“SROP ”

Sump Rescue and Recovery Orientation Program 2018

Cavers as Rescuers

Cave Divers Association of Australia
Australian Cave Rescue Commission
Australian Speleological Federation – Cave Diving Group.
International Underwater Cave Rescue and Recovery Organisation

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This program is adapted from the Australian Cave Rescue Commission "CROP" program, and the IUCRR "First Responder" Courses.

The Sump Rescue and Recovery Orientation Program (SROP) presentation material is of a quantity that can be presented over two days or as a series of evening presentations or half-day workshops. Sections of the material may easily be deleted from the program and/or others added in, but a recommended core set of presentations includes:

- The CDAA, IUCRR, ACRC and their role in Australia
- Minimal Impact Cave Rescue Code
- Self Rescue
- Incident Command Systems
- Search Techniques and Hasty Teams
- Initial Response Teams
- Communications in Caves
- First aid equipment and stretcher types
- Medical Considerations
- Underwater body recovery theory
- Sump rescue theory including paper exercise

plus

- Stretcher Practice
- First aid show and tell
- Rescue and Recovery Exercises

Liability Disclaimer:
Serious injury or death could result from the use or misuse of techniques used in this book and the Sump Rescue and Recovery Orientation Program. Every person undertaking cave rescue practice or actual rescues must be eternally vigilant, use good judgement and common sense. No liability to the presenters is expressed or implied in the case of the reader becoming injured whilst undertaking rescue practice or a real rescue.

The SROP is a basic level introductory program to enable cavers to make informed decisions regarding the care and evacuation of their caving companions in the event of an emergency situation whilst caving, and to safely assist the statutory authorities at the scene of a diving fatality. Additionally it is anticipated that attendees will be able to assist statutory rescue authorities in the undertaking of their duties in a sump rescue situation.

The program makes no statement of a certain level of competency by attendees at the end of the program, however a card or endorsement (evidence of participation) will be forwarded to each attendee at the conclusion of the program. This will be issued by the agency conducting the program e.g. CDAA or TDI.

Contents

Introduction

This program is designed to provide a brief overview of a variety of considerations specific to sump rescue and recovery. It is primarily intended for use by cavers and cave divers, and contains a large bias toward remote areas and small party self-rescue techniques. It does not present vertical rescue in any form.

The following text uses the terms “caver” and “cave-diver” interchangably.

Much noise has been made regarding the push for all courses to be presented at the Certificate 4 level and be aligned with this and that competency, and certain assessment procedures be followed and so it goes on…..

Please answer this question:
If you had a broken leg, were stuck under a rock 4 km into Cocklebiddy Cave, the nearest SES unit was >12 hours away and your caving expedition group had appropriate equipment and skills to remove the rock, stabilise your leg and remove you from the cave would you be asking them whether they were Cert 4 trained?

A unique issue that Australian cavers face in developing cave rescue training programs is the fact that as a nation we cover a land mass almost the same size as the continental USA but we have less than 10% of the caving population. Developing and presenting a nationally accredited competency based training program presents a few challenges, not only financially but also geographically. Maybe in the future a structured competency based program will be developed for presenting cave rescue training but at this stage Australia does not have a unified or even widely documented approach to the training of cavers to rescue themselves from caves.

This SROP represents the first nationwide steps towards an easily accessible, easily presented, low priced and flexible set of rescue training materials that can be made available to large numbers of cave divers over time.

Hence, as a result of this philosophy the presenters of the program are not professional presenters. The presenters are experienced cavers/divers that have an interest in furthering the development of other cavers and their ability, to not only cave dive safely and sensitively but to have some idea of what to do when it all goes wrong. In following this approach the system is open for peer review and development, with your input we can develop a world class program that is available to all and has been developed by those in the know – cavers!

American cave rescue statistics show that cavers trained in rescue become safer cavers and have fewer accidents. Since the 1970’s the NSS has been collecting accident statistics and presenting rescue training information to cavers, land managers, police, park rangers and interested individuals. They have several levels of qualification as a cave rescuer and have presented over 200 rescue courses in almost thirty years, approximately 7 courses nationally per year! The dry caving CROP program is loosely based upon the NSS – NCRC Basic Cave Rescue Orientation Course, as such it is not a new idea, and the topic selection is based upon any information need that has been identified over a thirty-year period, covering local and remote area caving. This SROP is based on the CROP *plus* the NSS-CDS and NACD Recovery Diver courses. Our thanks to all who have contribiuted to the text.

Looking beyond cavers rescuing cavers, what is the use of subjecting yourself to carrying people around in stretchers? Well, if you chat to most long term cavers they feel that cavers should be responsible for rescuing people out of caves. There are two significant reasons why cavers should be involved in cave rescue:

1) Involved, capable and familiar - Active cavers without doubt have an advantage over most individuals with the ease they can move around in confined dark spaces. Additionally cavers have knowledge of the locations of caves and are familiar with caves in their own region.
2) Conservation focussed as long term visitors – land managers seek cave conservation, cavers seek cave conservation; multi-tasked rescue organizations just want the person out! Combine the ability to move efficiently underground with the conservation values of cavers and that is the reason why cavers should seek to be involved in cave rescue.

However, as discussed earlier, in Australia we have a small caver population and few resources to undertake training and rescues. Therefore, we should seek closer ties with organizations such as the SES, Ambulance and Police and undertake joint exercises, where cavers can perform most of the underground tasks and authorities are tasked with above ground support. In this way each group works to its strengths.

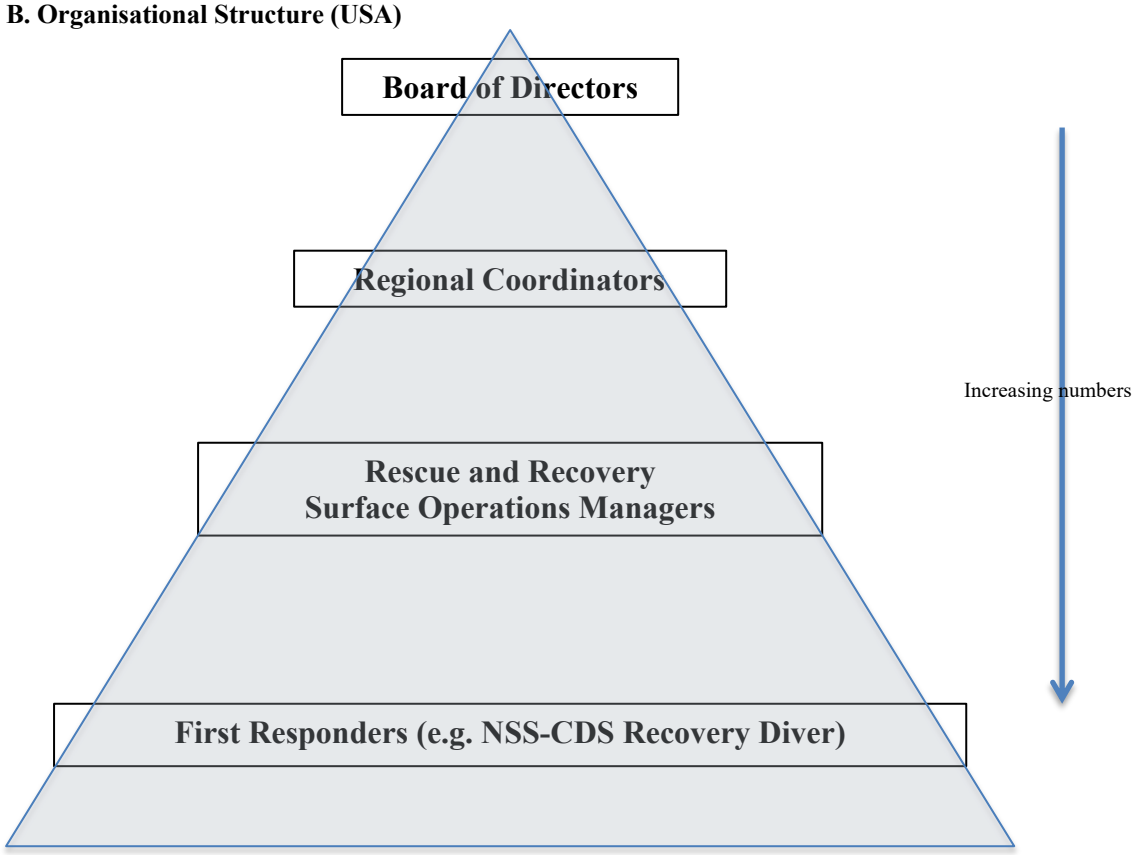
The International Underwater Cave Rescue and Recovery Organisation (IUCRR)

The CDAA is adapting the model used by the IUCRR to train our first responders.

A. Information regarding the IUCRR in Australia
The International Underwater Cave Rescue and Recovery Organisation was formalised as an apolitical, not for profit rescue organisation in the USA in 1999, although its origins go back as far as 1982. Although most active in the USA, it now has a formal structure extending to nine other countries or regions including Australia.
The role of the IUCRR is to provide advice and assistance to the statutory authorities when requested, in the event of an incident involving a cave diving rescue or recovery. The IUCRR is NOT a training agency, and hence does not provide any in water training. Rather it coordinates divers who wish to volunteer for rescue and recovery activities.

The IUCRR divers only become active when invited to an incident scene by the police.
In Australia, two Regional Coordinators organise training, maintain volunteer call out lists and *could* assist the statutory authorities with underwater incidents.

B. Organisational Structure (USA)



C. Roles and Responsibilities (see more details of 1-3 on IUCRR website)

1) Board of Directors
2) Regional Coordinators (RC)
3) Rescue and Recovery Surface Operations Managers (RRSOMs)
4) First Responders – YOU!

1. First Responders are ideally full cave divers with at least 100 significant post course cave dives.
2. First Responders have completed the NSS-CDS, NACD or another training agency's Recovery Diver (First Responder) Course. In the US, they need not be members of the IUCRR. (See note about training in Australia in next section).

3. It should be the goal that as many full cavers as possible earn this certification from the training agencies, as it is designed to increase awareness of the process which occurs immediately after a diver is reported missing. In some cases it may be that a rescue is possible, and swift action is required by the divers on the scene. In other cases, it will be obvious that a body recovery will be required at which time the First responder should alert the police, get all divers out of the water and prevent others entering the site**. It is this level we are aiming to train Australian cave divers to.**

Reference Documents:
IUCRR Organizational Summary - Feb 2002
IUCRR First Responder Manual - May 10th 2011
Responsibilities of IUCRR Regional Coordinators – Feb 5th 2000

D. Australian Specifics

Currently the Regional Coordinators in Australia are:

Peter Grills – Queensland, NSW, ACT
Richard Harris – WA, Victoria, SA, Tasmania
See the IUCRR website for contact details.

These RCs hold a complete list of volunteer cave divers in Australia, including a list of RRSOMS and First Responders.

Because there is equal potential for rescue *and* recovery in Australian cave sites, the "Recovery Diver/First Responder" Course that is run by agencies like the NSS-CDS in the USA, has been broadened somewhat in Australia to include a larger rescue component. In Australia this course is called the SROP (*Sump Rescue and Recovery Orientation Program*) and will be the minimum requirement for First Responders in this country. This course will be conducted by instructors of the Cave Divers Association of Australia (CDAA

SROP

The SROP is a 2-day training program offered by the CDAA.

Prerequisites
1. CDAA Advanced Cave (or other training agency equivalent) with 100 significant post course dives (this requirement has now been relaxed to include Cave Level divers).
2. Participants will need to be CDAA members or hold a Special Visitor's Permit for courses held in CDAA sites, however it is *not necessary to be a CDAA member to do the course*. In this case the CDAA is merely the training agency that will provide the training. In other locations outside CDAA sites, different access requirements may be imposed.

Fees
SROP instructors and coordinators *will not charge* for teaching these courses. The only charges will be for administrative costs like certification card processing and visitor's permits, and any profit will be used for training and equipment.

Certification
At the completion of the course, the participants will be endorsed as CDAA SROP/First Responders.

Course Content
The SROP will be a mixture of theory and practical exercises.

Theory will include discussions of our role as volunteers working under the authority of the Police within an Incident Command Systems, a management approach to cave rescue and recovery, search techniques, the fatality site as a crime scene and the concept of the chain of evidence, practical aspects of sump rescue, first aid and patient assessment, communications underground and the importance of documentation.

Practical exercises will include a mock search and rescue, and a mock body recovery in a cavern environment.

Australian Speleological Federation - Australian Cave Rescue Commission

The ASF NCRC was established at the January 2001 ASF council meeting and later renamed the Australian Cave Rescue Commission in January 2009. There were several reasons for the formation of the NCRC, some of which were: There was no Australia wide co-ordination of cave rescue arrangements. The ASF, as an Australia wide body, has undertaken the role of establishing an umbrella organization to correct this shortfall. The NSS in America has co-ordinated cave rescue through their NCRC for many years and liase at state and federal levels. Similarly the ASF is in the position in Australia to represent cave rescuers at all levels across Australia.

From an international perspective, overseas organizations recognise the NSW Cave Rescue Squad as the only cave rescue organization in Australia and are surprised that there is no national cave rescue structure. However the NSW squad did not feel it was its role to establish a national cave rescue organization but were willing to assist the ASF in the formation and operation of such a group.

The commission will be charged with the following objectives:

- facilitate the provision of cave rescue training to cavers
- facilitate the exchange of information and training related to cave rescue
- facilitate the provision of skills and equipment for cave rescues Australia wide
- provide a national communications framework for cave rescue organisations
- encourage an ethos of minimal impact for cave rescue training and rescues
- facilitate the establishment of cave rescue organisations in states where such organisations do not exist
- organise national cave rescue workshops at the Biennial ASF Conferences
- spread the self-rescue ethos amongst other caving groups
- enhance the first aid skills of cavers and other caving groups
- establish relations with overseas cave rescue organisations
- in nearby countries where cave rescue organisations don't exist, establish relations with relevant organisations to enable the delivery of assistance
  and education of government bodies and management authorities about cave rescue.

To date the ACRC has produced the Minimal Impact Cave Rescue Code and made progress on establishing international relations with New Zealand, US, and French rescue organizations. The NSW CRS is still operational, however the Victorian Cave Rescue organization is currently in recess. No other states are recorded as having cave rescue organizations.

Cave Rescue Organisation in Australia

In any emergency involving members of the public the Police force has statutory command of the situation. In the situations of search and rescue, generally the Police (e.g. STAR Group in SA) will be the leading "combat" agency to run the operation, with assistance from the SES, CFS and Ambulance.

The State Emergency Service (SES) is a volunteer emergency service organisation established under an Act of Parliament to render immediate assistance during emergencies and disasters. It is the leading combat agency in storm and flood scenarios. In SA more than 1500 volunteers are members of 67 Units.

The SES's primary functions are:

- Raise, train and equip an effective volunteer based emergency service
- Leading agency for flood, cyclone, storm, tsunami and earthquake.
- Assist in land search, vehicle rescue (in specific areas), vertical rescue, cliff and cave rescue
- Act in a support role for other combat agencies
- Support emergency management activities at state regional and local level
- Act in a support role of the Police in tasks acceptable to the Volunteers but excluding those where it is likely that offenders will be present.

In the case of cave rescue organisation, the specialized nature of the activity demands the provision of specialist equipment and specialist knowledge for the efficient removal of casualties from the situation.

In the case of a cave emergency in South Australia the following process would take place for the routine recovery of an injured person (under authority of Police):

- Emergency call to 000, Police, state communications for SES or Local SES
- Mobilisation of local SES unit, call up of volunteers from local on-call list
- Establishment of command post at point nearest emergency site
- Location of injured party
- Onsite treatment and stabilisation
- Evacuation of injured party from cave to further professional care
- De-mobilisation of SES unit
- De-briefing of SES unit

Other agencies like CFS could be involved. The SA Ambulance Service (SAAS) has a Special Operations Team (SOT) who can perform confined space rescue, and so may be used where an injury occurs in the dry cave.

These principles apply to any state or territory of Australia.

Minimal Impact Rescue Code
ASF - Australian Cave Rescue Commission

To help protect Australia's caves the Australian Cave Rescue Commission, in conjunction with the NSW Cave Rescue Squad, has produced the Minimal Impact Rescue Code.

Preface

This Minimal Impact Rescue Code (the MIRC) is to guide rescue squads in the conservation, protection and sustainable use of appropriate caves being accessed by rescue organizations unfamiliar with the Australian Speleological Federation Inc. codes for cave protection and conservation. This code is derived from and closely follows the ASF Code of Ethics and the ASF Minimal Impact Caving Code (MICC). This MIRC should be used in conjunction with the ASF Code of Ethics and the ASF Minimal Impact Caving Code (the MICC) and not as a substitute.

The need for a Minimal Impact Rescue Code (MIRC) has evolved over many years as cavers and cave managers have realised the impact that they have on caves. The impact that practice cave rescues have are so diverse and varied that it has become necessary to devise a code that ensures that rescue operators are aware of the measures that are necessary to reduce their impact on caves in a practice rescue.

It is important that you understand that a MIRC for Cave Rescue is necessary because rescue operators operating in caves can be a major source of damage to caves. Read the MIRC for Cave Rescue carefully and apply it to all practice cave rescues - it will not completely stop damage to caves but it will certainly reduce the impact on the cave environment. This MIRC was devised by cavers and cave rescue operators for Cave rescue exercises and authentic rescues - please assist the caves of Australia by using these simple techniques.

We are discussing here a code, which will ensure that practice cave rescues have a minimal impact on the cave they are set in. In many instances the practices may not apply as the impact that they have may be minuscule compared to natural impacts on the cave - such as flooding of the entire cave for example. These practices are intended to apply in caves where rescue operators are likely to have a detrimental impact on the cave purely by entering the cave.

In-cave marking refers to the use of a variety of materials to define tracks, routes and barricades in a cave. These measures are taken to protect sensitive areas, confine foot damage, make rescue teams aware that a sensitive (it may be a less obvious cave animal's territory) area exists.

There are no exceptions to this code - surveyors, photographers, scientists, explorers, cave rescue operators etc. are all subject to this code.

Introduction

1. Although their primary aim is the provision of rescue services and training for rescue in and from caves, nevertheless rescue operators will actively promote cave conservation and sound management practices through example, education, advice and training.
2. This code establishes a minimum standard of conservation to be undertaken by any rescue operator.
3. Higher standards may be required by management authorities for particular caves or karst regions, in which case those standards will be adhered to.

General Ethics

1. Landowners, Management authorities and their staff or representatives will be treated with courtesy and respect.

2. All rescue personnel must have specific or tacit approval from the landowner and/or management authority before entering any property or reserve, must follow only agreed routes and must not visit forbidden areas.
3. The prevailing procedures regarding gates on properties and reserves will be followed and care taken to cause no damage to stock, crops, equipment or landscape features.
4. No cave excavation, including the use of explosives will be undertaken with out the permission of the landowner and/or management authority and the controlling authority of the rescue organization and only after an assessment of environmental effect.
5. Recognised codes for minimum impact camping will be observed with particular emphasis on complete removal of rubbish and, wherever possible, avoidance of camping on karst catchment areas.
6. Reports on rescue practices and caving activities are to be accurate, avoiding sensationalism or exaggeration.
7. Consideration should be given before publishing an article disclosing a cave's location, as to the intended wishes of the landowner and/or management authority, and subsequent effect on the cave.
8. When visiting an area frequented by another caving body, the rescue organiser will cooperate fully with the caving trip leader.

General Cave Rescue

1. Remember every exercise in a cave has an impact. Is this exercise in this cave necessary? If it is for cave rescue training, is there another cave that is less vulnerable to damage that can be made use of? Make this assessment depending on the purpose of your visit, the size and experience of the trainees/rescue operators, and if the practice is likely to damage the cave---do not use the cave.
2. Where possible above and underground controllers should have visited the cave previously and hence should be aware of sensitive features of the cave, the best anchor points, and generally reduce the need for unnecessary access to other sections of cave.
3. Cave slowly. There will be less chance of damage to the cave and to you. This especially applies when you are tired. All rescue personnel should be in the cave for no more than 3 hours then relieved by fresh personnel.
4. Keep operating team size small - 4 to 6 is a good team size. Generally the maximum size of any rescue team should be limited to the expertise required (no more than two trainees to one experienced operator).
5. If there are trainees on a trip, make sure that they are teamed with experienced operators, so that the expertise can be passed to them when required, egg. in difficult situations. Ensure that the team operates at the pace of the slowest team member.
6. Operate as a team - help each other to minimize damage to the cave. Don't split up unless impact is reduced by doing so.
7. Ensure that team members don't wander about the cave unnecessarily.
8. Constantly watch your head placement and that of your team members. Let them know before they are likely to do any damage the cave.
9. Keep gear packs as small as possible and don't use sensitive caves or extensions to the cave.
10. Stay on all marked or obvious paths. If no paths are marked or none is obvious - define one with flagging tape (don't forget to remove the tape at the end of the exercise).
11. Learn to recognise cave deposits or features that may be damaged by walking or crawling on them. Examples are:- Drip Holes, Stream Sediments, Paleo Soils, Soil Cones, Crusts, Flowstones, False Floors, Cave Pearls, Asphodilites, Bone Material, Potential Archaeological Sites, Cave Fauna, Coffee &Cream and Tree Roots.
12. Take care in the placement of hands and feet through the cave.
13. If an area of cave is obviously being degraded examine the site carefully to determine if an alternative route is possible. Any alternative route MUST not cause the same or greater degradation than the currently used route. If an alternative is available suggest the alternative route to the appropriate management authority and report the degradation.
14. Note any missing marking materials while in the cave so it may be restored later. Tape off sensitive areas prior to the practice. If you believe damage is occurring during a practice stop the proceedings till damage has been overcome and report any damage to the appropriate management authority.
15. If it is necessary to walk on flowstone in a cave remove any muddied boots and or clothing before proceeding or don't proceed! Sometimes it is better to assess the situation and not damage any cave feature.

16. Treat the cave biota with respect, watch out for them, and avoid damaging them and their "traps", webs, etc. Also avoid directly lighting cave biota if possible. No disturbance should be caused to maternity or over-wintering roosts of bats.
17. Wash your caving overalls and boots regularly so that the spread of bacteria and fungi are minimised.
18. If bone material is found it should be reported to the appropriate management authority, do not touch or remove if termination of a practice is necessary do so.
19. Do not eat inappropriate food in a cave (such as biscuits or cake as it is difficult to avoid leaving crumbs). If it necessary to eat ensure that small food fragments are not dropped as this may impact the cave biota. One way to stop this is to carry a plastic bag to eat over or spread a large plastic sheet on the ground to catch the food fragments. This can then be folded up and removed from the cave.
20. Rescue operators will not smoke in any cave.
21. Camping will not occur in a cave, unless absolutely necessary to achieve a specific rescue training objective.
22. Ensure that all foreign matter is removed from caves. This includes human waste. If long trips are to be made into a cave ensure that containers for the removal of liquid and solid waste are included on the trip inventory.
23. When rigging caves with artificial anchors, e.g. tapes, rope etc. ensure that minimal damage occurs to the anchor site by protecting the site. For example protect frequently used anchors, e.g. trees, with carpet, packs, cloth, etc. Bolts should only be used in an authentic rescue situation if natural anchors are inappropriate. Traces should not be used.
24. Rescue activity must be conducted in a manner responsible to the cave environment, taking particular care to avoid damage to speleothems, sediments, biota and other natural phenomena.
25. Cave entrances and passages should not be excavated/enlarged, water levels in sumps should not be modified and stream flows should not be diverted until all possible effects are assessed and the appropriate permission gained. Any modification must be the minimum required.
26. Establish routes and mark them for other operators; a Michie phone cable or phone cable may be appropriate, single tracks should be followed and care taken to avoid needless deposition of mud. Mud throwing or modelling is unacceptable.
27. Caves must not be disfigured by unnecessary marking (including direction arrows).
28. The use of metal stretchers will only be undertaken in an authentic rescue if no other is available, metal stretchers will never be used in a practice rescue. Cave softly

New Cave or New Extension to a Known Cave

1. The existing microbiology of the new cave, fungi, bacteria, and a world of protozoa, will almost certainly be irreversibly contaminated on the first trip into the cave!
2. Do not enter a new area if you do not have the equipment or skills required to undertake the minimal activities.
3. The minimal activity should be in-cave marking and surveying---not purely exploration.
4. Ensure that all alternative routes are examined before any damage occurs. It may not be necessary to enter some areas as they can be by-passed.
5. Having determined that a sensitive area is to be crossed it should always be marked. Reduce future damage by defining a distinct, minimal width track.
6. Discuss in-cave marking within the party and ensure that all ideas are evaluated before marking is undertaken.
7. Cave softly.

The Cave Environment

To use South Australia as an example, our caves range from the harder limestone and marble of the Flinders Ranges and Adelaide Areas, to the mixed limestone of the Gambier-Murray embayment, and the Aeolian Calcarenites of the Eyre Peninsular and Kangaroo Island. The hardness of the rock has an effect on cave development, how we "cave", and on the potential damage that a rescue team can do in a cave.

Temperature Ranges
The temperatures in our SA caves, can range from 10 deg C in the south east through to about 27 deg C in the Nullarbor. Humidity is often in the nineties. High temperature and humidity can mean that caving or rescue parties become exhausted or dehydrated, and considerations as to the comfort of the patient need inclusion. Low temperatures in the southeast can result in hypothermia. In Tasmania water temp will be cloe to freezing at times and cave air may be 5-10 degrees. In the Kimberleys underground temperatures around 30 degrees C and almost 100% humidity will be encountered.

Fauna
Many of our caves contain specialist and fragile fauna and their associated habitats. There are endemic species and threatened species – and a range of biodiversity. Cavers need to be familiar with these fauna and the ability to identify specialised areas. For example fragile tree root areas and fauna associated with guano. For example tiny pseudoscorpions, isopods and spiders through to larger animals like bats.

The Nature of Caves
The rescuer may be confronted with darkness, cold or hot conditions, water or dusty dryness, mud and a range of hazards. Cave rescue has been referred to as similar to mountain rescue – except that individuals are often required to work upside down, in the dark or on a wet and muddy surface. All of these environmental conditions will impede the extrication of the patient.

Caves are dark, and also sometimes cold, wet, tight and muddy. The usual issue of darkness means that rescuers need to have appropriate light sources. The issue of temperature – it is well known that the cave temperature is usually the mean annual temperature – that is the average temperature for the area – although this can be affected by the elevation and latitude of the caves location. This will have an effect on whether issues such as hypothermia or dehydration will be issues for the injured party and the rescue team. Caves can be tight – causing restrictions in movement or airspaces, or they may be large and spacious – yet there may also be other obstacles or hazards that will affect movement in the area. Wet and muddy conditions can make moving difficult and may result in serious injury to other group members. Dusty caves can also cause respiratory distress to some rescuers. However, some caves may be clean, or have clean areas that require protection and special care to negotiate. And caves usually have speleothems, requiring care and caution – these fragile features are usually right where you want to go!! Other hazards come in the following categories:

- Water Hazards – Wherever water exists there is further potential for danger. Sumps, flash floods, moving water, permanently flooded caves – all have special consideration. Aside from cavers getting wet and then, likely cold, it is important to use caution and water-safety precautions when working near water.
- Atmosphere Hazards – eg CO_2.
- Vertical Hazards – The potential for falling down drops, being hit by falling rocks or becoming fatigued – rescuers working around vertical areas of the cave need to be highly trained and extremely careful. This whole category needs separate consideration, understanding and training.
- Normal Movement Hazards – humans can injure themselves as a result of simple falls or missteps – thru walking, jumping, climbing or other normal movement.
- Biologic Hazards – These may be airborne, waterborne, dust caused or plant or animal related. Contaminations from water or bats (eg histoplasmosis) also need to be considered.
- Rock Fall Hazards – These are possible and we all see the effect of rock-falls in nearly every cave we visit – instability, rubble on the floor or in the cave entrance.

Landowner Relationships
This aspect is something that is normally the realm of ASF Trip Leaders – who get prior permission/approval from the landowner to visit the cave. In CDAA sites, the CDAA has negotiated access on behalf of the divers. However, as visitors and guests, all trip participants and rescue teams also need to have appropriate communication and behaviour towards the landowner and their property. It is important to respect the landowners property and the environment. Think low impact, leave things as you found them (eg gates, livestock and crops) or in better condition (eg repair damage and remove rubbish). It is also important, in the

event of an accident, to liaise with the landowner/manager – particularly in relation to progress on the rescue, media relations and impacts on the cave, the local surrounding environment or publicizing the site.

Self Rescue

When Should I Self-Rescue?
We don't like to think of something going wrong on one of our trips, and we try to prepare for contingencies as best we can. But in spite of our efforts, things can happen. We should train in how to deal with problems before they occur and how to deal with them once they occur. How does one decide when to take care of a problem within your own group versus when you need to get outside help. The better trained you are, the greater the chance of self-rescue!

The boundary between self-rescue, small party rescue and a full-blown cave rescue is a fine line as well as a moving target. The more experience and training your group has, the less likely small problems will turn into rescues. Why should we care about the difference between self-rescue and outside help? The reasons are many and varied. A cave rescue can be dangerous. Not only for people responding but for the victim as well. Help from the outside is delayed, often for many hours as it takes time to get word out, organize the response, and get back in. There are serious risks to being tied in a stretcher for many hours at a time, There are cases of healthy people having problems during practice, so an injured person may be placed in greater danger by having to ride in a stretcher. And that's without even considering taking an injured caver through water filled passage, the dangers of which should not be underestimated! So a rapid and effective self rescue may be the best option for an injured member of your party. But you need to know when outside help is required.

As a good rule of thumb: you should attempt to self rescue as long as the situation is within your capability to deal with the problems and doing so will not place the injured party or your group in additional significant danger. Furthermore, even if an external rescue is required, if possible you should attempt to get the injured party closer to the entrance when moving them will not cause risk of further significant injury. The closer they are to being out, the easier the subsequent rescue will be. Occasionally a group may only need a small amount of additional assistance and sending someone out for a limited amount of help is appropriate. Knowing how the rescue situation is in your area is useful in making the decision to self rescue or send for help.

Sometimes the situation may warrant sending someone out for rescue soon after the event even while you are still working to take care of it. This way if you can't solve the problem and self-rescue, help will be much closer to hand. This is especially true in entrapment situations; if you can't free a stuck person within a few minutes of trying, send someone out for help while you continue to work on the problem. Generally speaking, someone who has suffered an injury to an extremity, and arm or a lower leg can be moved if the injury can be stabilized with splinting and bandaging and they feel up to it. This contradicts the usual first aid practice of not moving the victim, but the risks associated with the long delay to wait for an external rescue and a subsequent ride in a stretcher *may* outweigh the risk of self rescue by less trained cavers. If the injury is more serious the safest course of action may be to stabilize the victim, treat for shock, keep them warm, and go for help. The risk of causing further injury by your actions in these situations is higher.

There are no hard and fast answers to the question when to self-rescue. This is why we urge people to get training both in first aid, and in cave rescue. Doing so will increase your margin of safety and it will allow you to better know what kinds of situations you can deal with on your own, and what situations warrant calling for help.

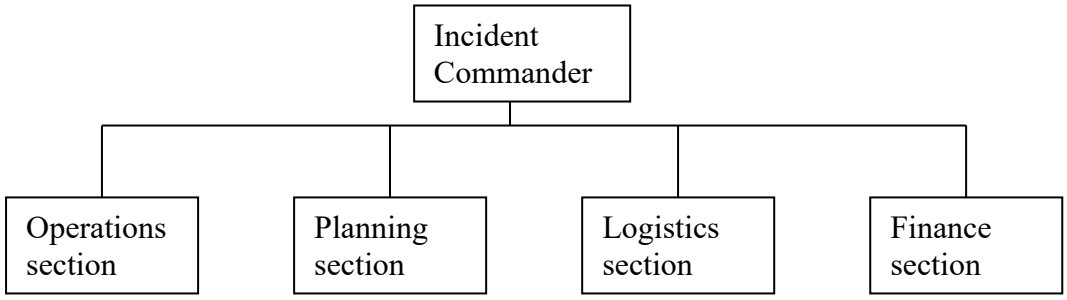
Consider these fatcors when deciding on self vs outside rescue:

- **Number in party**
- **Experience of team vs number of dependent cavers**
- **Equipment inventory**
- **Timing – early in trip, everyone fresh or late and everyone exhausted**
- **Severity of injury**
- **Distance to entrance and environment to be travelled**
- **Distance to medical care**

Incident Command Systems (ICS)

At a cave rescue, a single agency (police) will have jurisdiction. This agency will have control of the management structure of the operation and in Australia the management system is an ICS called AIIMS. An ICS works well in most situations where communication between functional units is required. Cave rescue suffers easily from poor communications due to the difficulties of access and transmission of information. In theory the ICS organisational structure is adaptable to any kind of emergency. The system has several basic common elements no matter what the size of the emergency. The complexity of any cave rescue management structure is determined by: the severity of the problem, the urgency of the situation and the technical requirements of the rescue. The complexity of the problem will influence how large the management team will need to be. A single lost caver in a simple horizontal cave may require no more than an single Incident Commander whereas a caver with a fractured pelvis deep in a Tasmanian vertical cave may require an international response covering several response agencies. A rescue from Toad Hall in Cocklebidy may be extremely complex and time consuming.

Simple ICS organisational structure:



Incident Commander (Police)
Has the overall responsibility for the situation and receives authority from the designated legal authority. This person should be the most experienced leader available. The IC is responsible for directing all aspects of the rescue. The IC designates additional managers to optimise the span of control and to facilitate the use of specialists to oversee specific tasks. It may be valuable for the IC to be assisted by a local caver acting in the role of "cave advisor". Such a person will know the cave and its hazards, and also know local intel such as possible helo landing zones, local comms issues, availablility of cavers and equipment etc. Cave Rescue "Preplans" will be a valuable resource (see later section).

Operations
In charge of the actual tasks involved in the rescue, and the manpower required. This team usually is the largest.

Planning
Considered as one of the most important functions in a rescue. Normally this section is used primarily for documentation, information gathering and emergency response planning. Planning section will look ahead of the Operations staff and identify potential issues and needs. They act to guide the operations staff in the achievement of their goals.

Logistics
Logistics attends to the needs of rescue personnel. Generally this function includes feeding, housing and in some cases the replacing of team members. Supervises the acquisition of equipment and locating of stock for use by the operations section. This includes equipment logging for use and return.

Finance
Charged with treasury and money raising. Identifies where money is spent. Rarely used in cave rescue.

Other functions that are important in cave rescue virtually no matter what size the operation include:

Medical co-ordinator – (most likely ambulance) in charge of all medical operations, directly controls the care of the patient. Obtains and uses medical supplies. Oversees and directs patient evaluation, interfaces with patient evacuation personnel and supervises patient medical needs during transport.

Surface Operations Manager (SOM) – has overall charge of the cavers/divers (under the ultimate control of the police).
Liasion with police, attends all briefs and debriefs
Should be main line of communication between cavers/divers and police (avoid multiple cavers doing this)
Anticipates need for more personell, cylinders, commpressors etc
Assigns tasks to cavers via Underground Manager
Appoints someone to document
Completes final report

Underground Manager – Manages all underground operations, including:
In charge of the in water team
Routine stretcher movement
Vertical operations
Interfaces with medical supervisors
Oversees preparation of the cave to allow the safe transport of the patient
Appoints team leaders to complete specific tasks
Co-ordinates recovery of equipment at the end of the rescue
Ensures that all personnel have left the cave at the end of rescue.

In the situation of a remote small party/self-rescue situation the above structure would normally be reduce to a single person overseeing the rescue and possibly one person being responsible for documentation of the patient's medical care and equipment needs for the rescue.

Logistics of Cave Rescue

The dictionary defines Logistics as the science of how to move and supply armies. The success or failure of a rescue may depend on how the logistical problems of materials and personnel are served.

What – Where – When and How

In the case of an extended remote area rescue, generally it is possible to operate a rescue scenario for a period of time utilising the equipment and supplies that the trip organisers brought with them. This may lead initially to few logistical considerations due to the fact that there isn't much equipment to move around, however as the situation develops and more people and equipment arrive, the issues increase in size and complexity.

Logistics always requires the following elements:

- Rescue personnel – may need to work in shifts
- Transportation
- Equipment for the rescue situation
- Tired or ill rescuers must be relieved
- Warm rest areas and sanitation needs to be organised
- Patient transport needs to be coordinated
- Communications must be established

If a rescue/recovery lasts 4-12 hours the following will be needed:

- Food and hot drinks
- More relief personnel
- Additional lights and PPE
- Specialized rescue equipment

Once a rescue/recovery goes over 12 hours the following will be added to the list:

- Sleeping arrangements for personnel
- Fresh personnel every 4-8 hours
- More support equipment

Logistics not only sources the equipment and personnel to assist in an operation but it also keeps a track of where everything is. The logistics team should know where items can be obtained well before the need arises, items that may only be required if the situation changes significantly should also be considered, such as if it rains, or the patients condition deteriorates.

Documentation

Depending on the situation and our involvement as rescuers, there is always some need to document what is done by who and when. For this program, we focus on small party self-rescue issues. This includes – patient management paperwork, entry sentry and command tasks.

Purpose:

- Tracking – People, Equipment, Events.

Important Aspects of Documentation:

- Readability
- Accuracy and Completeness

Documentation is preventative maintenance. It accomplishes 4 main things

- Helps resolve problems and disputes
- Provides a permanent memory
- It acts as an ongoing evaluation tool– it enables you to look at what you've done to decide what you need to do next, cave rescue involves constant reassessment of a situation. During and After the rescue
- Documentation provides and advances the learning experience. It should help make plans through evaluation for the future.

Documents to consider

- Vehicle register
- Daily mission report
- SAR task log
- Personnel register
- Communications log
- Equipment log
- Event Log
- Entrance control log
- Task assignment form
- Public information release log
- Medical logs

Brief Examples

Lost Person Questionnaire- Physical Description- Abilities/Capabilities- Planned Trip
Personnel Log- Personnel on site- What they are doing
Entrance Control Log–People in and out

Medical Logs – Patient management

The IRT (Initial Response Team) will bring with them some documents for recording the patient's medical status. We advise all cavers to carry a basic first responder medical assessment form or wet notes – this can be used to send to the surface in the case of an accident, and one form can remain with the patient, to enable recording of medical consideration and patient condition until more formal medical assistance arrives.

Normally the medic will maintain a log with the patient. The same information is regularly sent to the surface and recorded by the communications person receiving it and then passed to the Medical Co-ordinator. All information collected by the underground medical staff must be permanently recorded on the surface to protect it and allow medical review as shifts change.

Entry Control Log

Management of equipment and human resources is important. It is especially important to note the time that people were "in" and "out". This allows the command post to be aware of the in-cave situation and also keep track of several issues – how many people are in the cave and anyone who may need a break.

Summary

1) Document EVERYTHING! (People, Equipment, Events)
2) Facilitate rescue operations
3) Provide legal protection
4) Used as a learning tool

Communications

Communication is the vital lifeline of emergency services. It is the "exchange of thoughts, messages, or information, by speech, signals or writing". Most importantly, it is the commitment to get messages through to other people. Good management decisions rely on accurate and timely information exchange between all rescue personnel.

- Assume that the person on the other end knows nothing, be clear and concise.
- Use simple plain language without trade names or acronyms.

There are two forms of communication, direct and indirect.

Indirect communication
Via verbal, written or coded nonverbal messages. In the early stages of a rescue, "runners" are used to carry messages from the patient to the surface. You can also utilise hand/light/whistle signals for communication – eg in a vertical roping situation.

Direct Communication
- Interpersonal
- Face-to-face contact is best but often unavailable
- Military and commercial telephones
- Surface radios – hand held and mobile
- Cave radios – using Morse code or voice communications typically below 20KHz

Good communication relies on preplanning.
Equipment should be stockpiled and sufficient personnel trained.

Communication Functions
- A reliable exchange of essential information between many people and locations
- A lifeline between the cave search, rescue support teams and the rescue coordinator staff
- Medical communication between a patient and the attendants and the Medical coordinator on the surface
- Information exchange allowing allocation of materials and manpower throughout the operation.
- The incident coordinator and the local authorities have sufficient communication to allow accurate and timely information exchanges.

Key locations for communications

On the Surface
- At the cave entrance(s), At the command post,
- At logistics staging area(s)
- Off site

In the Cave
- Near the Patient, At major junctions, At significant obstacles

Messages to the surface
- Written Notes and Logs of Radio traffic
- Each Message Includes: Date and Time, To and From
- Message Text - Simple and Direct
- Protected from Damage by the Environment In a Plastic Bag
- Write-In-The-Rain™ Paper

Communication security
Not all messages conveyed need to be heard by everyone. Information such as medical information or updates from the underground may need to be protected due to confidentiality. It is important to restrict access to the communications area, particularly by media and bystanders.

Comms Equipment for caves

- Phones – military field phones, battery-powered phones, soundpower phones, twin wire systems
- Single Wire Earth return – Michie Phones
- Radio's – cave radios
- Surface based equipment –
- Paper and pencil!!

Examples of communications systems suitable for use during sump rescue or recovery incidents will be demonstrated during the course.

Additional specialised training is required to enable effective deployment, operation and maintenance of cave rescue technical communications systems, but anybody can speak, write and think clearly.

Documentation of Communication

It is important to set up direct communication quickly. Direct verbal communication links are vital during missions. All messages sent or received must be recorded in the Communications Log. Noting the time, date and content of all communications. These logs need to be preserved after the rescue.

Communications is a lifeline

- Establish it fast
- Maintain it well
- Remove it last

Get in fast. Get out last. Maintain the link. Be discrete with sensitive information. Ensure timeliness and accuracy. Write everything down

Searching in Dry and Flooded Caves

Whether you are searching for a lost caver or diver in a complex system, there are clues that can be used to assist the process, and techniques that can be used to streamline it. A coordinated apporach utilising the expertise of the police and SES should be undertaken, with careful briefs and debriefs along the way.

A note about interviews. If the would be rescuers are interviewing a witness e.g. the diver's buddy, the way the interview is conducted have have a large impact upon the efficiency and outcome of the search. Where possible, a professional interviewer should conduct the interview however if this is not possible, there are some important guidelines to be followed. All questions should be open and should not lead the interviewee. For example "Tell me where you have been", or "describe what you last saw" Rather than "Did you go to the Wombat Room", or " When you got to the end of A tunnel did you turn left?" In the highly stressed state after a near miss themselves, many individuals can be in a very suggestable state and may focus on words that you put in their mouth. So be very careful to let them tell you the story, rather than potentially put words in their mouth.

Locating Caves
The first problem usually encountered by any cave rescuer when looking for missing persons is locating the actual cave in which the victims are situated. There are several resources at hand to enable the rescuer to narrow down the possible sites.

If a person or group of persons has been reported missing, the individual raising the alarm may more than likely have information on the location of the cave. Cave names may have been mentioned and possibly even specific areas of a certain cave. Friends or relatives may be able to indicate preferences for certain areas or certain caves.

Subject Profile
Information about the subject may be invaluable in narrowing down the target areas. Some suggested questions are: is the subject;

- A novice caver?
- An experienced caver?
- Prone to foolhardy endeavours or generally of a careful nature?
- A 'flashlight caver' or a well-equipped individual with spare lights, water etc.?
- Stoic or prone to panicking?

Cave Profile
Information about the cave to be searched will be necessary to enable the cave searchers to properly equip themselves to overcome obstacles encountered during the course of the search. Conversely, over equipped searchers will be burdened with unnecessary paraphernalia that may hamper the ability to carry out a search effectively. Some suggested questions are:

- Is the cave long or short?
- Is the cave simple or intricate by nature?
- Is the cave horizontal or vertical or is it a mixture of both?
- Is the cave wet or dry?
- Are the cave passages easy to negotiate with lots of walking size tunnels or are there extensive crawling passages.
- Is the cave subject to flooding?
- Is or has the cave been known to contain hazardous atmospheres?
- Is there a map of the cave available?
- Are there people available who are familiar with the cave in question?

Search Operations
Cave and surface searches are important parts of cave rescue missions. The way in which these searches are planned and conducted can contribute to the success or failure of a mission. A search is an emergency.

Defining the problem:

- Overdue cavers/divers
- Injured or in need or assistance
- tired, lost, lack of experience, trapped, run out of light, vertical problems, injured….
- Criminal activities

Beginning the Search

- Information Gathering
- Active Searching
- Demobilisation phase
- Debrief and critique phase

Search Methods and Techniques

There are 5 methods that are used to establish a search area – any one or even all may be used depending on the amount of information available.

- Theoretical Search Area
- Statistical Search area
- Subjective Search Area
- Deductive Reasoning Search Area
- Group consensus search area

A single individual should never plan a search alone.

Clues in the dry cave

- Equipment at entrance
- Wet or muddy footprints, tracks in sand, dirty hand marks
- Equipment lying on floor, rigging
- Water droplets brushed off walls or roots

Underwater clues

- Disturbed silt or marks in floor/roof, especially near restrictions
- Disturbed line, cut line
- Equipment on floor (lights, cutting device)
- Bubbles on ceiling
- Stage tanks
- New line, personal markers, jumps

How a Rescue or Recovery Unfolds

CONSIDER 3 SCENARIOS:

1. A diver surfaces with 10bar of air in each cylinder and shouts, "I've lost my buddy!"
2. A diver is 2 hours overdue after entering a sinkhole with a single tank. There are no known airbells in the site.
3. A buddy pair surface in the lake in Cocklebiddy and declare they have left their buddy in Toad Hall. They think his leg is broken.

These three situations will all require extremely different responses. In situation 1, if a geared up and experienced diver was at the surface, he might consider entering the water to try and locate and rescue the stricken buddy who may still be alive but will be critically short of gas. He will conduct a HASTY search using the best information to hand at the time. Situation 2 suggests a fatality has occurred. Divers on the surface should get any other divers out of the water, secure the entrance (so nobody else enters the water) and call the police. No further diving should occur unless authorised by the police. The final situation marks the beginning of what may be a long and complex rescue. Everything needs to be done in a structured and considered fashion.

Personell can be divided into teams for rescue management and discussion purposes. In some cases one team may perform the roles of several:

Hasty Team

A Hasty Team or Hasty Search is the first response to scenario 1 above. When minutes count, available divers or cavers need to establish as many facts as possible in a short time, then make a judgement about the perceived risks involved in conducting a quick search in an attemot to safe a life that is in immediate danger. At all times remember, *a rescuer should never lose their life whilst attempting a rescue or recovery.* The Hasty Team goes straight to the area of highest probablity of success. If this team fails to find the victim, then they should leave the cave and a more considered and carefully planned search should be conducted. Subsequent searches must be methodical and carefully documented so as to maximise chances of success. Once the victim is located, then one of several things may occur:

- If a fatality has occurred, the location is marked and the cavers leave the site undisturbed
- If the caver is found injured, an assessment is made about assisted self rescue, or whether external assistance is required. Where possible someone should remain with the injured caver
- For an injured caver, an Initial Response Team is sent in.

Initial Response Team (IRT)

Accidents occur quickly and without warning in caves. The actions of companions and team members in the first hour after an accident may save the patient's life. It usually takes several hours for the outside rescue party to reach the patient, so it is important to protect and stabilise the patient before advanced treatment can begin.

The Initial Response is critical. The despatch of the Initial Response Team/First Responders into the cave has the aim of getting to the patient quickly and to treat any life threatening conditions while other equipment and personnel are brought into the site. It is important that the IRT is not encumbered by inclusion of comms teams or other slow moving tasks e.g. stretcher teams. The IRT enters the cave to seek the person with a known injury, entrapment or other problem. The decisions made in the first few minutes of action will affect the entire rescue effort.

Typically an IR team will not contain more than 5 members due to the need for fast movement. It is usually composed of a medic, a leader and two or more cavers/divers. Ideally this is a team of 3-5, where at least one person is medically trained.

Actions and decisions at patient site:

1. Can the team reach the patient safely?
2. Determine what happened and check for life threatening conditions
3. Stabilise the situation (secure a safe and comfortable environment for patient) - don't become a second patient
4. Full medical assessment and provide first aid. Think HYPOTHERMIA. See later discussion for details.
5. Decide – rescue or self rescue (IRT may be caver's companions still)? What transport is required to safely move the patient – can the patient walk or will a stretcher be needed? What restrictions to the patient's movement exist?

6. Documentation of victim's condition, supplies, site conditions – send information out to surface with decision about need for further assistance.
7. Maintain control until relieved

IRT Equipment

Individuals to carry minimal personal equipment to enable them to move quickly. Basic Team equipment that is required to be utilised to stabilise the situation until advanced care can be obtained.

Responsibilities of IRT

- Participate in Briefing
- Get to patient quickly
- Stabilise the Situation
    - Remove Patient from dangerous areas – consider spinal injuries
    - Provide immediate, basic medical care
    - Provide hypothermia protection
    - Monitor and evaluate patient condition
- Record and Report Patient Information
- Neatly printed, time and author recorded – RUNNER to memorise note in case lost
- Team exiting the cave to note any major obstacles
- Team to debrief to next level of command – Underground co-ordinator, operations aboveground
- Exit and report to surface for rest and reassignment.

Communications Team

Once an external rescue is embarked upon, establishing communications to the patient site becomes a high priority. Rapid communications will enable:

- Regular updates of patient status
- Medical advice from doctor or medic on surface
- Supply, personell and logistics efficiency

A dedicated team may be required to place the communications in the cave. E.g. Michie phone line can be deployed through a sump like a guideline, but SHOULD BE LAID AS FAR AWAY FROM MAIN LINE AS POSSIBLE. This will decrease the risk of breakages to comms by divers, especially when towing out a casualty or a stretcher. It also poses an entaglemenyt hazard to working divers who may not be concentrating on the line. In dry cave sections the wire can act as a guideline for rescuers to follow, but care needs to be taken. Other forms of comms will be discussed in the relevant section. The comms are generally removed on the final cleanup dive.

Stretcher Team

Once the comms are in and the victim is as stable as possible, the move to the surface must commence. This is divided into 2 phases which will be dealt with separately, but the "muscle" that makes this happen comes from the stretcher team (whether an actual stretcher is utisilsed or not). See stretcher section later.

1) Dry cave sections – For any significant injury, a stretcher may be required to lift and move the victim through the dry sections of cave. Remember this may involved restricted passage, vertical sections and rockpiles, waterfalls and streamways. The victim must be as medically stable as possible before the move commences because they may deteriorate during transport, and they may pass through places where treatment cannot be administered. Where possible allow the victim to have their arms free so they can protect their face and assist at times. This will give them some feeling of control over a frightening situation. Don't forget PPE for the victim (glasses or shield) and avoid stepping over them.

2) Sumps – Transporting an injured caver through a sump is fraught with danger and needs to done only if no other reasonable options exist. The caver will be completely dependent on the other divers whilst immersed.

Every step of the immersed section must be preplanned and choreographed to avoid disaster. This will be discussed in detail in the Sump Resue section.

Recovery Team

Unfortunately not all rescues are successful, and sometimes the search reveals a deceased caver rather than a lost or injured one. In this setting the rescuers may become the recovery team, and this process is very different one once it is established that the victim is dead. Body recovery through a water filled cave will be discussed in more detail but these general principles apply:

- Once the victim is known to be deceased, touch nothing and document everything at the scene. Photograph or video everything and make good notes.
- Inform the police and do nothing without their authority.
- There is now no urgency and the safety of the recovery team becomes the absolute priority.
- If the recovery is to be made, it will be in consultation with the police incident commander.
- A body recovery is not a pleasant task and no individual should be pressured into performing it. *Do not underestimate the impact it may have upon you and do not feel you should volunteer.*
- Minimise the exposure of the team to the smallest number of members possible at the "coal face". There will plenty of other roles for other team members.

Clean up team

When all the excitement is over, there may be significant amounts of equipment and litter to remover from the cave. Do this at a measured pace, after everyone is rested if necessary. Michie phone lines, food and drink containers, bandage wrappers etc must all come out leaving the cave as close to pristine as possible.

FIRST AID KITS

Different types/complexity e.g.

a. Personal kit
b. Team kit
c. IRT kit
d. Expedition kit/doctor's kit

If it is going into the cave

a. Needs to be durable and waterproof .e.g. Nalgene bottle or dry tube
b. Needs to be compact and portable

Contents
To Suit the owner's skills
Stand alone kit & as a part of group kit coordinate between members.

Consider contents by category of injury

a. Dehydration
b. Hypothermia
c. Lacerations
d. Eye injuries
e. Boken bones

What's in a Personal Kit?

Personal Medication for the length of the trip &
longer if needed.

Nalgene bottle with duct tape around it (tape
used for splinting, lacerations etc.)
Needle for splinters
Petzl Emergency light
Candle and matches
Space blanket or Garbag
10ml saline eyewash
Bandaids
Leukoplast tape
Rubber gloves 1pr.
Whistle
Antiseptic
Painkillers
Cord
Pencil/paper

What's In a Team Kit (shared)?

Personal Protection
Protective Gloves
CPR Face Shield
Antiseptic wipes

Wound Treatment
Trauma dressing
Gauze Pads
Antiseptic Wipes
Sterile Gauze swabs
Cotton tips

Iodine Liquid 15 ml
Saline 10 ml
Sterile Irrigation Syringe
Scrub sponge
Sterile wound closure strips

Bandaging
Elastic gauze Bandage:
Crepe Bandage
Band aid strips
Absorbent Non Adherent dressing 5 by 7 cm
Absorbent Non Adherent dressing 9 by 10 cm
Waterproof Dressing 6 by 7 cm & 9 by 10 cm
Eye Pads
Triangular Bandage
Adhesive tape

Blister & Burn
Open Weave Dressing
Second Skin Hydrogel dressing
Burn aid

Medications
Oral Rehydration Sachets
Ventolin Spray
Pain Medication
Eye Drops

Survival & Environmental
Space blankets
Water Purification tablets
Insulation ground mat
Water bag, wine cask
High-energy food

Additionals
Paper & Pencil, casualty report form
Big Safety pins
Small penknife/Multi Tool
Cord
Bio Hazard Bag
Tweezers
Splinter Probe
Thermometer
Duct Tape
EMT Shears
SAM Splint

Initial Response Team First Aid Kit

Needs to be portable
Durable enough to get contents safely to patient
Evaluation
Tools

Treatment categories (take what is likely needed)
DRABC's
Hypothermia
Dehydration
Broken Bones
Lacerations

Plus:
Sleeping bag & mat
Supply of water & smaller containers to transport it in
Small Trangier "brew kit"
Food
Shelter

E.G.

- **Closed cell foam mat**
- **Sleeping bag**
- **Small travel towel**
- **Plastic sheet/tarp and cord to make shelter**
- **Candles and matches (heat and light)**
- **Headlight and batteries**
- **Wine bladder of water**
- **Chocolate, trail mix**
- **Trauma shears**
- **2 x rolls duct tape**
- **SAM splints x 2**
- **Large absorbant dressings**
- **Small dive spares kit and Multitool**
- **Ziplok bags for rubbish**
- **Gauze swabs**
- **2 x large crepe bandage**
- **Bandaid strips**
- **Leukoplast tape**
- **Scissors and tweezers**
- **Steristrips**
- **Saline for eye wash**
- **Sterile syringe 10ml and 20ml**
- **Disposable gloves**
- **Notebook and pencil**
- **Pain killers**
- **Antispetic e.g. Betadine**
- **Small trangier and mug/soups**
- **Soups**

Medical Considerations

So you are on a caving trip and you or a member of your team becomes injured. In the minutes after this happens you must do several things to insure the safety of the injured caver and the team. The following is a checklist that everyone that caves should keep in mind just in case an injury happens:

- Protect yourself first then your patient. Don't become a victim yourself.
- Ensure that you can obtain access to the injured person safely. Check for unsafe conditions before entering an accident site and correct all dangerous conditions.
- DR ABC
- Determine extent of injuries and stabilize the patient as your skills permit. Consider hypothermia prevention straight away.
- Determine if the person can walk/crawl/swim out, can be assisted to walk/crawl/swim out, or if you will need assistance to get the person out. If there is any chance of spinal injury do not move the patient except to prevent further injury.
- If the injury is serious, use your own judgement. Begin to take notes about your patient. Pulse, respiration, and conscious state are minimum. Clearly time and date all data.
- If you need outside help, send for it or wait for your backup person to notify authorities. Remember that your backup person can only call for backup if they know exactly which cave you are at and when to expect your return from that cave.
- Inventory all equipment in your group to determine what is available; to help your patient survive, to aid your survival, and determine what may be needed from the outside. Get the information to the surface.
- When possible two people should be sent out for help, they should leave as much food and water and dry clothing as possible for the people that remain with the patient. They should carry a copy of all notes concerning patient condition and location. Include information about your needs as well as what you have on site to treat the patient with. Your messengers need to know emergency telephone numbers, have keys to vehicles, and have knowledge and experience to get out safely. WVSS (1993).

Patient Assessment – The following system is based on the Advanced Trauma Life Support (ATLS) system which is taught to doctors/medics who have to deal with trauma. It involves a Primary survey which should find any immediately life threatening problems (e.g. obstructed airway, punctured lung, severe bleeding), followed by a Secondary Survey which should reveal any other less obvious injureies. It gives the novice a system with which to approach and injured patient in a stresful environment.

Primary Survey ABCDE:

Airway and cervical spine

Breathing

Circulation and haemorrhage control

Disability = Central nervous system and spinal cord injury

Envirmonment – especially hypothermia in caves.

As you proceed through the primary survey, you fix problems as you find them BEFORE you go to the next part of the survey. By the time you get to “E”, you should have identified any immediately life threatening problems and addressed them. If at any time during the rescue you become concerned about the patient’s well being, repeat the primary survey.

In more detail:

Airway and cervical spine

Is the airway clear? Is the patient conscious and talking – if yes then the airway is clear, the patient has a reasonable blood pressure and the brain is working at some level, so half your primary survey is done! If the patient is unconscious then a much closer assesment of the patency of the airway is required. Remember the noisy airway is partially obstructed (e.g. snoring), but the silent airway may be completely obstructed. Any manouvres of the airway require care of the potentially injured cervical spine, especially in the unconscious patient. Practical approaches to spinal care will be shown during the course.

Breathing

Once you are happy the airway is clear, assess the patient's breathing. Slow or rapid? Quiet or noisy? Look at the chest – are both sides moving evenly? Is there any concern about a chest injury/broken ribs? Borken ribs or bruising, with chest pain and breathlessness might suggest a pneumothorax (collapsed lung). Look at the patient's lips and tongue for cyanosis (blue discolouration) suggesting hypoxia. Give oxygen if available if any concerns; it will never do any harm.

Circulation and haemorrhage control

Stop any obvious bleeding. Direct pressure with the flat of your hand or a finger is the best first move (not a tourniquet f you can avoid it). Assess the circulation. Good signs include a lucid, talking patient who is still passing urine and has good skin colour, a strong pulse and fast capillary return. Bad signs include a pale patient, slow capillary return with a fast weak pulse, decreased conscious state and not passing urine. Intravenous fluids will be recommended in anyone with significant injuries. Check the circulation of any injured limbs e.g. a dislocated ankle or a brken arm near the elbow may have cut of the circulation to the foot or the hand. It might require realignment to preserve the limb.

Disability = Central nervous system and spinal cord injury

More formally assess the spine and CNS. Assess the level of consciousness with the simple AVPU test:
A – Alert
V – Responds to voice
P – Responds to pain
U – Unresponsive

An assessment of the spinal cord can be made by simply asking the patient to push their feet against you hands (?both equal and normal strength) and squeeze your fingers hard with both their hands (?both equal and normal strength). Can they feel you touching their hands and feet? If this is all normal, there is no spinal cord injury at this point in time. BUT, it doesn't mean they have not got a boney or ligamentous spinal injury which COULD injure the cord if it is not looked after properly. Assume a spinal injury in anyone who:

- has had a significant fall and has altered conscious stat
- is complaining of pain in the spine anywhere

Environment – especially hypothermia in caves.

Get the patient as comfortable as possible, especially if you might be there for a while. Get them off the ground using caving packs, ropes,anything that will insulate them from the cold ground. Hypothermia is your biggest enemy in most caves and once it sets in, it is very hard to get rid of. Get them to a dry area out of the draft. Set up a shelter and keep them warm.

Record all findings!

Secondary Survey

Systematic "head to toe" survey of the body. Talk to the patient and let them know what you are doing, even if they are unresponsive. Remember to watch the patient's face for reactions to painful stimulus. All areas check for deformities, bleeding, and pain response. If in doubt about deformity, check. Be as thorough as possible including undressing them unless hypothermia likely, or moving victim not appropriate. Should exposure suit be removed??

Head and Neck: Look for clear fluids from ears, eyes, nose, or mouth. Check pupils for reactivity to light and if they are equal in size and reaction.

Spine: Check when logrolling or lifting patient.

Chest: Movement should be symmetrical and have no paradoxical motion (one section moving in while others are moving out). Breath sounds should be clear and equal on both sides.

Abdomen: Divide into quadrants. Tenderness or rigidity should be noted along with which quadrant.

Pelvis: Gently rock the pelvis, immediately stop if pain or grating sounds are noted. Legs: Symmetrical to each other? Can they move their feet equally? Can they feel you touching their feet? Do they have a pulse in their feet?

Arms: Symmetrical to each other? Can they grip equally? Can they feel you touching their hands? Do they have a pulse in their wrist?

Record all findings!

Hypothermia

There are numerous disorders caused by inadequate or excessive heat. Some are localised, others are systemic (widespread) such as hypothermia or hyperthermia (heatstroke).

Hypothermia is one of the best-known but most easily overlooked disorders in caving. When cavers are exhausted, poorly dressed or injured, in cool, cold, wet conditions…

The situation occurs when heat is lost faster than the body's normal compensatory mechanisms can replace it. This causes peripheral vasoconstriction (the closing down of small blood vessels in the extremities, sending blood to the core, rapid muscle activity (shivering) and metabolic changes.

Hypothermia is broadly described as a condition where the body's functions are impaired due to inadequate temperature in the body's core. The core of the body contains the vital organs and is designed to operate at about 37 deg C. If the core temperature falls below this, the body cannot function well. If it falls low enough, the body will malfunction and eventually simply shutdown. The temperature of the human periphery fluctuates in response to its environment. Rescuers cannot rely on measurements of peripheral temperature to judge the patients core temperature. It is important that the medical team monitors the temperature of the body core during a rescue. This can be done in a number of ways (rectal monitors or other devices)

It is best for medics to consider and assume that every injured caver is, or soon will be hypothermic. Cavers are generally dressed to be active and when they suddenly become inactive, like after a bad fall, they cool quickly.

There are many different theories on how to treat hypothermia. Different sources present conflicting information regarding classification, recognition, diagnosis and treatment of this disorder.

Signs and Symptoms

Shivering, cold extremities, numbness of hands and feet, diminished mental function (taking longer that usual to complete tasks) memory lapses, poor judgement, ignoring safety, clumsy, agitated, irritability, lethargy, listlessness, slow and irregular pulse, sluggish pupils, decreased respiratory rate, lack of shivering or sever shivering, the appearance of death.

Treatment

Stop the Heat loss –padding, ropes, mats, packs, plastic under and around patient. Dry patient if possible, bivvy sac/canopy
Support natural heat production – warm drinks, food if appropriate (conscious state OK)
Add heat – warm food/drink, carbide lamp/candle under canopy, 2nd caver in sleeping bag.

Warming – Walking and moving are excellent methods of generating internal warmth and are useful in warding off hypothermia, or treating mild hypothermia in a caver who has been given food and water. However, it can be dangerous to ask patients displaying signs and symptoms of severe hypothermia to exert themselves. The additional stress may be sufficient to exceed the body's depleted reserves. It is safer to keep the patient at rest , with heat loss reduction measures in progress, until symptoms clear.

Hyperthermia (heatstroke) – stop, rest, drink, disrobe. Simpler problem, less frequent in cavers but can be deadly.

Psychological Considerations

The mind can powerfully affect the body, positively or negatively. Regardless of their condition, it is important to talk to the person injured and to have good communication with all individuals involved in the event.

Some of the accepted relationships between emotions and vital functions are:

- Anxiety and fear accelerate the body's respiration and cardiac functions and waste energy by muscle tension.
- Patients may become uncooperative and interfere with the rescue,
- A calm attitude slows the body's vital functions and conserves energy for fighting pain, infection, fear and the cold.
- Patients who are calm have more conscious control for cooperation with the rescuers.

The psychological aspects of a cave incident are important and often overlooked. These aspects must be considered and properly addressed for an optimal rescue outcome. In many cave rescues there are long periods of waiting and a lack of visible progress to those on the surface – this produces stress for everyone.

Each individual's mental state will affect his or her physical wellbeing. Leaders in particular need to keep a close eye on the emotional and mental state of all under their supervision, especially that of the person who has the injuries.

Psychological considerations apply to every person involved in the cave incident. The level of consideration and the seriousness of the issues involved vary with the nature of the individuals' role in the incident. They can be separated into the following categories:

- Injured individual
- Members of the involved caving party – friends/fellow cavers
- Non-injured victim – stuck, lost, stranded.
- Family and friends of injured, and also of the rescuers
- Members of the rescue team.
- Landowner
- Bystanders and observers

In more detail

Injured individual – They have many concerns – fear, pain, extent of injuries, chances for rescue. They are helpless and what is occurring is out of their control. The may be cold, feel helpless, disoriented or have impending panic. Any anxiety or fear will accelerate metabolism but also lead to an uncooperative individual.

Members of the involved caving party – they are likely to be concerned by the quality of care and rescue efforts for their friend, guilt and responsibility for the incident. They need to be kept together but in an area adjacent to, but out of the mainstream rescue activity.

Non-injured victim - These individuals are often concerned with self-esteem and peer ridicule.

Family/friends of injured/rescuers – They may have uncertainty and long periods of waiting. Also concerns for safety of those they know and are related to.

Members of the rescue team. These individuals need to remain calm, in control and assertive. It is know that they often push themselves beyond safe physical limits or may be uncertain of their own ability to provide appropriate cave or knowledge. Sometimes they may overstate or understate their own abilities. It is important that any major decisions are made by responsible leaders who have both the experience and the legal authority to make such decisions.

Landowner – need to be treated with respect and have clear and accurate communications.

Bystanders and observers – often uninformed and inaccurate talk can be overheard and produce extra stress

Categories of Communication

1. **Initial Approach**

Rescuers need to gain the confidence of those involved – so trust and understanding are important in gaining optimal cooperation. Introduce yourself with a brief statement of experience with cave rescue matters. The first team will need to obtain important background information from the party about the person injured, and then evacuate the caving party from the cave (explaining that it is in the injured person's best interests to do so).

The main objective is to keep the person calm and positive – so rescuers need to consider not only how they interact with the patient, but also how they interact among themselves.

2. Patient Interaction

- The person who is injured is a "patient" but not a "victim"
- The most important thing is to use the patient's name
- Talk to the patient – be positive
- Never leave the patient alone

Rescuers need to approach the whole person, not just the injuries. The person needs to have the assurance that someone is always watching out for them. Continually verbally monitor their wellbeing and always identify yourself by name and in your role as a rescuer. One-on-One contact reassures the person. Remember that knowledge and understanding are important – so keep the person involved and aware of what is happening around them- always assume that an unresponsive patient is aware.

3. Rescuer- Patient Interaction

- Humans respond well to specific achievable goals. Goals….
- Give sense of direction and purpose
- Allows for a sense of accomplishment
- Allows for an evaluation of actions
- Helps rescuers adapt to negative rescue outcomes

It is important for the rescue team to have clearly established goals that they are working towards. The rescuers must be perceived as calm, knowledgeable and in control. Assume that the patient will hear everything said. Limit the number of people close to the person – only those involved in direct care or evacuation. Keep talk and discussion amongst rescuers to a minimum and keep all discussion involving the evacuation plans or any difficulties away from the person and their caving party. It is important that rescuers work together and that they do not argue amongst themselves.

Communication about Patient and Rescue Updates

One person should be responsible for presenting the situation updates to those who are waiting. This avoids conflicting information from inadequately informed sources, which are common at a rescue site. This means that anxiety is not increased. It is important that the rescue personnel are seen as knowledgeable and professional. Likewise, a specific person needs to be the liaison with the family – to instil greater confidence and to ensure consistency of information.

Consideration of what happens when human life can't be saved – body recoveries.

There are occasions where a patient dies prior to the rescue or during the evacuation. The stress on rescuers is obvious. The resultant feelings can have very detrimental, long lasting effects. Many rescuers may be wondering if they did the right thing.

- Post rescue discussions need to be mandatory – also referred to as a debriefing,
- Professional Counselling should be offered to all involved – many people benefit by having someone (trained in the area) to talk to. It will often be in the days and weeks to follow that rescuers may have different thoughts and feelings.
- CISD – Critical Incident Stress Debriefing

There are 4 different types of debriefings – on-scene; initial debriefing (a few hours after the critical incident); a formal debriefing and a follow up debriefing. Usually facilitated by a mental health professional or a trained individual, the specialized debriefing sessions are not about "process" or "critiques/feedback" but about the individual responses to the situation and their feelings about what happened.

Bad Air

(1) Carbon Dioxide, (CO2)
The most commonly encountered gas problem in caves, CO2 is released into the cave atmosphere by various means eg; percolating water, rotting vegetation. In the majority of cases it would appear that the oxygen level decreases roughly relative to the increase in CO2. The normal level of atmospheric oxygen is approximately 21%, and the CO2 level is about 0.1%. In the cave situation, if the CO2 level is around 2%, the oxygen level would probably be about 19%. CO2 is difficult to detect at low concentrations without sophisticated equipment but at higher levels several symptoms of CO2 poisoning and the normally accompanying O2 depletion become apparent:

a) Panting, deep, strained breathing.
b) Blurred vision and/or headache.
c) Pounding or racing heartbeat.
d) Bewilderment and the inability to carry out simple tasks.
e) Anxiety and panic.

It must be noted that the above symptoms of CO_2 poisoning and hypoxia can be very subtle indeed. They bear a close resemblance to the effects of physical exertion and some types of psychological trauma. Effects vary from person to person and some people show little or no distress whatsoever.

A simple CO_2 detector can be furnished from as little as a candle and matches. A candle will not burn in an atmosphere containing less than about 16% O_2, and a high CO_2 level can be inferred from the O_2 depletion.

(2) Carbon Monoxide
This gas is normally introduced into the cave atmosphere in excessive quantities by the presence of fossil fuel operated equipment being set up near the entrance of a cave which is drawing in air, as would be likely in the case of a prolonged rescue situation. Fires built in or near the entrance of a cave will also have the same effect.

(3) Methane
Methane is produced by rotting vegetation. Beware, it is explosive. It can usually be detected by its characteristic rotten egg smell. It is often noticed by cavers when wading through mud or debris and the bubbles can be seen rising around the legs. Do not use naked flames. Spark free miners type lights must be used in an atmosphere of concentrated methane. Methane is much lighter than air and dissipates quickly. Explosions in caves are extremely rare. Methane will collect in air bells and if a caver duck dives into an air bell and takes a deep breath of the gas, the results will probably be fatal

(4) Dust
Cave dust may cause allergic reactions in sensitive individuals, producing shortness of breath, rasping breath, runny nose and watery eyes. If working in extremely dusty atmospheres, the lightweight industrial dust masks produced for filtering nontoxic dusts should prove suitable.

OXYGEN DEPLETION LEVELS SUMMARY.
21%....Normal
19%....Panting, shortness of breath even after prolonged rest period.
17%....Matches will not burn. Candle burns with guttering flame, if at all.
16%....Candle will not burn.
15%....Approximate beginning level of dangerous hypoxia(at sea level)
12%....Severe hypoxia experienced.
8-10%..Carbide lamp will not burn.
7-8%...Rapid unconciousness followed by death.

(note: the risk at higher altitudes is increased due to a lower PO_2)
Source: D Brooks, (1996).

Patient Transport Within the Cave

Two phases of transport of an injured caver need to be considered in the cave environment – through the dry cave and through a flooded section of cave (sump). Ideally, the same equioment will be used for both however this may not always be possible. Rescuers are encouraged to consider that the simplest solution to the transportation problem will usually be the best. Wherever possible, the authors would discourage the use of overly complex or unfamiliar equipment.

* Before each movement phase, ascertain the following:

I. Is the patient as medically stable as possible?
II. Is the patient stable enough to survive the next phase?
III. Is there a clear plan for each phase of the move?
IV. Is there a plan for any problems that arise during the move?
V. Is there a better alternative?

Dry Cave Patient Transport

The best technique for moving through the dry section will depend on the nature of the injuries, the ability of the patient to assist and the topography of the cave. Assuming the worst case scenario where the patient is confined to a stretcher with possible spinal injuries, what are the desirable features of the stretcher?

The ideal cave rescue stretcher will:

- Immobilise the spine and the limbs, protecting them during transport
- Be easy to carry by the stretcher team
- Be able to be transported vertically
- Slide easily over rocks without damage to stretcher or cave
- Be simple to package patient into
- Quick to remove patient from
- Be cheap and light, comfortable, waterproof and indestructible!
- Bend or separate in centre for tight corners/restrictions

Sadly no stretcher fulfills this wishlist.

A selction of stretcher types and their pros and cons will be discussed in detail during the course.

Through Sump Patient Transport

Once the patient is immersed in water, much of the body will be supported by the water itself and the need for a stretcher will be obviated in many (?all) cases. Restraining a caver on a stretcher underwater has the following dangers or concerns:

- Normally the patient will be supine (lying on back) on a stretcher. This is an unnatural positio for a diver. Regulators often breathe wet in this position and a full face mask may flood. Drowning is a definite possibility as witnessed in a British rescue exercise.
- A stretcher adds bulk and bouyancy issues to the diver. This may make restrictions impassable.
- Psychological – It is very unnerving for a diver to be restrained underwater, especially if arms are restrained.
- Where do you attach the patient's gas supply and how do you manage their bouyancy?

In most cases the injured part of the diver can be immobilised with splinting, spinal boards, CED Device etc without the use of a full stretcher underwater. Wherever possible at least one of the diver's arms should be free so they can contribute to mask clearing, ear clearing and 2nd stage regulator adjustment. The diver should be maintained in a slightly head up, prone position where possible (i.e. normal diving attitude). Bring the diver to the water in a stretcher as necessary, float them off the stretcher whilst supporting their head, attach their dive gear as required depending on the injuries and gently roll them into the prone "diving position" to assess whether all is well.

<u>Role of the Full Face Mask (FFM)</u>

Most divers are not familiar with, and therefore not comfortable with FFMs. Hence they should be used with caution and only when necessary. Such instances might include when the diver is so affected by pain, cold, pain killers, head or facial

injuries that they are unable to securely hold a standard 2nd stage mouthpiece. The use of underwater communications may be considered an indication for FFM however we believe that once submerged in the sump, there are few things that the patient is going to say that will affect the rapid but orderly transit of the sump. One way comms to the patient from another diver may be of value to reassure and explain during the dive however. In the event a FFM is to be used, it should be the most simple and reliable available, providing a good seal on most divers.

Preplan the Exit

Before the dive commences, a clear plan should be agreed upon for all stages of the dive, especially the entry into the water, the attachment of gear, the negotiation of known restrcitions and the exit. The patient is completely reliant on the support divers for:

- Bouyancy control
- Propulsion
- Gas management
- Decompression if required

Whether the diver is towed by a swimming diver or one using a DPV, a suitable leash or bridle may be used. Alternately a diver either side of, or above the diver to move them will work. This will depend on the length of the sump to be passed.

Consider these roles:

- One diver to navigate and *maintain contact with the line at all times*
- One diver to observe the patient and manage their gas and bouyancy – next to patient
- Diver(s) to propel the victim through the sump

Gas Management

What configuration is the injured diver wearing? What configuration *can* they wear with their current injuries? How much gas will be needed for the exit? What about extra gas for the team allowing for their exertion and any emergencies?

When a diver has a serious injury and their gear has already been removed, a simple harness and sidemount system may be the easiest and most comfortable for them to wear. A switch block which can be controlled by the attending diver may be the easiest way to manage their gas supply, so they do not need to change regs or take off their FFM. A system including quick disconnects allows cylinders to be changed out without interupting the gas supply to the diver, but of course all regs in use must have the correct connectors.

*If at any stage the patient may traverse an area where the attending diver will not be in *close and visual contact* at all times, the patient should carry a redundant gas supply (even a small pony bottle with 2nd stage secured around neck).

An example of these gas management systems will be demonstrated on the course.

INTERNATIONAL

UNDERWATER CAVE

RESCUE AND RECOVERY

(IUCRR)

FIRST RESPONDER

MANUAL

WWW.IUCRR.ORG

(05-10-2011)

Ken Hill
IUCRR Program Director

MISSION STATEMENT

The mission of the IUCRR is to support all Public Safety Agencies in the rescue and/or recovery of victims in an underwater environment with an overhead obstruction (caves, caverns, mine shafts, etc.).

ORGANIZATIONAL STRUCTURE

The IUCRR, through its design, must be managed as a paramilitary organization. Chain of command and unity of command are necessary in order to maintain accountability in attaining the IUCRR mission.

The following notes have been written primarily for the USA audience, but most of the points discussed are equally applicable in Australia. As you read this, don't focus on the detail but rather the generalities of the document. Some modifications have been made for this course. RH

1. INITIAL REQUEST – DETERMINE AS SOON AS POSSIBLE IF THIS IS A RESCUE OR RECOVERY

The following procedure is directed primarily for a recovery operation. If, the initial request is a rescue operation, speed will be of the essence. However, the safety of the rescue diver and others, will not be jeopardized unnecessarily. The rescue diver will use caution and common sense. He/she must safely get to the scene without endangering other lives or the rescue is subject to failure.

NOTE: If the rescue/recovery diver has partaken of any alcoholic drink, or if his/her mental faculties are impaired by the use of drugs (prescription or non-prescription), HE/SHE WILL NOT RESPOND TO THE CALL. The request will be relayed to the appropriate rescue diver.

Upon arrival at the scene, the rescue diver will direct every attempt in the saving of a life. There is no set guideline or procedure to follow. The following outline will be used when applicable. Again, common sense will prevail.

The initial request may be received by the IUCRR Program Director, an Assistant Program Director, a Regional Coordinator, an Assistant Regional Coordinator, or an IUCRR Team Member.

- Received by the IUCRR Program Director or Assistant Program Director
  a. He will log all pertinent information and assign the operation to the appropriate Regional Coordinator.
  b. He will assist as needed and assure proper follow up and completion of the operation.
  c. He will notify the IUCRR Chain of Command.

- Received by a Regional Coordinator or Assistant Regional Coordinator
  a. He will log all pertinent information and assign the operation to the appropriate Assistant Regional Coordinator or directly to an IUCRR member or take the assignment himself.
  b. He will assist as needed and assure proper follow up and completion of the operation.
  c. He will notify the IUCRR Chain of Command.

- Received by an IUCRR Team Member
  a. He will inform the Regional Coordinator or Assistant Regional Coordinator as soon possible.
  b. He will complete the operation as detailed in the First Responder Manual.
  c. He will notify the IUCRR Chain of Command.

A member of the IUCRR should not manage the recovery operation if he/she was involved in the diving accident, unless there are extenuating circumstances that would make it impractical.

Supervisory acceptance of an assignment from the Regional Coordinator.
Once you accept the supervisory position, you have the responsibility to complete the entire operation, or until a higher rank relieves you. This includes completion of the accident report initial call out, gathering all diver's statements, Surface equipment log, Sign in and Liaison report and any witness statements when law enforcement is not available in a timely manner and submit it to your Regional Coordinator . If for any reason you cannot complete the operation, you are personally held responsible for notifying your Regional Coordinator immediately so another qualified Rescue/Recovery Diver can relieve you. The only persons authorized to relieve you of IUCRR position are the Program Director, an Assistant Program Director, or your Regional Coordinator.

1. Ascertain and log the content of the request. This log will help you organize the call and the information needed to later write your report.

a. Name of requesting agency
b. Exact location of accident **(**County and name of Dive Site, Nearest intersecting state road, Exact distance from known hard roads, directions).
c. GPS location reading if available.
d. Location of command post
e. Name of Law Enforcement Officer in charge of scene
f. Approximate time victim was reported lost
Note: This is another good time to re-evaluate the incident. Is it possible that this may be a rescue instead of a recovery?
g. Establish an ETA (estimated time of arrival)

2. Notify/obtain adequate resources to the complete rescue/recovery.

a. Make the decision of a rescue or recovery. If in doubt, run a rescue until evidence shows a recovery.
b. Decide what personnel you will need.
c. Decide what equipment you will need.
d. Make request of personnel and equipment. Remember to log all times of any calls you make.

2. STARTING THE RESCUE/RECOVERY.

a. Locate and introduce yourself to the person in charge of the scene. If it is Law enforcement, remember that this is their scene, not ours. We are there to assist them. Do not try to run the scene. If no Law Enforcement is there, you can assume the scene is yours until Law Enforcement arrives. Record everything you do. This will help you later when you write your report. Remember to log all times.
b. Most Law Enforcement will welcome your help. Ask if you can make some suggestions that will help you when you start the actual rescue or recovery. These are suggestions. Law Enforcement will make the final decisions.
c. Cordon off area to all non-essential personnel. Only called in divers should be allowed
inside this area.
d. Establish Command Posts.

A. Primary (area for law enforcement, news media, family, communications, etc. this is away from where the body will be brought up).
B. Secondary (where the actual work is being done). Remember to have space and access for the coroner or ambulance.

e. Halt all unauthorized diving.
f. Reserve access to area for divers, ambulances, police, etc.
g. Only Law Enforcement will talk to the news media and family.
h. Arrange for projected equipment that will be needed (generators, lights, drinking water,
food, firewood, maps, rope, coffee, etc.)
i. Locate all witnesses and persons who might help in the reporting of the incident.
j. Look after relatives and friends of victim(s). This is solely for the Law Enforcement. The IUCRR team will not interact with the relatives and friends of the DD.

3. RESCUE INCIDENT

Once you establish that this is a rescue, use the first qualified rescue divers that arrive on the scene. Make sure the ambulance is called before you enter the water, if you are one of the rescue divers. Remember: It is easier to stop the ambulance if there is no need for it, than it is to get it started. Error on the side of caution. If in doubt, call for the ambulance.

a. If you have other divers, stay on the surface as the coordinator until Law Enforcement arrives.
b. If there are bystanders, give them tasks to help you. Send one to help the Ambulance find the way in.
c. Have a couple people start working on crowd control.
d. Try to keep all family members away from the water edge in case it turns in to a recovery.
e. Do not let any non-certified divers help with the water rescue.
f. As soon as Law Enforcement arrives, turn the scene over to them. Tell them what you have done, and ask them if they want you to continue with the rescue (they will always say yes). It is important to ask to ensure that they know you have given them the scene.
g. Establish excess for the ambulance. Remember, a rescue is a very fast pace incident. Suggest to Law Enforcement that they have a helicopter standing by and have to closest dive chamber on standby.

Alert Divers Alert Network (DAN+).

If possible, have a standby set of divers ready to get the patient from the safety/decompression stop, to the surface. There are cases where you will need to bring the patient up and get them to the chamber immediately, but the rescue divers will not be able to surface. Having the second set of divers will allow the pass off of the patient and safety for the rescue divers.

Information gathering (When Law Enforcement is NOT present).

1. Begin completion of the Rescue/Recovery Report form(s), one per patient.
2. Request that the dive partners, witnesses, friends, and anyone who helped in the rescue to fill out an incident report. If Law Enforcement is on the scene, this is their responsibility. Ask each person to fill their form out separately without talking to each other. We need individual insight.
3. Have each rescue diver fill out their incident report before they leave (appendix B). This is important so you can finish your reports in a timely manner.

Once you have all the reports, make sure you leave your name and phone number, and the IUCRR point of contact information with the on scene Law Enforcement. Ask if there is anything else you can do to help. This lets them know you are about to leave the scene. Leave the scene as soon as the Law Enforcement is done with you. Do not hang around and discuss the incident with anyone outside of the team.

4. RECOVERY OPERATION

Once you establish this is a recovery and not a rescue, you can slow your thoughts down a bit and start planning the recovery operation. Remember, if there is a doubt if it is a rescue or a recovery, run the rescue until you have evidence to prove otherwise.

Do not let any other divers attempt a search for the missing body. There is no hurry and the better you plan the recovery, the less chance of a recovery diver getting injured. Get the liaison work sheet out and start planning your recovery.

1. Request whatever assistance that is anticipated in performing a safe recovery. Even though it is not an emergency, you should work with some awareness of time.
   a. Back-up divers (always have a plan to fall back on).
   b. Relief personnel.
   c. Medical assistance.
2. Consider necessary logistics if the rescue or recovery may be a prolonged operation
   a. Dive equipment.
   b. Transportation: 4-wheel-drive units, boats, helicopters, etc.
   c. Communications: telephones, radios, etc.
3. Consider changes in weather.
   a. Utilize adequate shelters: portable sheds, RV units, etc.
   b. Postpone operation if safety dictates.
4. Organise the search if location unknown
5. Consider the following:

   a. Establish the Command Post(s) for the Recovery Divers
   b. Select an Underwater Team Leader (UTL).
   c. Organize dive teams and their roles.
   d. Assign an underwater photographer.
   e. Assign a surface recorder and photographer. Use IUCRR forms (Appendix C).
   f. Organize surface logistics (back-up tanks, scooters, fire, etc.)
   g. Establish a search plan
   h. Review procedure to be used when locating victim(s)
   i. Prepare a plan for recovery
   j. Body removal
   k. Equipment removal
   l. Evidence handling
   m. Utilize other personnel as needed
   n. Station someone at incident entrance to log all entries and exits
   o. Equipment handlers
   p. Communications (In some locations a cell phone is essential)
   q. Security (Controlled by Law Enforcement)

r. Food and shelter
s. Liaison to family members (This should be Law Enforcement or the senior IUCRR member).

6. Body Extrication
   a. Collection of facts on location of body; assure that all pertinent information is recorded (if safety permits). If you have a photographer on the recovery team, allow him/her time to take photos from all angles before starting the extrication process.
   b. Tunnel size and configuration
   c. Flow
   d. Bottom time
   e. Depth
   f. Prepare the equipment on the DD for extrication. You may need to remove the equipment before extrication. Take pictures of gauges and computer before removal if possible. Try to preserve the equipment and the diving suit on the DD in the condition found. This helps later with the report.
   g. Underwater Incident Scene
      (1) Photograph or sketch of DD(s) and the position the body was found in.
      (2) Collect data before moving body(s) (if safety permits).
      (1) Equipment data
      (2) Air PSIG
      (3) BC-Auto yes/no, degree of inflation
      (4) Face mask
      (5) Lights-on/off, how many, type
      (6) Fins
      (7) Line entanglement/or if any line
      (8) Weight belt (how much)
      (9) Instruments
      (10) General condition of equipment
      (11) Position of body
      (12) Any sign of foul play
      (13) Any sign of struggle
      (14) Collection and preservation of evidence at the surface.

Evidence

a. Immediately notify police officer in charge (if not already done).
b. Do not alter any gear in any manner, if possible.
c. Have one dive team handling all the gear as it comes out of the water.
d. Photo each piece as it comes out of the water.
e. Place in protective containers, or catch bags when possible.
f. If Law Enforcement is not coming to the scene and they want the IUCRR to bring in the gear, mark and identify each piece as soon as possible.
g. Record chain of evidence (Only if requested by Law Enforcement).
h. Only minimum number of persons should handle the gear.
i. Record all names of persons who do handle each piece.
j. Give to Police Officer in charge as soon as possible.
k. Remember, only tag, mark and remove the gear from the scene if Law Enforcement instructs you to. Otherwise, let the onsite Investigator take charge of the gear once it is on the surface.

The Removal of DD – proper recovery plan.

Recovery I - DD is open water diver, limited penetration (less than 200 ft total depth and distance on a single cylinder).

Recovery II – DD is in recreational cave zone, and can be extracted using OC equipment: manifold doubles or sidemount setup.

Recovery III – DD is outside the recreational zone. The teams will require special equipment, sidemount, stages, DPV and/or CCR.

Recovery IV – DD is below recreational depth limit. Special training and equipment is required (deep caves). This will include CCR, DPV special gas mixes (if using OC) and/or other equipment.

<u>Recovery I – Cave unrestricted and depth is above 130 feet. The DD is suspected to be an open water diver in a cavern/basic cave zone.</u>

a. Raise DD by using BC on DD first. If necessary, inflate with your own BC.
b. With diver at neutral buoyancy, move body to cave entrance.
c. Remove gear from body. Do not sacrifice your own safety to do this.
d. Remember to do your teams safety stops/decompression.
e. Ascend slowly to prevent embolism of body tissues of DD.
f. Pass gear to surface dive team for photos and recording. Remove body from water to preplanned location (all by standers, family, and friends should be out of view of this procedure).
g. Turn body and equipment over to proper authorities as soon as possible.

<u>Recovery II – Recreational cave zone, diver on main line or popular offshoot tunnels. Diver is not suspected to be in small areas.</u>

a. Utilize qualified Rescue/Recovery Divers. Make sure each diver signs in. All rescue divers should be IUCRR trained divers if possible.
b. Prepare necessary cylinder configuration.
c. Lay line from the cave entrance to the main line. Remember placement rules. Visibility may diminish when you are extricating the body, so make sure a good line is in place, even in a well known cave
d. Remove gear from DD only if needed (err in favor of safety).
e. Remove tank, regulator, and BC (if attached to tank). Remember to use the DD's BC to assist in achieving neutral buoyancy and retrieval of gear.
f. Drop weight belt (if DD is wearing one).
g. Begin body removal
h. If gear is removed, dive team 2 should meet team 1 and get the gear at the decompression staging area and start getting it to the surface.
i. Dive team 1 will surface with the body after their decompression and/or safety stop is completed.

j. If Team 1 is still in decompression, and team 2 is finished getting the gear to the surface, team 2 should go back to the decompression area and bring the body to the surface, allowing team 1 to finish their decompression time. Do not risk your own safety for a recovery operation.
k. Make all decompression stops.
h. Plan for line removal by a qualified dive team.

Recovery III – Beyond recreational limits, offshoot tunnels, small passages and beyond 2000' in popular cave systems (beyond the gold line).

a. Make sure you have enough Dive teams to make the search and extrication (keep one fresh team for the extrication).
b. Extra teams may be needed to switch off of both search and extraction.
c. Record all teams going in, all teams coming out and their times.
d. Mark on a map what areas were searched, when they were searched and by which team.
e. Equipment selection may be specific to the type of cave. Sidemount, DPV or CCR may be required for extraction teams.
f. Station extra O2 at designated decompression site as needed. Remind all teams to complete all required deco stops.
g. Once the body has been located, all divers should return to the surface. The fresh extrication team should then go in to retrieve the body. If the body if far in, you may need to plan a second team to relieve Team 1.
h. Search and recovery is high task loading. Watch the dive teams carefully. The Incident commander is responsible for all assignments. Only allow teams back in the water that are well rested and rehydrated.
i. Finish the recovery with the process from Recovery II once the body is at the decompression stage area.

Recovery IV – Deep Cave (below 130 feet)

a. Utilize special personnel qualified for deep diving. They all must be trained in Trimix diving or CCR. Try using only IUCRR divers if at all possible.
b. CCR is recommended for deep extractions unless the cave requires sidemount. These should be specialized teams.
c. Follow procedure III. These recoveries are time consuming. Do not push the recovery divers. Take your time and keep the teams safe.
d. Follow procedures in Recovery III.
e. Make sure you have the surface crew ready to receive the body when the divers come up.
f. Plan for decompression problems. If you are far from a chamber, you may want to have a helicopter and the chamber on standby in case there is a DCS incident with a recovery diver.

NOTE: These are extremely dangerous dives. Keep your teams safe.

Record all pertinent information and coordinate with the Law Enforcement in charge of the scene.

REMEMBER! - Emphasis should always be on safety of Rescue/Recovery Diver. It is better to leave the equipment in the cave than to jeopardize the Rescue/Recovery Diver's life.

NOTE: *IF THE RISK FACTOR IS TOO HIGH, YOU MAY NEED TO ABANDON THE ENTIRE RECOVERY. THE VICTIM IS DEAD. NO RECOVERY IS WORTH THE LIFE OF A RECOVERY DIVER.*

5. POST RESCUE/RECOVERY

A. Assure that all records are complete.

- Ensure that evidence is recorded, preserved, marked, and turned over to the proper authorities if Law Enforcement is not present.
- Cooperate fully with the Law Officer in charge. Remember, these are their scenes. We are there to help them extricate the body or rescue for a success.
- Complete and submit all required reports to proper agencies and persons. Make sure you send a copy of all the reports to your Regional Coordinator. Save a copy for yourself.
- The IUCRR Report must contain the information required by the Accident Analysis Coordinator as shown on the IUCRR On-line Report.

  As a rule, if you cannot get the information on the IUCRR On-line Report, it is probably unnecessary information. This does not preclude the submission of a supplemental report through the chain of command.

  Keep the report simple and as factual as possible.
  The Regional Coordinator must approve the final report before it is submitted.

NO ONE CAN CHANGE THE CONTENTS OF THE ORIGINAL REPORT WRITTEN BY THE IUCRR MEMBER MANAGING THE RESCUE/RECOVERY OPERATION. The Regional Coordinator (or the next level above ranking IUCRR Staff Member) may point out discrepancies concerning grammar, IUCRR policy, IUCRR procedure, etc. and ask the writer to make the necessary corrections. The Regional Coordinator may submit a supplementary report if deemed necessary. If the IUCRR Member managing the operation and the Regional Coordinator cannot reach an agreement on the final report, the next level in the chain of command must be contacted and the matter resolved before the report submitted. Remember that all reports have the potential to show up in court. Take time to spell words correctly and write the best that you can.

1. Check with the Law Enforcement Officer in charge to assure that the operation has been completed and he/she doesn't need you for anything else.
2. Do not suggest or solicit any financial aid or reimbursement for your aid in the recovery operation. Exception: Airplane tickets when flying is necessary.
3. As soon as practical, critique the entire operation for constructive review and suggestion to make the next rescue/recovery better.
4. Before the team leaves the site, obtain all related data needed for the report (see appendix A-E).
5. Ensure all the IUCRR members fill out their report before signing out from the scene (appendix B).

- The only person that should have contact with the media is the Law Officer in charge of the scene. If he asks for input, give only facts. Do not offer opinion.
- Do not release any names of the rescue divers. We are a team. You can release the name of the Team/Organization: IUCRR. We are not in this for glory. If the Officer wants to write a press release, that is up to him. We cannot get involved in that.
- Contact your Regional Coordinator immediately after completing the operation.

Appendix 2 Self Rescue Tips

Self Rescue Tips

Improvise wound closure strips out of duct tape. Cut the duct tape into 1/4 inch strips. Puncture tiny holes along the length of the tape with a safety pin. The holes prevent fluid build up under the tape while it covers the wound.

Almost all cave rescues involve long term (over a few hours) care of a patient. Good psychological care of an injured caver becomes a critical factor for a successful rescue. Keep your patient calm and allow them to participate in their rescue. This gives them a feeling of control and allows them to utilize their limited energy toward the rescue instead of toward panic and immobilizing fear.

Create a makeshift sleeping bag from a couple of plastic garbage bags. Loosely fill the garbage bags with clothing, dry leaves, papers, etc. Tie or tape the bags shut to prevent moisture from soaking the contents. Place one filled bag over the patient, and the other below.

Blisters can be "glued" in place if it is necessary to keep walking. Drain the blister with a sterile needle or knife. Inject a small amount of super glue or tincture of benzoin into the blister and press the loose skin into place. The pain is intense, but will only last a few moments. Cover the blister with a piece of tape and keep going.

Use a zip lok bag to create padding if no other material is available. Inflate the bag by blowing into it and then seal it with duct tape.

Circular cuts on T-shirts for a compression bandage
Make a conforming roller bandage out of a T-shirt or similar stretchy garment. Cut a thin strip of material from the body of the shirt in a circular fashion.

A moistened non-herbal tea bag may be used to control bleeding and pain within the mouth/tooth socket. The tannic acid in the tea acts as a vasoconstrictor (constricts the blood vessels).

Replace a lost filling by melting some candle wax from your rescue candle. Let the wax cool until it is soft and pliable, and stick it into the tooth. Smooth it out with your finger, bite down on it, and wipe away the excess wax.

It is easy to make a sling from just a few safety pins. Secure the patient's sleeve to his coveralls using several large safety or diaper pins, spaced evenly along the arm. Make sure you pin the upper arm to the coveralls too. Wrapping the arm and torso with duct tape will further secure the sling.

Wrap several feet of duct tape around each of your water bottles. This method of carrying tape does not add much bulk or weight to your gear. The tape will also be available when you need it.

If you don't have enough pulleys for your haul system, a karabiner may be used as a poor substitute. Expect losses in efficiency of 50 percent or more.

As a person's blood pressure starts to drop, the pulse will disappear from certain areas of the body. First, the pulse will disappear from the feet. Next, it will disappear from the wrist, then from the neck. Prior to blood pressure dropping, the pulse rate will usually increase. A change in pulse is a clear indication that the patient is experiencing distress.

Small plastic sandwich bags are often used to carry caving items. You can use them as a substitute for a set of surgical gloves. Turn the bag inside out (dirty side in) and stick your hand inside. The bag is a little awkward, but does provide a barrier against contamination.

A broken finger can be splinted simply by padding it and taping it securely to the finger next to it!

Need a splint? How about a nalgene water bottle? Cut off the top and bottom of the bottle. Next, make 2 lengthwise slits in the remaining tube, from top to bottom, splitting the tube in half. Place the two pieces of nalgene around the injured area. Tie or duct tape the splint in place.

A bandanna worn under the helmet can keep your hair clean, your head warm, and act as a bandage or sling in an emergency.

An irrigation syringe can be made from a small zip-top plastic bag and a safety pin. Pour water into the bag, seal it shut, puncture the lower corner with the safety pin, and squeeze the bag.

Carry a set of non-latex (vinyl, Nitrile, poly-blend, etc.) surgical gloves in your medical kit. They create instant "clean hands" for dealing with wounds.

Self rescue tips from: http://home.netcom.com/%7Echeazlit/self_rescue/home.html

All cavers should learn about “Harness Syndrome” or “Harness Suspension Trauma”

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