rope by the slings to his feet. His helmet saved him from head injury during the pendulum of inversion.

The climber attempted to right himself but could not. During this, without warning, he dropped his helmet, light, battery and pack, nearly hitting the caver below. They exchanged words about this. After 35 minutes of hanging upside-down, the climber "verbalized his last will and testament" and prepared to die.

His companion below, in desperation, tied the rope to himself and got into the low passage leading from the bottom. With great effort, and some pulled muscles, he was able to force his way along, with his feet on the ceiling of the passage, thus pulling the climber above fifteen feet sideways, to a small ledge.

The climber was then able to right himself and secure himself to the rope while he sent down the vertical gear. The man below ascended and was able to rig a 4 to 1, Z-type mechanical advantage and lift his exhausted companion to safety.

Reference: Jeff Cooper "Incident: Heel Hang" undated, 2 pp.

Analysis: Cooper, an EMT and NCRC Newsletter Medical Editor, reports that unconsciousness can result from five to ten minutes of hanging upside-down. He strongly recommends not caving with only one companion, and not sharing equipment. One set of vertical gear is really a poor idea.

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De-equipment failure May
China Pig Hole Cave, Missouri

Laura Jones Guyer was rappelling in China Pig Hole in Missouri when the nut came off her rack. When she got to the bottom, the release of tension allowed the bars to simply fall off. Racks should always be set up with the bars on the closed side of the rack. If the bars are specially made and will not fit around the curve, get bars that will. (Deb DuMont "Rack Safety" **Meramec Caver** July 1988; Laura Guyer **NSS Incident Report** May, 1989, 1 p).

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AAe-equipment failure June 4
Cottonwood Cave, New Mexico

On Saturday, June 4, four cavers entered Cottonwood Cave in the Guadalupe Mountains of southern New Mexico. It was evening when the group attempted a climb into a side lead, about 30 feet up the wall of the main passage. They erected a "homemade" scaling pole, apparently with a rope attached. Kenneth C. Hanson (38) then climbed to the top, apparently with ascenders. The pole then collapsed; Hanson fell, suffering fatal head injuries. He reportedly was killed instantly.

References:

1) Chris Vaughn "La Luz Man Dies During Cave Outing" **Current-Argus** (Carlsbad, NM) June 6, 1988.

2) Larry Sansom "Report of Incident" U.S. Forest Service, Lincoln NF, Guadalupe R.D., Carlsbad, NM, June 7, 1988, 1 p.

3) Ed. "Obituary" **Southwestern Cavers** May-June 1988, p 36.

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Bo-other June, A
Reed's Cave, South Dakota

As one of many functions at the 1988 NSS Convention at Hot Springs, South Dakota, there was a scheduled children's cave trip to Reed's Cave. In the cave two adults took nine or ten kids of age 7 to 12 in one group, while another two or three adults followed with a group of younger children (age 4 to 6). Both groups came in the entrance culvert and down a "slippery gravel slope" into a second room. A separate party of cavers was exiting the cave at this time and described the children's tour as "disorganized," "an accident waiting to happen" and "a couple of adults loosely surrounded by a multitude of kids, with more coming ... every minute."

Apparently several of the kids had non-functioning lights, one was apparently deaf, some helmets fit poorly and one child was obviously terrified. Two had to be physically restrained by the separate cavers from "running around in the cave." Apparently no injuries resulted form this trip.

References:

1) Bruce Hagen "Letters to the Editor" **Devil's Advocate** Vol 21, No 8, p 63.

2) Vanessa Rennewitz "Editor's Thoughts" **Ibid.** No 7, p 54.

Analysis: Caves are not a playground. Children represent novices of the most extreme sort — not only do they not know the hazards of the underground, they do not have the reason, wisdom and emotional stability to properly judge situations as adults supposedly do. Having adult novices in a majority may be manageable, but children should be introduced to caving in a carefully controlled, highly supervised fashion. There seem to be three measures of irresponsibility here — the NSS, which sponsored it, the adults who led it, and the parents who allowed their children to participate.

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Db-bad air June, B
Hicks Cave (Hidden River Complex), Kentucky

(Note: This incident is continued in the incident of October 8).

Hicks Cave is a twenty mile long system of essentially horizontal passage that resurges on the Green River upstream from Mammoth Cave National Park and extends into the sinkhole plain south of the river for several miles.

The J survey is located far from the Green River entrances. Normally a stream rises around Station J278 and flows along, dumping into an 8 by 7 foot deep slump pit (in the mud floor) at J247. From 1976 through 1987, about 15 survey parties passed by and observed a two foot plus deep pool at the bottom of that slump pit, and no apparent continuation.

A survey party passed by on Memorial Day weekend, 1988 and noticed that the floor was dry. A drought that Spring (that continued on into the Summer) had produced low water levels in all caves in the area.

In early June, Phil O'Dell led a team to investigate the J247 pit for a possible continuation. O'Dell found the climb down to be easy and, beneath overhanging flowstone, there was a 3 foot high by 1 to 2 foot wide lead. But within seconds of reaching the bottom of the pit, his carbide lamp flame turned bright yellow and extended to about 6 to 8 inches in length — the base of the flame began about 2 inches from the orifice. In less than a minute he became dizzy, noticed shortness of breath and started suffering a lack of coordination, "bouncing off the passage walls."

O'Dell realized it was bad air and quickly climbed back up to the J survey passage where the air was good. After several minutes his breathing returned to normal. Meanwhile, a companion placed a candle on the floor of the sump pit — it was extinguished in 15 seconds.

Reference: Tom Ahlers "NSS Accident Report" October 11, 1988, 7 pgs.

Analysis: After doing some library research and talking with State of Kentucky mining and water experts, it was concluded that the slump pit air was high in carbon dioxide and low in oxygen. That summer the pit became a stop on survey trips to demonstrate the bad air.

It was hypothesized that this represented a link with Hidden River, of Hidden River Cave in Horse Cave City, the terribly polluted cave stream that seemed to be linked to the rising at Disappointment Lake in Hicks Cave, but that mainly rises at several springs in the Green River, three to five miles northwest of the J247 slump pit.

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Bce-equipment failure, caver fall June 11
Roubidoux (Indian) Cave, Missouri

At about 9 a.m. on June 11, Clinton Hooks (27), Erick Olson (22), Daron

Walters (20) and Timothy Butler (20) entered Roubidoux Cave near Waynesville, Missouri. Olson and Walters were novices and carried flashlights as their main light source. Hooks and Butler wore electric headlamps. Only Hooks wore a helmet. They brought no food, water, extra lights, ropes, or vertical gear. They intended to go the 1,500 feet to the back of the cave and return.

Toward the end of the cave they encountered a 40 foot pit and Butler was determined to explore it. He could not be talked out of it. They had found a muddy manila rope nearby and Butler began to descend, hand-over-hand.

At about 12:30 p.m., Butler was about ten feet down when he lost his grip and "slid or fell" the 30 feet to the bottom. He was not seriously injured, but could not climb up. They tried to haul him out using the rope, but could not. An attempt to fix the rope into a ladder also failed. At about 3:30 p.m. Hooks told the others to stay there and went for help.

Hooks re-entered the cave at about 6:40 p.m. with a policeman and a fireman. They attempted to haul the victim up, but failed. Hooks joined the wait at the top of the pit while the fireman and policeman went for more help.

At 12:05 a.m. Bob Gitchell, a local caver with NCRC training, was contacted; he arrived at the cave at about 1:45 a.m. with five other cavers.

Those now at the scene had no knowledge of the cave or the location of the victim. The original policeman and fireman were no longer there and the only cave map on hand was dated 1962.

At 2:30 a.m. two soldiers from nearby Fort Leonard Wood arrived and one had assisted on a prior rescue involving the same pit. They organized a team and went in the cave at 2:55 a.m., with two staying at the entrance for the arrival of further personnel.

The rescuers had 400 feet of rope, vertical gear, three rescue pulleys, heat packs, SKED litter and other gear. At about 5:30 they reached the pit. The victim was given food and water and heat packs were applied. A seat harness was lowered to him and a haul system was set up. With a belay applied, Butler was hauled up at 7 a.m., and he and Hooks were able to exit under their own power by 10 a.m.

Reference: Robert Gitchell "Incident Report" **Ozark Speleograph** July, 1988, p 2-3.

Analysis: I guess the lesson here is that one shouldn't leave old rope lying about in caves.

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Be-equipment failure June 12
Scott Hollow Cave, West Virginia

At about 10:30 on Sunday, June 12, three cavers entered Scott Hollow Cave in West Virginia. These were Cheryl Kenez, Greg Springer, and Jay Stevens, on a mission to haul gear for the Saturday dive at the Second Sump. They would carry food in and diving gear out.

At the climbs leading to the Mystic River they met the three divers on their way out. Shortly before noon they arrived at the First Sump and had a brief meal. They then began the 30-foot cable ladder climb into the bypass. Stevens did the climb using a Gibbs shunt to a fixed rope for a belay. Kenez was the next to go up but found it impossible to climb over the lip of an overhang 20 feet above the floor. She decided to switch to a rappel, go down, and use ascenders to climb the belay rope. She attached her rack and started to rappel. At that point one of her feet slipped from a rung through the rungs and then caught on two rungs so that she was left hanging by one foot, upside down.

Springer was right below and heard the fall. He soon had two Jumars with slings out and Kenez was able to attach herself to the belay rope with these. The slings were too long, however, to enable her to ascend into an upright position.

They communicated with Stevens at the top and he lowered a second rope that had been left coiled at the top. The victim's ankle had begun to hurt severely. Stevens rappelled to Kenez and forced her foot free of the ladder, returning her to an upright position. She was able to climb down and had suffered only a bruise and a sore ankle.

Reference: Greg Springer "Incident at Scott Hollow" **Greenbrier Grotto News** Vol 6, no 4, Aug 1988, p 19.

Analysis: Kenez had been attached to the standing line by a Gibbs to her seat harness and had clipped her rack to the same 'biner. After she fell, the Gibbs and rack were still attached to the line. Either the 'biner had not been locked, or it was open just as her foot slipped, allowing the rack and ascender sling to escape. The foot behind the ladder slipped through and held her. That is, she was climbing alternating feet — one in the ladder form the front, the next from the back. It is speculated by Springer that if she had been climbing only on the front of the ladder, she would have fallen to the floor. It is unclear, however, if the foot slipped on the ladder causing the fall or if the lack of attachment to her rappel setup caused the foot to slip...

Kenez was praised for her "incredible calm" throughout the incident.

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Bl-lost caver June 16
Cave on Cash Canyon Road, Tennessee

On Thursday, June 16, Craig Lee (23) entered a cave in the 2100 block of Cash Canyon Road in the Tiftonia area. He explored for a while but became lost while "looking for another way out." Apparently friends were nearby — about two hours after Lee entered, the Hamilton County Rescue Squad was called. About twenty squad members, including a team of cavers responded and found Lee at about 11:30, uninjured.

Reference: Ed. "Man lost in cave found unharmed" **The Chattanooga Times** June 17, 1988.

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Co-crawl injury June 18
Lost Creek Cave, Tennessee

On the Saturday morning of June 18, Richard O'Hara (24) and Robert McDaniel were exploring in Lost Creek Cave in Tennessee. This was the weekend of the S.E.R.A. Carnival. They proceeded downstream from the Waterfall to where the borehole passage ended in breakdown. They looked for a way on and found a crawl. O'Hara was forcing this breakdown crawl when he suddenly felt pain in one knee. He retreated and found that in a kneeling position he could put no pressure on it. The knee hurt progressively worse, the more he used it, but he made the entrance under his own power. A bit later there was a loud "pop" from the knee and the pain instantly lessened.

Reference: Richard O'Hara **NSS Accident Report** undated.

Analysis: Apparently the knee was dislocated or hyperextended. Keep this in mind — one can break bones, dislocate joints, as well as become irreversibly stuck, when forcing crawls.

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Bo-electric shock Summer A
Whigpistle Cave, Kentucky

On the Saturday morning of the Kentucky Speleofest, five cavers arrived at the entrance of Whigpistle Cave, near Mammoth Cave National Park in Kentucky. The trip was one of the scheduled field trips of the Speleofest.

The cavers had been warned that the landowner has a pump in the pool just inside the low entrance and that one should not touch the wires or be in the pool when the pump comes on.

They donned wetsuits and two entered, traversing the pump pool. They reported "tingling sensations" to those still outside. The leader of the group, Geary Shindel, went to the owner's house to cut the power. This was done but the owner was not home so there was no guarantee that the power would not be turned on after they had entered. One of the two inside came back out before the power was off and got "shocked" in the process but apparently was not injured. They abandoned the trip.

Reference: Shari Lydy "Speleofest 88" **Birmingham Grotto Newsletter** June 1988, p 3.

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Bl-lost cavers Summer B
Fossil Mountain Ice Cave/Wind Cave System, Wyoming

Late on a Monday afternoon, Scott Smith (18) and Tom Brighten (19) of Rexburg, Idaho entered Wind Cave in Teton County, Wyoming. They intended to traverse from Wind Cave to the higher Ice Cave entrance to the system. This is the opposite of what is usually done since there are several significant vertical drops that would have to be already rigged for this to be possible. This had not been done.

Past the first tight crawl in Wind Cave is what is normally an up-climb which is usually rigged on a preliminary trip when one is planning a thru-trip. To Smith and Brighten it was a rappel and they executed this and pulled their rope down after them. They were thus trapped.

They had spoken vaguely of going to the caves so when they failed to return that night, friends called the Sheriff's Office. Three men were dispatched to the cave and entered at 6:30 p.m. They found the lost pair four hours later. They were suffering from mild hypothermia but were able to exit under their own power.

Reference: Ed. "Two teens safe after cold night" Newsclipping, undated, unspecified.

Analysis: It must be supposed that the pair had heard that one could do a thru-trip in the caves and believed the proper direction was Wind Cave to Fossil Mountain Ice Cave. They are lucky their absence was reported promptly and that their destination was known, for the temperature of this breezy cave is just above freezing.

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Ac-caver fall Summer C, 1988
Daniels Cave, Alabama

Nathan Curry (12) was injured when he fell "about 25 feet from a ledge" in the entrance of Daniels Cave, Cherokee County, Alabama. He was evacuated by the Cherokee County Rescue Squad. (**The Alabama Rescuer** Vol. 23, no 3 July August-Sept 1988)

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Do-equipment stolen Summer D
Cass Cave, West Virginia

A group of cavers was in Cass Cave in West Virginia, and used a 40-foot piece of orange nylon webbing for a handline on the climb up to the Belay Loft. When they exited the cave, they found the webbing to be missing. It had been taken by cavers of another group. The cavers who had placed the webbing were able to exit safely since they had additional webbing. (**Dead Dog Dispatch** Vol. 3, no 10, October, 1988).

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Do-snake Summer E
Lady's Descent Cave, Texas

Three cavers were touring Lady's Descent Cave in Texas and were about 200 feet from the end of this 1,100 foot cave when they encountered a five foot long snake with "brown squares on a silvery-looking body." They didn't get close enough to see if it had rattles. It is likely that the snake was non-poisonous but it is interesting that it was so far into a cave. (**The Maverick Bull** Vol 3 No 9 September 1988, p 8; Sue Bozeman **Personal Communication** June 14, 1989).

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Cr-rockfall Summer F
Crystal 67 Cave, California

A group of eleven cavers was in Crystal 67, a cave in the western slope of the Sierras. They reached the Mountain Room in the bottom section of the cave and spread out, exploring. One group was near the top of the long rubble slope at one side of the room when one of them dislodged a relatively small rock or two. There followed a minor chain reaction and larger rocks become involved, tumbling down the steep slope. They yelled "rock" and cavers below scrambled for cover. One got under an overhang; a second lost his footing and went over a short ledge knocking out his light and getting a bruised shin. A third was hit in the back of the hard hat by a rock and knocked down slope. He suffered a sprained ankle and a bruised head. The rocks continued to the bottom but fortunately did not reach the pit there where two other cavers were. All were able to exit without assistance but the victim with the sprained ankle had difficulty on flat ground.

Reference: Steve Ruble "Rock!"**SFBC Newsletter** Aug 1988, p 5.

Analysis: Cavers generally know that they shouldn't climb above someone or conversely not walk below someone climbing. But in a large group like this there needs to be some leadership so that the priority of being first above or first below is established..

The caver with the head injury was wearing a "construction-type" helmet; the rock actually penetrated the plastic shell, but only slightly, administering only a bruise to the head.

Remember that a British caver would yell "below!"to which an American caver would look up and reply "What?"

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Cr-rockfall Summer G
Unspecified Cave, Arizona

On a photo trip, a three foot rock shifted in the "Entombment Maze," momentarily trapping J. R. Guthrie by pinning his thigh to the wall. He was able to scramble out before the rock stabilized, suffering only a large bruise. (J. R. Guthrie **Arizona Caver** October 1988).

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De-equipment failure July 10, 1988
Grapevine Pit, West Virginia

A group of cavers was doing the 120 foot drop of Grapevine Pit. Al Stubbe got his shirt eaten by his rappel rack but was able to free it and continue. (Sonja Ostrander and George Dasher "WVACS Activities report"**The West Virginia Caver** Vol 5, No 5, Oct 1988, p 17).

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AAc-caver fall July 11, 1988
Levi Cave, Tennessee

On Monday, July 11, a group of 34 youths from the Open Bible Center of Kankakee, Illinois were on a trip to Florida. Shortly before noon the group was at Falling Water Falls on Walden's Ridge in Chattanooga, Tennessee. Half the group visited Levi Cave at that location, while the rest went to a nearby shopping mall. Not far inside the cave, apparently Mary Beth Gremar (17) was being helped at a difficult place when she slipped and fell into a 20 foot pit.

At about noon this was reported to the Sheriff's Office and personnel from the Chattanooga-Hamilton County Rescue Squad and Dallas Bay Volunteer Fire Department responded. They performed "lifesaving measures" but to no avail and the victim was pronounced dead of head and abdominal injuries at the accident site.

The rescuers reported slick and treacherous conditions in the cave and two rescuers were treated for minor injuries.

Reference: Beverly Carroll "Illinois teen dies in fall during Walden's Ridge

cave expedition" **The Chattanooga Times** July 12, 1988. Two versions, same date.

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Bf-flood July 17, 1988
Carcass Cave, New Mexico

Late in the morning of July 17 a group of four cavers entered Carcass Cave in De Baca County, New Mexico. They surveyed a bit, to a breakdown maze, and decided to tour the larger parts of the cave. In the main passage they met another group heading out. One of these cavers joined the group of four.

Two of the cavers had been in the cave before, but it is confusing, with several loops going to three separate pits at different levels.

The group reached the bottom of Odd Wizard Pit and were discussing the course to take from there. One went off scouting and returned ten minutes later having encountered the sudden sound of rushing water and a strong sulfur smell. The group went and verified this and realized the cave was flooding. Two went back to the pit while the others investigated further. The sound of water was soon very apparent coming from passages above them. There were low, usually muddy crawls between them and the entrance — the group soon reassembled and headed out, in a hurry.

At the first pit they came to, they could look up and see "a substantial amount" of water coming out of the passage they had entered by. An alternate route was suggested and they sped on their way. They proceeded up through breakdown to the top of the pit. They continued out, encountering no more obstacles except a large pool just inside the entrance. There had been a fifteen minute cloudburst outside.

Reference: John Stephenson "Carcass Cave, GYPKAP" **Southwestern Cavers** Sept-Oct 1988, Vol 26 No 5, p 54.

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Co-eye injury July 23, 1988
Cave on Stevens' Farm, West Virginia

Greg Springer went to the farm of Jerry and Elaine Stevens near Union, West Virginia on the weekend of July 23, arriving at 10 a.m. He intended to dig at an entrance but was delayed by a six hour rainstorm. Finally, at 4 p.m. he began to dig, directly above the drain of a large sink. He had previously felt cold air coming from a hole above a boulder in this sink.

His pick immediately hit trash. He soon had made a hole several feet in diameter and four feet deep walled by trash on three sides and the boulder on the fourth. There then appeared two one foot high drains on either side of the boulder. As he stooped to pull out a large rock in the middle, he inadvertently pushed his head onto a piece of fence wire sticking out of the side of the hole. The wire gouged his right eye.

He thought relatively little of this at first, but the following day he awoke to find his right eye blind. One doctor said it was all right and put a bandage over it but a second opinion revealed that he had lost an area of the cornea "nearly as large as a contact lens." He passed out in the second doctor's office and the injury caused him to miss a week of work, but he has recovered 20/20 vision in the eye.

Reference: Greg Springer "Hey, Buddy, Can you Spare an Eye?" **The West Virginia Caver** Vol. 6, no 5, Oct 1988, p 18.

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Be-equipment failure August 8, 1988
Lechuguilla Cave, New Mexico

On an August expedition to Lechuguilla Cave in New Mexico, a caver was ascending a 30 foot pit with a rope-walker system when his chest harness failed and he went upside-down, hanging from his knee and foot Gibbs ascenders. He apparently was aided by his companions. (Bali Ballmann **Personal Communication** September 1988).

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Be-equipment failure August 19, 1988
Hell Below Cave, New Mexico

On August 19, two cavers visited Hell Below Cave in the Guadalupe Mountains of New Mexico. David Locklear was ascending the 60 foot pit; he was using a Mitchell system with prussik knots instead of Jumars and had no safety ties from the knots to his seat harness. He furthermore had no additional knot or ascender ready. Thirty feet up the webbing slipped out of the buckle of his chest harness — it had been threaded wrong.

When the harness failed, he managed to grab the rope and remain upright, and yelled to his companion below. The companion came up as quickly as possible and Locklear made another prussik knot with a spare sling with one hand while holding himself upright with the other.

With the additional prussik on the rope and safetied to his seat harness, he was able to rest, upright.

There was a small ledge below Locklear and his partner sat on this, gave Locklear one of his three ascenders, and helped him piece his chest harness back together. Locklear then ascended and lowered the borrowed ascender. They left without further incident.

Reference: David Locklear "Partner Rescue in Hell Below Cave" **Habla la Abuela del Oztotl** Vol 6, No. 9, Sep 1988, p 9.

Analysis: If one wants to use knots instead of mechanical ascenders, one can still, and should, safety them off to the seat harness. Locklear says he should have had a third ascender already attached to his seat harness and a light source other than just a flashlight ... then self-rescue might have been possible.

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Ac-caver fall September 3, 1988
Fort Stanton Cave, New Mexico

At about noon on Saturday, September 3, four cavers visited Fort Stanton Cave in New Mexico. These were David Irving, Linda Starr, Karen Dennis, and Lester Sharpton. They intended to do an inventory of a section of the cave for the B.L.M.

At about 6 p.m. they had competed their work and were heading out, walking in large, open stream passage. Karen Dennis (41) slipped on a muddy slope, did the "splits" and slid a ways, suffering a knee injury.

They determined that no bones were broken so the knee was braced by binding it with webbing and she was helped out of the cave by her companions. It was later found that she had suffered a "torn medial colateral ligament."

Reference: Karen Dennis "NSS Accident Report" undated, 2 pg.

Analysis: Karen Dennis gives two contributing factors. She was wearing old boots with no tread left and in fact had noticed traction problems on the way in. Furthermore, when their lights grew dim on the way out, they didn't stop to recarbide, but hurried on in hopes of claiming a free meal from the B.L.M. Thus the pace was that of the better cavers.

Indeed, cavers often hurry from a cave, for a variety of reasons and this is usually the time that Darwin smiles — the fit survive and those with light problems and slick boots become extinct.

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Ac-caver fall September 10, 1988
Ain't Barbwire Cave, Arizona

At about noon on Saturday, September 10, two teams of cavers entered Ain't Barbwire Cave in Arizona. A team of three started surveying in the upper level near the entrance while Bob Pape and Bruce Thompson went to the lower level stream passage, also to survey.

The second team finished their work and were exiting the cave. At about 5:30 p.m., about ten minutes from the entrance, Bob Pape was near the top

of the 10 ft climb to the upper level when he apparently lost his holds and fell. He felt it coming and called to Thompson, but by the time he turned around, Pape had fallen. Apparently a foothold gave way, or was too slippery, for the victim landed on his feet but had suffered a dislocated right shoulder. He landed in a shallow pool but was able to move to the far side; Thompson quickly down-climbed and checked Pape's condition.

The right arm exhibited great pain and had to be supported to move. He determined that the collar bone and humerous were not broken and that the shoulder "had not dislocated ventrally since his upper right chest was not in pain and there was no evidence of the shoulder joint in his upper right chest."

After resting a few minutes, Pape tried the climb again but couldn't manage it with only one arm. Thompson exited and reached the others at the cars at 6 p.m.

One caver returned to the victim while the rest re-suited for the cave and got out gear for hauling. The cave is 47 degrees and the victim was beginning to shiver when the group arrived at the climb. They decided to have him climb out rather than haul him up and he managed to do this with a belay, using his left arm and with one caver maintaining his footholds. Thus his left arm supported him on the left wall and his feet were on the right wall, moving from hold to hold, kept in place by a fellow caver.

At the entrance the passage is steep and tight and Pape was helped through by one caver pulling on his left arm from above and another caver bracing his feet below. They were out by 7 p.m.

References:

1) Bruce Thompson "Accident Report" **Arizona Caver** Oct 1988, p 3.
2) Bob Pape **Personal Communication** Dec 26, 1988, 4 pgs.

Analysis: Pape had suffered an anteriorly dislocated shoulder (dislocated in front of the shoulder blade). The climb where he had fallen is described as being less than ten feet, overhung, but with good hand holds to where you can "canyon-walk" or bridge the passage on two ledges, then make the move to the upper level floor. Thompson states that it probably should be belayed in the future.

One has to observe that Pape was not injured by the fall, but rather by his reflex holding of handholds when his footing was lost. Thus it is difficult, in my view, to find fault with procedure. Short climbs will usually be done without belay for if you can fall under control, landing on the feet, there is low probability of serious injury. Perhaps Pape made the analysis most to the point: "Shit happens."

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Bx-exhaustion September 13, 1988
McFalls Cave, New York

On Tuesday, September 13, at 12:15 p.m. six cavers entered McFails Cave in Cobleskill, New York. These were Mark Gottlieb, Roger Moore, Mike Cook, Dave Brewer (25), Tom Gangi and Gary Dawson. For Brewer and Gangi it was the first trip into McFails.

The entrance drop of 67 feet was rigged with a rope. There was just enough water showering down to make communication difficult. The second drop (13 feet) was also roped and the third (8 feet) rigged with an etrier.

They proceeded to the first breakdown room and took photos. Brewer complained of fatigue so they cut short the rest of the trip and headed out. Brewer needed some assistance at the third drop. He was able to get up the second with his two-Jumar Texas rig but the climb took a long time and he was obviously very tired afterwards. His companions could imagine that he would have great difficulty with the entrance drop.

They arrived at the entrance pit at 3 p.m. Three went on up and one was to rig a short rope so that he could descend and help Brewer over the lip at the top. Brewer started up but only got ten feet off the floor. He was told to climb down and did so, taking 15 exhausting minutes. His companions removed him from the rope"semi-conscious."

Roger Moore, one of those already up, descended and fitted the victim with his rope walker, but after some discussion it was decided that Brewer should not attempt the climb again, for fear that he would become exhausted part way up and be more of a problem than he already was.

Two cavers were left with the victim — carbide lamps, candles and a space blanket were already there and dry clothes, food and garbage bags were sent down the pit. The rest went for help. At 4:45 p.m., Emily Davis Mobley was called and began an alert among Helderburg-Hudson Grotto members.

The two cavers with the victim were relieved and rescuers from HHG began to arrive. At 7:20 p.m. Mobley descended and it was decided that Brewer would attempt to climb out with the ropewalker rig. A second rope was rigged and Mobley climbed beside the victim, coaching him. He was able to exit under his own power.

Reference: Mark Gottlieb "Rescue at McFails Cave" Sep 30, 1988, 4 pgs.

Analysis: This was Brewer's first real vertical cave and first wetsuit trip, and he was reportedly "overweight." The Texas rig he used is more strenuous to use on free drops than Mitchell or ropewalker but was reportedly commonly used on the McFails entrance drop. Gottlieb was trip leader and takes responsibility for including Brewer who obviously was "not ready for the trip."

I would add that it takes time, that is, experience to adjust to the use of a wetsuit in a cave. One tends to overheat easily and perspire a lot at first but apparently the body adjusts after some trips. Also, body movements are not the same in a wetsuit and at first one tends to "fight" the suit, wasting energy. It helps to thin or eliminate the wetsuit material inside the elbows and behind the knees — this is where the material bunches up and hinders movement.

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Dr-rock fall September 24A
Crystal 67, Cave, California

On Saturday, September 24, four cavers were in Crystal 67, a cave in the western Sierra Nevada Mountains of California. Progress was made in a dig near the bottom of Canopy Pit. On the way out, two went up the 50 foot pit and their equipment was passed up the rope. The expected small rocks fell during this operation, but suddenly there was a "wall-shaking" series of crashes and the cry of "Rock!" Brandall Suyenobu and Mike Lyvers dove for cover in the narrow twisting stream passage and escaped being struck.

Reference: Mike Lyvers "Cave Hunt in Crystal 67" **The Explorer** Dec 1988, p 147.

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AAc-caver fall September 24 B
Pig Hole Cave, West Virginia

On Saturday, September 24, two students from Virginia Tech, Jeff Snyder and Rex Linville decided to go caving. They had attended a few VPI Cave Club meetings but were not members. Still, both were experienced cavers.

At Pig Hole Cave in Giles County, they signed the entrance register and at 10:30 a.m. they entered the Back Entrance. Neither had been in the cave before, but reportedly had experience in other caves. Jackie Redder Hoell, the faculty advisor to the Cave Club, was reported as saying: "They weren't what we call 'nerd cavers' — they were people who knew what they were doing..." They had MSA helmets with chinstraps and used carbide lamps and both had fanny packs with extra light sources. Snyder wore tennis shoes while Linville had lugsole boots.

By noon they arrived at the Mud Bridge; they were unaware of the extent of the pits in this area. One dropoff was right before them and Snyder decided to see if he could climb down. This was the 60 foot drop into Hess's Hollow. They could see a ledge below and Snyder began climbing down toward this. When he was at eye-level to his starting point, he suddenly fell. Linville yelled to Snyder and could hear him moaning below. He went for help.

At 12:30 p.m. he left the cave and contacted the landowner who called Giles County dispatch and in turn Giles County Rescue Squad. The VPI Cave Club was also called via the VPI police. Linville could not describe the area where the fall had taken place and was instructed to go back and wait at the top of the pit.

Giles County and Newport Fire Department arrived first and sent a team of two into the cave. Cavers arrived and two rappelled the top entrance and proceeded to the Mud Bridge, arriving at 1:45 p.m. Four more arrived at 2 p.m. A rope was rigged into Hess's Hollow and two descended. One, an EMT, took vital signs — there was no pulse and no respiration, pupils fixed and dilated. The body was cool to the touch, but warmer than the cave.

Hauling systems and personnel were organized and the body was evacuated, reaching the entrance at 8:30 p.m.

References:

1) Ken Gellman "Caver's fatal slip called tragic accident" **The Roanoke Times & World News.**

2) Jackie Redder Hoell "Tragedy in Pig Hole" **Tech Troglodite** (VPI Cave Club) Fall, 1988, p 7-9.

Analysis: Some less obvious points bear repeating from Hoell's report. The helmet came off in the fall and was found eight to ten feet from the victim. The chin strap had come unhooked on the right side. The cause of death was given as a "major depressed skull fracture in the left posterior area, about two fingers wide, four to six inches long." A better helmet might have kept him alive. The victim also suffered fractures/dislocations of his left femur/hip and the lower bones in his left leg, as well as other head injuries.

As Hoell says in her Tech Troglodyte report, "Jeff was doing a climb without a belay in a cave he had never been in before." Unfortunately the **Times** article quotes her as saying: "Because they didn't know the cave, they didn't know there was a pit — I would call this a pure and simple accident. They did everything by the book, everything they were supposed to do. It was just one of those tragic things."

Obviously, this analysis is vastly different from the one for the NSS. Why are non-NSS cavers told, via the newspaper, that tennis shoes and climbing without a belay are OK? Do we care only about the safety of NSS cavers?

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Dr-rockfall September 24 C
Widow Cave, Oklahoma

On the morning of September 24, two cavers, Ted Blasingame and Sue Bozeman, went to Widow Cave in Major County, Oklahoma, for a survey trip. They surveyed some and explored a bit of new passage. At 5:45 p.m. they headed out, leaving via the Resurgence Entrance. Bozeman climbed they entrance pitch first. Apparently they had been carrying on a conversation and Blasingame stood below to continue this.

When Bozeman stepped on a projecting rock, normally used as a foothold, it came loose. Blasingame was looking down at that moment and was struck on the side of the helmet. Blasingame was uninjured but voiced the obvious lessons of wearing a helmet and not standing below someone climbing.

Reference: Ted Blasingame "Trip Report - Widow Cave" **C.O.G. Nizance** (Central Oklahoma Grotto) Oct 7, 1988, p 6.

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Bc- caver fall, improper equipment September 26
Counterfeiter's Cave, Missouri

On September 26, Herbert Samples, Jr. (30) and Kevin Berdak (29) entered Counterfeiter's Cave in Ha Ha Tonka State Park near Camdenton, Missouri. Not far inside they came to a dome. Both climbed to a ledge about 13 feet above the floor, inside the dome. At about 3:30 p.m. Berdak "lost his balance" and fell backwards to the floor and some 35 feet down a steep slope. He was obviously incapacitated so Samples went for help. At 3:50 he contacted a park ranger who alerted the Camden County Sheriff's Office. Ozark Vertical Rope Rescue was called out.

The cave entrance is at the bottom of a large, deep sink. This was rigged for hauling. Berdak was conscious, complaining of back pain and feeling very cold. A cervical collar and K.E.D. were applied and he was strapped into a Stokes litter. With help from Mid-County Fire Department he was hauled form the sink at 6:45 p.m., and transported to Lake of the Ozarks General Hospital at 7 p.m., by a "Staff of Life" helicopter. The victim was found to have suffered a broken lumbar vertebrae.

Reference: Mike Whisman "Incident Report No. 88002" (Ozark Vertical Rope Rescue) Oct 2, 1988, 6 pgs.

Analysis: This was a restricted part of the park for which the cavers had no permit. They were equipped with flashlights for light and having to hand-hold these may have contributed to the fall.

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Cc-caver fall October 8, 1988
Gage Caverns, New York

On October 8, a group of French Canadians entered Gage Caverns in New York State. They had obtained permission. At the bottom of the pit one of the group, who had removed his helmet and set his flashlight down, walked off to relieve himself. In the darkness, he stepped over the edge of a drop and fell 20 feet head first. Luckily, he was not seriously injured (perhaps it was a sloped drop) and eventually left under his own power. He later refused medical attention.

Reference: Ed. "Gage Caverns Incident" **The Northeastern Caver** 19:3, 1988.

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Ca-bad air October 8, 1988
Hicks Cave (Hidden River Complex), Kentucky

(Note: This incident is a continuation of that of June, 1988).

At about noon on Saturday, October 8, a party of four cavers entered twenty-mile long Hicks Cave via the artificial WAR Entrance, several miles south of the cave's resurgences on the Green River, east of Mammoth Cave National Park in Kentucky. The four were Tom Ahlers (40) and Duke Hopper (41) of long-time Hicks experience, and Larry Peterson (40) and Barbara Graham (22), of relatively lesser experience.

The 85 foot drop leads to essentially horizontal cave so they left their vertical gear at the bottom of the pit. That entrance was blowing out as it usually did in cool weather — a simple chimney effect with entrances on the Green River, about 150 feet lower.

The group planned to get samples of a black material at Q24 and the stream bed between J278 and J247, for analysis to see if the stream at Q24 was related to the one in the J survey. They collected at Q24 and proceeded about 2,000 feet, doing the climb down of the 40 foot high J280 dome, to the second collection site.

At the slump pit at J247, the drought had dried out a pool at the bottom leaving a lead with bad air (see June B, 1988). This lead was reportedly one of the last chances for a connection to Hidden River Cave, further upstream and heavily polluted. Apparently the lead **smelled** like Hidden River Cave.

They stopped about 5 to 10 feet short of the pit to get out the sample bottles. Peterson removed his helmet with lamp and his pack. Graham removed her pack. Hopper set aside his ammo box camera case and also took off his pack. Ahlers took off his right glove. A "subtle smell, non-petroleum, not ethyl mercaptan — somewhat like extra-strong mold..." was noticed. Hopper and Ahlers were nearest the pit, with the other two about 4 to 5 feet further back.

Hopper moved toward the pit with a bottle to collect a sample . About 2 to 3 feet from the rim there suddenly appeared a two-foot diameter, bright blue fireball, near the ceiling, just in front of Hopper's carbide lamp. His immediate reaction was that his carbide lamp base had split but two seconds later, the whole area over the slump pit exploded with a loud "whoosh!"

Ahlers was "surrounded by wisps of blue flame" and dove back, landing with Hopper on the floor, the blue light of the flames the sole illumination in the passage — all the carbide lights had been blown out. Graham and Peterson were outside the flames but were so alarmed they immediately turned and "crawled for it" back up the passage.

Hopper asked if he were on fire and got a "No" for an answer. He and Ahlers were under the flames, breathing good air near the floor. They started crawling for their lives, their ears filled with the "low rumble of the passage

on fire." Hopper and Ahlers "crawled the first 40 feet with their noses to the floor, under a ceiling of fire and heat." Peterson looked back and saw "two silhouettes crawling in a wall of flame;" he felt a blast of heat and continued on.

The trailing two got 40 to 50 feet away and paused to look back — the flames were not following them but back at the pit it looked like a "giant sterno can, burning wall to wall" in the ten foot wide passage. The wall of solid blue flame started a few inches above the top of the slump pit — the passage rumbled with a "deep steady roar."

Hopper felt burned and Ahlers' right hand and face were warm. Their companions were out of sight so they shared their one remaining light, Ahlers' flashlight, and headed for the entrance.

Peterson and Graham waited where the passage gained walking height, and Hopper and Ahlers soon caught up with them. They inventoried their gear and re-lit the two remaining carbide lights. Ahlers was the only one with a pack, with extra carbide and two spare flashlights and an extra carbide lamp. No one wanted to go back to the slump pit to retrieve gear, so they headed on out, reaching the surface at about 4:30 p.m.

References:

1) Tom Ahlers 'NSS Accident Report" Oct 11, 1988, 7 pgs.

2) Barbara Graham "Hot Lead in Hick's Cave" **The Tech Troglodyte**, Fall, 1988, pg 22-24.

Analysis: Hopper had minor burns on his face and Ahlers lost the hair on his right hand. Both had worn cotton coveralls which had become damp and were thus relatively less flammable than synthetic might have been. Peterson had "crawled for it" without his helmet and was very lucky he had not bashed his head in the panic.

Ahlers speculates that the gas could have been from Hidden River Cave, a most vile and polluted cave, driven into Hicks by a 3 to 4 inch rain the previous weekend, or that one of the natural gas or oil wells in the area is leaking gas.

The alarming part of this is that there was no warning. Pollution may become more and more of a hazard in caves so keep this in mind.

Ahlers also speculates that if the cave had been blowing normally, with a good breeze down the J-survey, the gas may not have been allowed to collect above the hole — had someone then descended, as was planned, or fallen in, for the edge is a bit tricky, they might well have been unable to get out when the gas in the pit ignited.

They were also lucky that neither Ahlers nor Hopper breathed any burning vapor, a common cause of death in fires.

One other point to note, is that since they were expecting bad air, they all were watching Hopper as he approached the pit and reacted immediately to the unexpected explosion.

Finally, as Ahlers says, "Good Luck (is) sometimes the most beneficial factor of all."

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Do-rough sea October 14, 1988
Deathtrap Cave, California

Three cavers apparently encountered rough sea conditions on a trip to Deathtrap Cave, a sea cave on Santa Cruz Island off the coast of California, receiving a battering within the cave and were "lucky to escape with their lives." (Ed. "Recent Trips ..." **The Explorer** December, 1988).

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Df-flood Nov 19, 1988
Keystone River Cave, Tennessee

On Saturday, November 19, a group of cavers visited Keystone River Cave near Spenser, Tennessee on the western edge of the Cumberland Plateau. They suited up in a hard rain and observed that they were entering a cave with "River" in its name in bad weather. They entered the cave as two survey parties, a rigging party and apparently various onlookers.

The cave has a constricted entrance series of passaages before a walking tunnel takes one to the river passage, a 15-20 foot borehole that goes downstream a ways to a fissure where it plunges through a resistant layer and has carved a huge chamber in the softer limestone below. One group, Jack T., Mike R., Andy Porter, and Jeff Bowers, rigged this 246 foot pit and descended, finding that their rope was just long enough.

They explored and surveyed for some time and returned to the pit eight hours after entering the cave, to be greeted by a "roaring torrent" of water coming down. The cave had flooded. They found a sheltered spot between two breakdown blocks and used garbage bags and carbide lamps to fend off the chill. When someone got too cold, he would walk around a bit to generate some heat. It apparently was not safe to even approach the rope for at intervals they heard sounds "like rocks falling..."

They decided to try to exit at 7 a.m. and got as much sleep as possible. At the fated hour they decided their condition was gradually deteriorating and went for it. The rope end was retrieved from the spray and tied to a boulder to keep it out of the water. Mike R. ascended and re-tied the rope so as to be more out of the water. It was again re-tied at the bottom and only the last man, Porter, had to climb with it hanging free, the bottom part in the spray. The flow was estimated at 20 to 25 cfs.

The river passage was wall-to-wall water, about upper-thigh deep, but negotiable. The water crawl near the entrance was not sumped and they exited a little after noon, 26 hours after entering.

Reference: Jeff Bowers "Incident at Keystone River Cave" **The Speleotype** Jan-Feb 1989, 23:1 & 2.

Analysis: "This trip proves that it is wise to beware of adverse weather when entering ANY cave with an active stream."

The bad weather ignored in this case was hurricane Keith, downgraded to a tropical storm, but which managed to dump four inches of rain in the area that day and night. The other cavers in the cave had exited just before the flooding and reportedly were going to wait until Sunday night to call a rescue... "but nost figured we would get out ourselves, sooner or later."

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Ace-caver fall, equipment failure November 20, 1988
Hoya de Guaguas, Mexico

On November 26, a group of cavers was doing Hoya de Guaguas in Mexico. They were rappelling the 607 foot high side and ascending the 485 foot low side. Two ropes were rigged on the high side for efficiency. Everything went smoothly until Rob Bissett got about 100 feet from the bottom. At that point he gave a "startled cry" and his speed of descent greatly increased.

Cavers ran over and reached him as he got to the bottom. He yelled that his hands were burned. He had gone over the lip using four "half-diameter steel bars" on his rack and this was immediately insufficient. He couldn't get his other two bars on and tried a "leg wrap or two." This worked for a ways but near the bottom the weight of the rope decreased and he went out of control. He was wearing bicycling gloves (no fingers) and had blistered the exposed skin.

His companions had a two-way radio but it refused to work. They yelled up that they needed first-aid supplies for an injury and the next rappel brought bandages, creams and even leaves of a native plant that a botanist with them said would ease the pain and prevent infection.

They removed burned skin with a razor blade and applied the ointment and bandages, securing them with duct tape. They found an abandoned pair of large gloves on a ledge and Bissett wore them over his bandages. He proceeded out under his own power.

Reference: Jay Jorden "A Mexican Black Hole Revisited" **The Texas Caver** Feb 1989, pg 4.

Analysis: If you can't test the friction before going over the lip, why not put on all bars and then take off what is required for proper friction.

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Ace- - caver fall Dec 10, 1988
Indian Grave Point Cave, Tennessee

On Saturday, December 10, Robert Gardner, a non-NSS caver from Nashville, Tennessee, and companions visited Indian Grave Point Cave. In the cave, Gardner was reportedly climbing down a 10 to 12 foot ledge, using a rope for a handline, when the rope "came untied." He fell and suffered a fractured leg. The Smithville and DeKalb County Rescue squads responded and carried out the evacuation. (News clipping, unreferenced, undated).

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Ac-caver fall December 10, 1988
Middle Millerton Lake Cave, California

On December 10, a party of five from the Southern California Grotto visited the Millerton Lake Caves, a granite talus stream cave system in Fresno County, California. They thru-tripped the lower cave and intended to do the same of the middle cave.

At the first pond in that section, Marvin Zaske (32) found he was not tall enough to bridge or chimney his way across and so was using an underwater shelf, about two feet below the surface.

At about 3 p.m., when he tried to climb out, he grabbed a hand-hold over his head when his foot slipped off the polished granite ledge. He tried to hold on, but could not and went into the pool, ending up on his feet in chest-deep water. Unfortunately he had dislocated his right shoulder, and required aid to the entrance and up the 15 foot entrance climb.

Reference: Marvin Zaske **NSS Accident Report** undated, 2 pgs.

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Cc-caver fall Dec 11, 1988
Fisher Ridge Cave, Kentucky

On December 11, three cavers entered the Splash Entrance of the Fisher RIdge System in central Kentucky. They were armed with a 35 foot, sectioned scaling pole, to climb the lead at Rainbow Climb in the Big One area. They had considerable difficulty hauling this through the crawls and in setting it up. Moreover, it only reached to a steeply sloped, sandy bank near the top. They were able to dig steps in this and finished the climb, but one caver "somehow" fell while climbing the pole and suffered bruised ribs. She was able to exit without assistance. (Dan Crowl "Fisher Ridge Summary" **DUG Scoops**8:3 Jan1989).

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Be-lost, equipment failure December 18 A
Salt Peter Cave, Missouri

At about noon on Saturday, December 18, two boys, age 16, entered Salt Peter Cave in Stone County, near Galena, Missouri. The cave is rather difficult with a lot of stoopway, belly crawls, and tight places. They had only two flashlights and a hand lantern. When the batteries in these grew weak, they were unable to find their way. They were soaking wet and quickly became cold in the 58 degree cave.

They had left a note on their car and people knew where they had gone.

When they failed to return, a few relatives and neighbors went to the cave. They searched for a short way in, but had only flashlights and they turned back when these began to fail.

About 9 p.m. on Sunday they called the Stone County Sheriff's Office and several fire departments were alerted and responded to the scene as well as the Ozark Mountain Volunteer Rescue Team. A rescue team proceeded into the cave, reaching the boys in 90 minutes. They were cold but "incredibly calm" and in good condition. They were brought out of the cave about 3 a.m. on Monday.

Reference: Linda Eardley "Group Saves 2 Stranded in Cave" **St. Louis Post-Dispatch** Dec 21, 1988.

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Be-lost, equipment failure December 18 B
Salt Peter Cave, Missouri

On Sunday, December 18, two boys were lost in Salt Peter Cave near Galena, Missouri. When they failed to return on time, relatives and neighbors went to the cave and a few armed themselves with flashlights and entered. When the flashlights began to fail they retreated except for Mike Dahms, father of one of the boys. He continued until his light failed and then sat down to wait. He was found by rescuers a couple of hours later and led from the cave.

Reference: Linda Eardley "Group Saves 2 Stranded in Cave" **St. Louis Post-Dispatch** Dec 21, 1988.

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CAVE DIVING INCIDENTS

AA-drowning February 7, 1988
Orange Grove Sink, Florida

On Sunday, February 7, three divers entered Orange Grove Sink in Suwannee County, Florida. They proceeded into the lower cavern. They used no guideline. John Gillegan (18) led the group. He had a single 80 with no octopus, a single light (UK600) and was advanced open-water certified (PADI) with 20 dives over an 18 month period, but was neither cavern nor cave certified. Followed by one companion, he passed two major constrictions at the bottom of the cavern, getting into a small chamber. Apparently he decided to turn back at that point and communicated to his companion via his slate: "Nothing here, let's leave." His companion managed to back out of the totally silted condition, but Gillegan tried to ascend vertically through a tight hole, and ran out of air.

The body was recovered later that day by divers who got directions from the survivors, reached the location, and, turning their lights out, could see the glow of Gillegan's light. The body was at a depth of 120 feet.

Reference: Dustin Clesi "Orange Grove Sink Body Recovery" **Underwater Speleology** February, 1988, pgs 14 - 15.

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AA-embolism May 15, 1988
Little Dismal Sink, Florida

On Sunday, May 15, a group of divers was at Little Dismal Sink, in Leon County, Florida. They were working on the map of the Little Dismal Cave System; the day's dive was intended to collect survey data for the last bit of the upstream and downstream tunnels of what is called the Sixth Room — part of the "deep section." There apparently were three separate parties of divers in the cave at the same time.

Parker Turner and Shirley Bailey collected rock samples in the First Room, Bill Gavin motored ahead to the downstream tunnel, and Bill McFaden (32) and Bill Main went to the upstream tunnel to finish the survey in that area.

The upstream tunnel is low in places and very silty. Main led, laying new knotted survey line while McFaden followed doing the compass work and taking notes on the survey slate. At one point McFaden's battery pack fouled the line and Main swam back to help. A short time later the line was snarled again, this time on McFaden's safety reel. This was quickly fixed. They continued the survey. Finally Main signaled to end the survey and they turned back, Main leading with McFaden close behind. Several times the visibility was zero and holding the line was necessary. Several times Main turned around to check on McFaden.

At the Sixth Room, Main turned around but McFaden was not in sight."Moments" went by and Main became concerned. As he was about to go back and check, he saw a light approaching — it was Bill Gavin. He had finished his downstream survey and was heading for the Fifth Room. Main swam over and communicated that McFaden was still in the upstream

tunnel. Gavin quickly swam up the line, soon hit clearer water and found McFaden, off the line but apparently all right. The two rejoined Main, waiting in the Sixth Room. Everything seemed fine.

All three headed for the Well, the bottom of the Fifth Room. They had been operating at 220 feet and bottom time had been extended and valuable air used up in the delay looking for McFaden. At the Well Gavin hooked up to his "deep-modified DPV" to begin his exit.

At this point McFaden flashed Gavin that he was out of air. Gavin immediately gave McFaden his long hose and began to share air. Gavin started up the Well and began venting his drysuit, to moderate his speed. This had no effect, as McFaden was hanging onto Gavin's manifold and had lost control of his drysuit. They didn't stop rising until they were in the bell ceiling of the Fifth Room at a depth of 100 feet. They had risen 80 feet rather rapidly. Main had grabbed McFaden's legs to try to control the buoyancy problem. Gavin tried to get McFaden to switch to Main's air but McFaden would not release the manifold. Gavin was down to 1000 psi and wanted to head out — it was only 700 feet to the entrance but he was sharing air.

Gavin powered his way down from the Fifth Room bell ceiling with the DPV with McFaden and Main hanging on. They proceeded through the Fourth Room, the "Shortcut" and into the Second Room. They were making progress but McFaden was "breathing hard" and Gavin realized this was going to be close.

Going through the duck under to the First Room there was another sudden ascent from 110 feet to 60 feet depth — McFaden's drysuit buoyancy was still out of control. Main thought about knifing it, but felt that the sudden rush of cold water into it might panic McFaden and make things worse.

They reached the Balcony and entered the low bedding plane passage before the restricted portion at the cave entrance. Gavin's regulator started breathing harder and harder — it occurred to him that even this close to the entrance they could still drown.

With lungs burning, Gavin looked over at Bill Main and saw that he had only one regulator — McFaden had switched to Main's long hose. Now two divers were out of air with the restriction still to go through.

"Main realized that Gavin was hurting badly and quickly gave him his regulator. Taking three breaths, Gavin was numbed by the lack of air, stressed and barely coherent."

At this point McFaden let go and they realized he had passed out. Gavin was concerned he would not make it out alive but Main grabbed Gavin and in minutes had pulled him through the restriction and to their decompression stop with oxygen bottles. They went through their very long decompression burdened by the "mental horror that just took place."

References:

1) Karen Thurston "Cave diver feared dead in accident" **Talahassee Democrat** May 16, 1988.

2) Steve Gerrard "We Lost Our Friend" **NACD News** May-June 1988, (20)3, pgs 27-30.

3) Ed. "Little Dismal Drowning" **Underwater Speleology** May/June 1988, (15)3 p 15.

Analysis: The operating depth of the dive, 220 feet, was extraordinary and Gavin and Main had been recruited for the survey project because of their "tremendous experience" with deep dives. McFaden "had done many, many deeper dives prior to this one." He had logged 40 dives in Little Dismal, 15 at deeper depths.

An autopsy later showed that McFaden had suffered an embolism in the brain.

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D-equipment lack May 28, 1988
Orange Grove Sink, Florida

Three people entered Orange Grove Sink in Suwannee County, Florida, on May 28. They were equipped only with masks and fins. Two shared a scuba tank with two regulators and one had a pony bottle and regulator.

The diver with the pony bottle ran out of air and made a "mad dash" for the surface. He was almost intercepted by one of the others who tried to grab his leg. At the surface he was observed by passing cave divers and, though coughing some, apparently had not suffered an embolism.

Reference: Frank Lavelle "Letters to the Editor" **Underwater Speleology** July/August 1988, p 25.

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AA-drowning June 11, 1988
Blue Springs, Florida

On Saturday, June 11, a group of four divers entered Blue Springs, Madison County, Florida. Three were U.S. Navy personnel and the fourth was the teen-age son of one of the group. They were not trained in cave or cavern diving and had only standard open-water equipment, plus minimal lights.

They entered the Horseshoe Room "daylight zone" and found the ledge that leads down into the "Crossunder Tunnel." Three proceeded into the tunnel for some 350 feet, stirring up silt in the process. They became disoriented and only one was able to make his way back to the daylight zone. The other two apparently "followed a jump line laid by cave divers back to the permanent line, ran out of air, and drowned."

The surviving two (the teen-ager and presumably his father) were able to recover one body. The other was found by two certified cave divers from Tallahassee who were exiting the upstream "Main Tunnel" about thirty minutes after the drowning. While swimming across the Horseshoe Room, they noticed a scuba tank on the floor at the mouth of the Crossunder Tunnel (the other report states that the tank was across their line, as if for staging but they had made no prior agreement with other divers to share their line, nor was there a line clip, so they became suspicious and looked around). They expected to find a cave diver but found instead the drowned diver up near the ceiling.

References:

1) Ed. "Double Drowning at Blue Springs — Madison County" **NACD Newsletter** July-August, 1988, p 41.

2) Ed. "On the Darker Side..." **Underwater Speleology** July/August, 1988, p 22.

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AA-drowning June 18, 1988
Arch Spring Cave, Pennsylvania

On June 18, two divers, John Schweyen and Roberta Swicegood (36), entered Arch Spring, near Altoona, Pennsylvania, to continue work on a four-year project trying to link Arch Spring with Tytoona Cave, about 4,000 feet to the southwest.

Tytoona Cave is 3500 feet long to the fourth sump where a boulder choke blocks further progress. The sumps have lengths of 50, 30, 280 and 100 feet, separated by air-filled sections of passage. The cave is downstream from Arch Spring.

Arch Spring is 2250 feet long with a 250 foot initial sump (I) reaching a maximum depth of 35 feet, with an 850 foot canal (airbell) leading to Sump II. This is 1000 feet in length descending to 70 feet depth about 300 feet in; near the end it dips to 105 feet depth then ascends to 80 feet in a 50 foot diameter terminal chamber. This is about 200 feet from Sump IV in Tytoona Cave. Schweyen had on several occasions attempted, to no avail, to penetrate the breakdown terminating this chamber.

The water temperatures of these caves is 51 degrees F. and conditions are normally silty (substantial silt on walls and floor) with visibility of two to three feet. When exiting from a dive, visibility was usually zero.

Passage dimensions in Arch Spring are usually six to eight feet in width and height with occasional smaller sections. "The possibility for line traps exists in several locations, particularly in Sump II where the rock is more fractured and friable than in Sump I."

On June 18, the divers planned consecutive solo dives to re-survey the end of Sump II to determine the closest approach to Tytoona Cave.

At 1 p.m. Schweyen entered Sump II and proceeded 700 feet to the end of a previously laid line of one-eighth-inch braided nylon. There he attached his No. 18 nylon survey line and proceeded, following more one-eighth-inch

main line, reeling off 190 feet of No. 18 line to a boulder in the center of the terminal chamber. There were, from there, two lines leading to different points in the breakdown. Schweyen clipped the reel into the junction lines and headed back, marking the locations where significant azimuth deviations occurred. When he exited Sump II, Swicegood was waiting and entered the sump at 2:50 p.m. while Schweyen continued out of the cave.

Swicegood's job was to take azimuth and depth readings along the line just laid, then remove it. If gas reserves allowed it, she would check the breakdown for leads. She had new 95 cubic foot steel tanks with 3000 psi in one and 2700 psi in the other, giving her more than 190 cubic feet of air. At moderate work levels this could be expected to last 60 minutes at 70 foot depth, the average depth of Sump II. Before going in she told Schweyen that her new USD regulator had suffered a minor freeflow in Sump I which she had quickly corrected. She also reported that at the entrance she had temporarily aborted the mission due to an improperly seated O-ring, which she replaced.

"At 6:15 p.m. Schweyen became concerned when Swicegood failed to appear." He went to town for backup light batteries, then got his gear on and dove Sump I to see if Swicegood was stranded there. She was not. He exited and initiated a rescue alert at the Huntington State Police barracks.

At midnight, Bill Stone in Maryland was called and began to assemble a rescue team. Schweyen went to Tytoona Cave to dive the sumps there, with the aid of local divers, to see if Swicegood had made the connection and was stranded there. She was not. At 5 a.m. the 19th, the dive team was mobilized and reached the cave by 2 p.m. It was thought that the victim could be still alive in an air bell. That evening two rescuers penetrated to 690 feet into Sump II, carefully searching as they went. On Monday morning, the 20th, Schweyen located Swicegood's body, ten feet beyond the point where the new line had been tied off. She was facing into the cave, wedged in a low section on the south side of the passage just beyond a brief constriction. Six divers, working in two- and three-man teams, completed the body recovery by Wednesday night, June 22.

References:

1) Jim Brown, Tom Morris, Rob Parker, John Schweyen, Bill Stone, John Zumrick "Arch Spring Accident" **Underwater Speleology** Jan/Feb 1989, (16)1, pgs 11-14.

2) Joe Prosser "Comments on the Deaths of Bill McFaden and Roberta Swicegood" **NSS News** Jan 1989, pgs 23-24.

3) Jacque Grieff "R. H. Swicegood Rescue/Recovery" Pennsylvania State Police Incident Report, undated, 26 pgs.

Analysis: The following facts shed some light on the accident scenario:

1) Her tank gauges read zero.

2) She was wedged in the restriction.

3) There were no mechanical problems with her scuba equipment. Both regulators functioned properly when attached to freshly-charged tanks. This appears to rule out an uncontrolled second-stage free-flow or the unseating of a main high-pressure O-ring.

4) Her drysuit had a small rip at the left cuff and a four inch rip on the right thigh. It was felt that the latter may have been due to the body recovery.

5) Her compass, used for surveying and direction-finding, was found in the terminal room, close to the point where the survey reel had been tied off.

6) Her dive slate was ruled for survey but only one depth and azimuth reading had been taken.

7)She was not tangled in the line; her body was found resting on the line.

8) Her depth gauge registered a maximum of 105 feet.

9) The No. 18 line reel was jammed and the line had been cut about one foot from the reel. The guide line to the terminal room had been pulled toward the victim — a drop weight originally at the top of a mud rise was now ten feet downslope, closer to the victim and the entrance.

10) The main line was still intact.

11) The No. 18 survey line was inspected on the surface later. The first 190 feet were marked at the bend locations for subsequent distance measurement on the surface. The next 270 feet had fresh particulate matter on it, so this may have been laid and then respooled indicating she went exploring, but could have been from a previous dive.

12) A previously unknown side passage was later found between the body and the Terminal Room. If she had been off-line this may have added to her problems.

13) Rescue diver Rob Parker "reported that the No., 18 line went nearly straight up from its anchor point just before the constriction where Swicegood was located, and was taut. Just beyond that point he noticed a slack piece of No. 18 line hanging vertically to where it touched the floor and disappeared up the silt slope which extended beyond that point toward the Terminal Room. This indicated a snag or tie-off near the roof. The previously unknown passage led off at that point.

The rescue divers (Reference 1) construct the following scenario:

"a) Swicegood passed Schweyen at the start of Sump II (they exchanged notes and discussed the dive) and proceeded on a nominal dive until a penetration of 700 feet where the new No. 18 line began. She then began the survey but aborted it after only one survey shot. Since the compass was subsequently found in the final chamber it must be assumed that some other factor caused her to make the decision to abort. This likely was a tear in her drysuit as she passed the restriction ahead of the survey line tie-off. Schweyen reported that this area was known to have jagged projections that could easily snag a drysuit. Schweyen and Swicegood had planned to dive in Tytoona Cave later that afternoon and the survey reel would be needed there. It is likely that Roberta made a decision at that point, despite the drysuit tear, to continue on to the final chamber and recover the reel before heading out.

"b) Having reached the final chamber she picked up Schweyen's reel and accidentally dropped the compass (which she normally carried around her wrist by means of a loose lanyard while surveying). She started out, reeling back the line in what likely was less than one foot of visibility.

"c) At some point between the 55 foot level and the restriction at 70 feet (on the way out), she became entangled in the No. 18 survey line (which she was reeling in). This would not be likely if she had the line in front of her as she was reeling up, but would have been possible if she had turned around for some reason so that the survey line was behind her or off to the side. She may have turned around for any of the following reasons: 1) Entanglement in the permanent line. This could explain why the drop weight was out of position as well as a subsequent entanglement in the line she was reeling in. 2) Buoyancy problems, possibly resulting from an inflator malfunction (Schweyen reports of experience with sporadic drysuit free-flows in very silty conditions; in one instance he was momentarily pinned against the ceiling of a low bedding plane passage) or from momentary overinflation to compensate for gas loss associated with the drysuit tear(s). This would also explain the movement of the permanent line drop weight if she had tried to hold onto it to control her ascent. 3) On the way out, she may have explored a small side passage just upstream of the restriction at 70 feet. This had been found a couple of weeks before but had not been fully explored.

"d) In any case, the survey line entanglement was apparently so difficult that she had to cut it.

"e) The only reasonable explanation for her using all her air was that she lost both lines somehow. If she was off the permanent line when she cut the survey line, and if that line snapped away, she would have been lost. Given the low visibility, the deep silt on the floor, and the lack of good projections on the walls, her gap reel would have been useless without a drop weight.

"f) She apparently used nearly all her air in the process of looking for the line. Although she was found on top of the line heading into the cave, she may have come to rest there after losing consciousness. If she did find the line, she would not have gone more than 50 to 70 feet in the wrong direction before realizing that she was going up the slope (and into the cave) or before she hit the drop weight there, a major landmark for those who have been in the sump before. This distance is small compared to the 700 feet to the entrance of the sump.

"g) The survey line going up towards the ceiling just beyond the restriction may have caught around a projection after she cut the line (under tension) or, more likely, may have caught if she had been near the passage reported by Schweyen. If she had been up there exploring, the line could have caught on a lip."

Joe Prosser (Training Chairman, Cave Diving Section of the NSS) creates a similar scenario:

"Evidence suggests that Swicegood began her survey as planned. However, somewhere after Survey Station 1, she lost her compass. **Her survey slate contained notes from Station 1 but no other station,** and

her compass was not located during the recovery. At some point, with an unknown amount of air remaining, she became entangled in the guideline. When Swicegood cut the line, to evade the entanglement, she failed to adequately secure the loose end of the line and lost touch with it. With no guideline and no compass to aid her in choosing a direction for retreat, she wandered until she ran out of air.

"Evidence found during the recovery, and on a later dive by John Schweyen, provides at least one explanation of what may have occurred. **Of the four rips found in Swicegood's drysuit,** only one can definitely be linked to the recovery. Two of the tears were near her wrist seals. We speculate that at least one of these occurred during her traverse of the restriction. With the seal of her drysuit breached, Swicegood was immersed in 51 degree F. water. Initially, she elected to continue with the survey and completed Station 1. Realizing that she was becoming cold, and perhaps using air faster than anticipated, Swicegood abandoned the survey, but did not call the dive. Instead, she decided to retrieve the line and reel rather than leave it for another dive. **By the time she got to the reel tie-off point, hypothermia was beginning to have its effect.** Swicegood dropped or lost her compass while retrieving the reel. Now beginning the final exit, Swicegood had lost the sure control needed for handling a line and reel in a sump. When the entanglement occurred, she was unable to eliminate it and opted to cut the line. With unsure hands, due to the increasing effects of hypothermia, the exit line was lost. Swicegood's breathing rate was no doubt increasing as her ability to deal with these added problems was decreasing. She may have attempted to deploy her safety reel, but cold hands and an unsure grip could have defeated attempts to deploy this reel.

"Solo diving, regardless of the justification, entails a great deal of risk; the potential difficulties one may encounter can quickly become life-threatening. What may well have begun as a simple line entanglement took on life-threatening proportions when Swicegood lost command of the guideline. The value of a dive partner under these circumstances must be weighed against the potential difficulties that the dive partner could present under other circumstances. Note that while the initial rescue-search for Swicegood began as solo dives, the final recovery required a team. Recall also that the recovery team faced far more hostile conditions than did Swicegood when she began her final dive. This is not meant to be a rekindling of old debates on the value of a dive partner; it is meant to be a reminder that the decision to dive solo must be carefully considered before the commitment is made. A dive partner, under these circumstances, may well have provided the extra control necessary to deal with the entanglement. A dive partner may also have added some checks to the decision-making process by electing to call the dive when problems first began to appear."

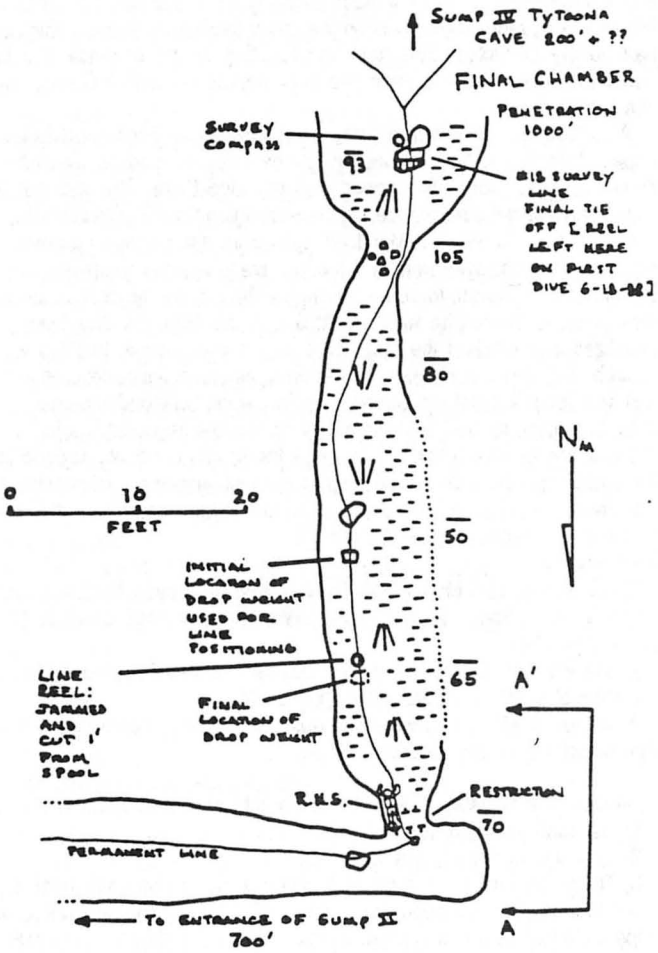
The remainder of discussion is from the body-recovery divers (Ref. 1):

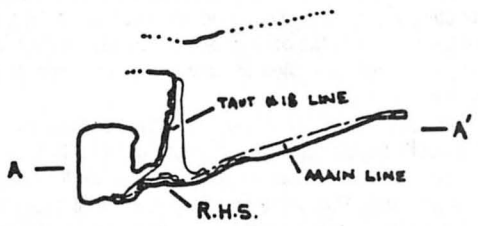
"This accident is noteworthy for several reasons. First, Roberta Swicegood was an NSS trained cave diver with several hundred logged cave dives in the U.S., Puerto Rico, and the Bahamas. She specialized in sump diving and had made three previous dives to the final chamber in Arch Spring. She was experienced in, and comfortable with, cold water and low visibility environments. Secondly, depth was not a factor in the accident.

"The accident was almost certainly caused by a line entanglement, or a succession of line entanglements in very low visibility. Hard evidence only exists for one entanglement (i.e., the cut survey line). Irrespective of losing the main line, the cause of the accident would appear to be entanglement in, and subsequent surgery of and ultimate loss of the survey line. Medical factors were ruled out by an autopsy conducted following the recovery. If we ask ourselves why Roberta did not come back from this dive, and we believe that she was lost, the answer is that she could not find the line with enough air left to get out of the cave. The reason she could not find the line efficiently was that she could not use her gap reel (since she lacked a drop weight and there were no nearby tie-offs).

"Given the coldness of the water, extremely limited to zero visibility, and the fact that wetsuit gloves are necessary, it is debatable that a person under stress could effectively use a gap reel without immediate recourse to an easy line tie-off. An apparently necessary safety modification underscored by this accident is the requirement to carry a drop weight with a quick connect that can be handled even with wetsuit gloves. This can be used under any conditions which might exist in the form of floor sediments to permit the undertaking of a radial search with a minimum of lost time.

ARCH SPRING: SUMP II





Rehearsal of such drills would serve to reduce stress (and therefore reduce breathing rate) during a real lost-line emergency. It is recommended that such lost-line, and drop-weight drills be incorporated into the NSS cave diving training program.

"All of the dives at Arch Spring, prior to the recovery, were conducted on a solo basis. The reasons for this will not be debated here, save to say that it has generally been accepted practice, both in Europe, Britain, and in the U.S. to dive solo when original exploration or mapping is involved in low visibility, constricted situations. Swicegood's equipment had been modified for solo diving (twin K-valves), she was experienced in regulator switching, and equipment malfunction was apparently not a factor in the accident. Given near zero visibility conditions it was regarded as highly unlikely that a partner would have been of assistance.

"The original line strung through the cave was a one-eighth-inch nylon variety, about twice the thickness of standard Florida line. There were no markers (arrows, etc.) on the lines in either Sump I or Sump II to indicate the direction of the entrance prior to arrival of the support diving team. While it is uncertain what role this lack of directional indicators played during the final few moments of Roberta's dive (if indeed she had found the main line prior to losing consciousness), the use of regularly spaced directional markers for sump diving is clearly indicated. This becomes an even more pressing requirement in sumps where there are no distinctive landmarks.

"All of the divers involved with the exploration of Arch Spring were NSS-trained cave divers, and as such learned their technique in Florida. While the use of one-eighth-inch line represents a step towards addressing the different environment, it is questioned whether, in fact, a stouter line might have provided greater safety, given the conditions encountered in Arch Spring. It may be useful to draw a comparison with British sump diving practice, where conditions are similar. There, 5/16 inch diameter stranded polypropylene line is used for guide line. The line is tagged at regular intervals (3m, 5m, and 10m are common) with different colored bands, for example, plastic electrical tie-wraps tightened with at least one loop through the lay of the line to prevent slippage. One color always indicates the direction of the entrance, and these tags can be felt even with wetsuit gloves. One could achieve the same effect with a braided line through the use of a knot code: for example, two closely spaced knots followed by a single knot, with the single knot on the entrance side or vice versa. This latter procedure has the advantage of being effective even in zero visibility since the entrance direction can be felt, even if it cannot be seen. Arrows are inefficient for this job since they cannot be pre-spooled before the dive. Larger line has the advantage that entanglements are less likely and easier to rectify than with small diameter line. In low visibility environments there is a tendency to place more force on a line, since buoyancy control without a reference point is less precise. Here again, thicker line is superior. Finally, there is always risk involved when more than one guideline exists along a particular passage.

"Although the above scenario and discussion are likely close to what happened, the exact cause of the accident will never be known. One thing is certain, however. The myth that NSS certified cave divers are "immune" from the risks inherent in this endeavor has been shattered. It would appear that a reassessment of the applicability of certain elements of standard Florida cave diving practice to other environments (specifically sump diving) is in order."

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AA - Chacalal Cave, Mexico June 19, 1988

On June 19, two men undertook a dive in Chacalal Cave at Chacalal Lagoon near Akumal, Mexico. They intended to recover scuba gear left from the double fatality of May 3, 1987. They had no cavern or cave training, only one light apiece, and apparently did not apportion their air in any particular way. Both were using twin tanks yoked together with only a single outlet. Their guideline system is described as "bizarre and unorthodox." Apparently the end of the line was secured at the entrance, then they proceeded with the lead diver having the line over his shoulder with the second diver following with the spool. Thus the lead diver acted as a pulley, with the line going from his shoulder back to the entrance and to the spool.

They proceeded into the cave; apparently about 200 feet in the second diver panicked. In any case, the lead diver lost the line and the second headed for the entrance. In the low visibility, silted conditions of the passage, the leader was lost.

Apparently the second diver exited very quickly and notified an instructor at the Kapulum Dive Shop who called an American diver, Jim Coke, who was in the area. They proceeded to the cave immediately, thinking that the lost diver still had air left. At 6 p.m. they entered the water — two hundred feet in they encountered the body of the lost diver. He had run out of air and apparently panicked as he died, since his "fingers appeared to have clawed at the rock."

The body was recovered as well as the diver's equipment and that from the fatality of the previous year and all lines previously installed. The cave and lagoon are now closed to divers.

References:

1) Ed. "On the Darker Side..." **Underwater Speleology** July/August 1988, (15)4, p 22.

2) Mike Madden "Fatality in Chacalal Cave, Mexico" **National Association for Cave Diving** Jul-Aug, 1988, p 46.

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AA - Little River Springs, Florida July 3, 1988

On Sunday, July 3, a diver was exploring solo in the Little River Springs Cave System. He apparently was not cave or cavern certified and had been on only 40 dives in the previous twenty years. His body was discovered by accident the following day by a team of divers from Virginia in the "Mud Tunnel."

References:

1) Ed. "Drowning at Little River Springs" **NACD Newsletter** Jul-Aug 1988, p 41.

2) Ed. "On the Darker Side..." **Underwater Speleology**.

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AA - Ottawa River System, Quebec, Canada July 19, 1988

During the last two weeks of July a cave diving camp was held by the SQS (Speleological Society of Quebec) at certain springs on islands near the middle of the Ottawa River just inside the province of Quebec in Canada.

On the 19th of July Jean LaMarree (37) and Luc LeBlanc entered one of these springs via a small surface pool. They penetrated 90 meters upstream, laying guideline. The passage was some 2 meters high and 5 meters wide, with the maximum depth some 6 meters below the surface. At the end of their line (90 m) they turned back. LaMarree had a minor leak in one of his regulators and he dismantled and cleaned it after reaching the surface.

They returned to the cave and surveyed the 90 meters. At the end of the line, LaMarree motioned to LeBlanc to start out. LeBlanc had a minor problem with the line; when he got sorted out he was no longer sure if LaMarree was in front or behind — visibility was "poor." He continued to the entrance but LaMarree was not there. LeBlanc went back to the end of the line and found LaMarree, dead. His regulator was not in his mouth but his face mask was in place; there was some blood on it. He brought the body part way out, but had to leave it when he ran low on air. Body recovery was completed the next day.

Reference: K. David Sawatzky, MD "Cave Diving Fatality: Jean LaMarree" **Canadian Caver** 20(2), Fall 1988, pg 4.

Analysis: LaMarree's regulators were found by the recovery team to be working and his tanks still contained air.

Sawatzky speculates that LaMarree may have suffered a nose bleed and suffocated or may have had a heart malfunction — ruptured aneurysm or ventricular fibrillation and secondary heart attack.

In any case, "this tragic fatality simply reinforces the extreme risk of cave diving and shows how even a simple event may be fatal in this environment."

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AA - Orange Grove Sink, Florida September 5, 1988

At 10:11 p.m. on September 5, Mark Happe and Debi Eaves (21) entered Orange Grove Sink, Suwannee County, Florida, for their third dive of the day. Happe was Basic Cave certified in May and Eaves on July 3. When they discussed their plans for the dive with their instructor and others, they were warned that they were not ready. Eaves had logged only ten cave dives and was diving with rental gear.

They planned to head toward Challenge Sink, turning back if silting occurred. They knew that Eaves' primary light would not last the dive and they brought a UK 1200 to use when the primary gave out.

The pair proceeded past the halfway point; apparently silting occurred and they turned back as planned. When Eaves' primary light expired, the UK 1200 was turned on, but during the exchange they drifted away from their line. With the light on, they turned their attention back to the line and regained it — but it was not the one they had followed. They used the line for a time, came to realize it was not correct — a slate note was exchanged — and turned back. Presently Eaves saw another line and went for it. Silting had now brought visibility to near zero. Happe made a line search but could not find Eaves. He then made his way back along the "wrong" line to the correct line and exited.

Reference: Ed. "Fatality at Orange Grove Sink" **Underwater Speleology** Nov-Dec 1988, 15:6, p 5-6.

Analysis:

Underwater Speleology cites: 1) (Lack of) Training — Both divers were diving well above their level of training. By definition of "Basic Cave" (certification) they should not have gone to twin tanks nor to diving in the advanced-cave conditions of Orange Grove Sink. 2) (Lack of a) Continuous Line — During the exchange of lights they lost sight of the continuous line. This slight error proved to be a fatal one.

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AA - Emerald Sink, Florida December 15, 1988

On December 15, a group of three divers, all "Basic Cave Certified," entered Emerald Sink in Wakulla County, Florida. They were led by Bill Cronin, reportedly having experienced some 100 to 125 cave dives. Cronin used twin, side-mounted 80's while the others used dual-manifolded double 80's.

They penetrated the cave for some 800 feet, using a line already laid by other divers and passing one line junction, to a depth of 150 feet, when Cronin decided they had gone far enough and signaled "turn around." They began to exit. When they reached the line junction they had passed on the way in, they proceeded following a line that was marked with exit arrows.

Near the entrance Cronin flashed the other two and signaled that they were going the wrong way. With misgivings, but because he was the leader, Cronin's companions turned and followed him back into the cave.

Back at the line junction, "he pointed into a deep tunnel which (actually) led to Clear Cut Sink, some 5000 feet away. His companions were now frightened — their air was running low and they were sure the line with the arrows was correct. They could not convince or perhaps communicate this to Cronin, however, so they split up, Cronin heading deeper into the cave,. His companions made it out, but without enough air to complete decompression. They had oxygen available on the surface and suffered no reported bends symptoms.

Cronin was found by recovery divers about 300 feet from the entrance at about 117 foot depth, in a pocket in the ceiling. The guide line at that point was at 145 foot depth.

Reference: Ed. "Drowning at Emerald Sink" **Underwater Speleology** Jan/Feb 1989 (16)1, pgs 6 - 7.

Analysis: The maximum on Cronin's depth gauge read 160 feet — this apparently indicates he proceeded another 200 feet into the cave from the line junction where his party split up. There was 150 psi in one tank and 350 psi in the other. Both regulators seemed to be "significantly out of adjustment." The ambient bleeds were both clogged so they would have "breathed poorly at depth and probably contributed to his (apparently) probable narcosis."

A good number of safety rules were violated and these are listed here, quoted from the above source, though one must remember that equipment malfunction and resulting narcosis is apparently what really caused the fatality.

"1) Failed to reserve adequate air for the exit. Knowing that they were entering a siphon, their dive plan was to dive in to 1/3 of their air or 20 minutes, whichever came first. Siphons require additional air reserves beyond thirds because of increased swimming resistance during exit due to the siphon flow. Because of this added hazard, siphons are considered especially deserving of respect and are approached very conservatively by safety-minded cavers.

2) Exceeded the penetration limits allowed for Basic Cave certification. Basic Cave parameters allow a maximum penetration of no more than 1/3 of a single tank or 1/6 of doubles. the dive was planned around 1/3 of twin 80's.

Exceeded the depth limits allowed for Basic Cave certification. Basic Cave depth parameters are 100 '. The planned portion of the dive went to approximately 150'. It is considered likely that the difficult breathing resistance of the poorly maintained regulators caused Cronin to be significantly narked (much more than would be normal) even at this depth.

4) Violated the Basic Cave restriction prohibiting decompression dives. The dive was planned to be well beyond the no-decompression limits. Also, decompression bottles were not left at the depth of the first anticipated stop, which means that the intention was to decompress on emergency-reserve air.

5) Failure to check gear and/or be familiar with its proper operation. Checking the ambient first-stage pressure bleeds on Sherwood regulators is a routine pre-dive check item. The fact that they were not working indicated either pre-dive forgetfulness or carelessness, or ignorance of the proper functioning of the regulators. Although Cronin was found to have been using his operational primary light when he died, tests of his back-up lights showed that the batteries in all of them were low, and therefore poorly maintained and not well-checked before the dive.

6) Violated equipment configurations stipulated for Basic Cave. Cronin was wearing two single 80's attached low on his hips in the British side-mount fashion, an advanced technique which requires additional hoses and complicated regulator exchanges and gauge monitoring. It is hypothesized that the additional stress and time factors associated with performing the necessary regulator switches may have compromised Cronin's ability to deal with the narcosis induced by poor regulator performance, and slowed down his final attempt to exit from the cave. It is speculated that his chances of surviving the cave dive might have been enhanced had he been diving a standard dual-valve rig. Side-mounts are an advanced form of dive technique that are way beyond the scope of anyone who only has Basic Cave certification.

7) Encouraged other divers to violate the dive parameters of their certification skills. Cronin was the "leader" on this dive, and though he knew the others were only Basic Cave certified (like himself), encouraged them to participate on a **deep decompression siphon dive on doubles.** It is reported that on other occasions Cronin had helped other Basic Cave certified divers rig themselves for side-mount diving and in other ways "instruct" them in advanced cave-diving techniques. It is also reported that several instructors, including his Basic Cave instructor, encouraged him repeatedly to complete the full training course before attempting to do dives that went beyond the parameters of Basic Cave Diver certification, but to no avail. It has also been suggested that this was very nearly a triple drowning."

NATIONAL SPELEOLOGICAL SOCIETY
Accident Report Form

Date of Accident: _____ Day of Week: _____ Time: _____

Cave: _____ State: _____

Reported by:
Name _____

Address _____

City _____ State _____ Zip _____

Name (s) of person (s) involved	Age	Sex	Experience	Affiliation	Injuries or Comments

Describe the accident as completely as possible on the back of this form or on a separate sheet. If possible obtain information from those involved. Use additional sheets if necessary. A report in the style of "American Caving Accidents" is ideal. The following checklist is suggested as a guide for information to be included:

( ) Events leading to accident. Location and conditions in cave.

The Accident

( ) Description of how it occurred.
( ) Nature of injuries sustained.
( ) Analysis of main cause.
( ) Contributory causes (physical condition of caver, weather, equipment, clothing, etc.)
( ) What might have been done to prevent the accident.

Rescue

( ) Actions following accident.
( ) Persons contacted for help. A flowchart may be helpful.
( ) Details of rescue procedures.

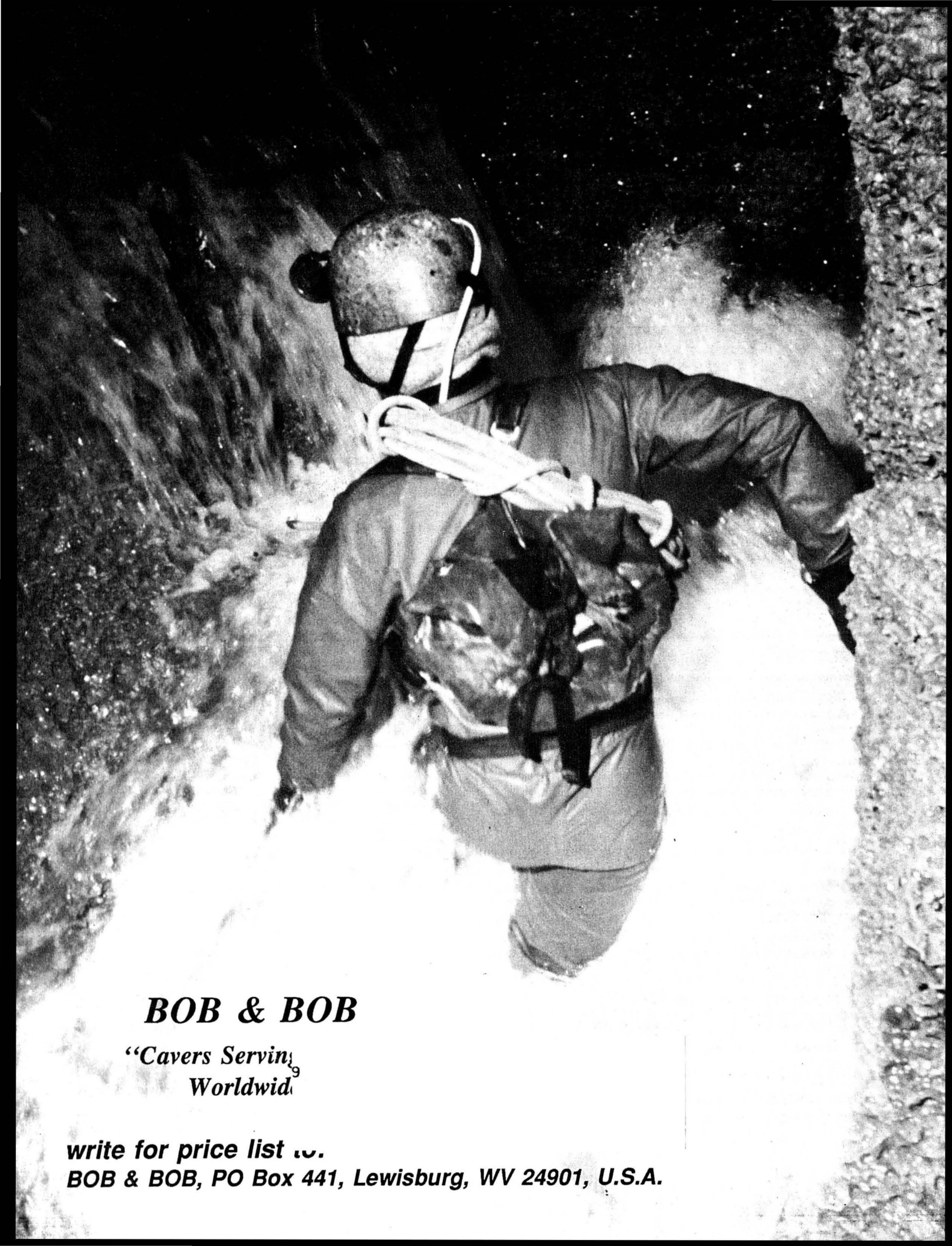
Further details were reported in:

( ) Newspapers ( ) Grotto newsletter ( ) Other

(Please enclose copies if possible.)

Please return completed report to the NSS as soon as possible after the accident.

National Speleological Society
Cave Avenue
Huntsville, Alabama 35810



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