12. Problem Solving and Rescues.

This chapter has been kept deliberately short and vague. There are many books out there on rescue skills – all better than this one.

As the more complex scenarios will demonstrate the skills required to deal with problems that might arise during a long drop abseil are varied and manifest. It is not the ability of someone to perform the skills that is important but the judgment to be able to correctly apply the right skill at the right time. Having a full arsenal of rope rescue techniques as would a holder of the MIA or MIC award is essential and beyond the remit of this book however, this chapter outlines some useful set ups and specific techniques that have been found particularly pertinent.
(For knots see Chapter 7).

Insert 30

All techniques described in this chapter will exclude the use of a knife. When working with ropes an industry mantra is "Think rope, think knife" but this is in the case of an entrapment emergency. There is no need to use a knife if you have good set ups and good skills and indeed, waving a knife around in an abseil rescue situation is potentially very dangerous.

Virtually all situations faced on an abseil stance can be dealt with from the top and it will be instructive to deal with some of the more complex ones before we consider having to descend.

- Having to drop in excess of 60m of abseil rope. Unscientific tests have demonstrated that a 60m rope on the helmeted head or unprotected body can smart somewhat but not cause any significant damage (obviously uncoiled). If it is necessary to lower someone further than the remaining rope and the dead end has to be released this then if it is greater than 60m there is a risk of harming someone. Also, unless the drop zone has been cleared and there are no spectators within the reach of the rope then there is a risk of serious injury to passers-by. In these circumstances then it is always better to safely lower the abseil rope using another rope.
    - Attach the second rope below the abseil point with a mechanical device or klemheist and ensuring that there is a separate friction system on the new rope continue to lower (photo 110). Once the weight is on the new rope release the old system and tie a knot in the end in case the connection fails.
    - This technique, applied on the belay rope is also effective should a lower be required without enough rope to reach the ground.
- A jammed belay device. Quite how is difficult to envisage how it will happen but again, it is easy to deal with.
    - Using another rope set up a separate system and attach to the safety rope below the belay device with a klemheist prussic or mechanical device. Take the weight off

the jammed belay device, release the rope, reattach the belay device and continue. A rescue should be avoidable.

Equipment and techniques

Abseil devices

There is a dichotomy between what is recommended for charity abseilers and what is effective in a rescue situation. With a long drop an ab-rack is advised but from a rescuer's point of view it is not be the device of choice. It is safe and provides a good level of friction, consistency and control throughout the abseil but is unfamiliar to many and is less versatile should you, for example need to haul yourself back up the rope.
This also applies to some self-locking devices. If the rescuer needs to turn the system into one that allows them to ascend they all further complicate what they have to do.
It has been found that a normal belay type device is difficult to use for the most part but has the advantage of versatility and familiarity. This is not to remove the responsibility of the rescuer to be familiar with the most appropriate technique.
Every climber will have a preference but with the shorter abseils using a belay type device that is less-forgiving (slick) is the best compromise. It can still be operated with one hand and can be turned into an ascension system with minimal fuss.

An improvement is to extend the abseil device a short distance with a sling normally larks-footed to the harness or with a short extender and screwgates (Photo 109). It is a matter of personal preference as to whether the sling is attached to the belay loop or directly to the harness via the belt and leg-loops but generally if you're about to effect a rescue pick up it is quite useful to have your belay loop free for attaching yourself to things.
Do not be tempted to have the abseil device too far away as this limits your ability to then ascend the rope if required (hopefully not). As a rule of thumb the abseil device should be extended about 30cm using a long sling and knotted into a Y-hang (Photo 112). This gives you the attachment point for your abseiler when you reach them.

Photo 112 Use of sling as an extender and Y-hang. The instructor should be just below the abseiler and a safety rope should be attached.

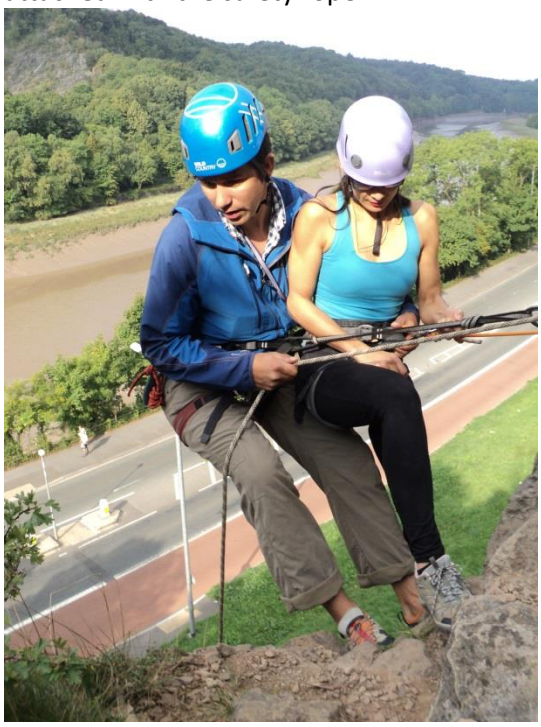
Auto-locking; equipment and techniques

To abseil without an auto-locking system is not an option and there are many systems out there each with their detractors and advocates. It is important to be familiar with as many systems as possible as the system that you may have to use is not the one that you prefer. Being able to change it is your prerogative however only if you have access to the right kit and consider your method to

be superior given the circumstances. Not being familiar with the abseil set up is not a reason to change it necessarily.

The most common method known to climbers is the use of a French prussic (see chapter 8) on the leg loop. It is quite common to not extend the belay device and doesn't really cause a problem on a short abseil to retrieve a bit of gear. On longer abseils it is imperative to extend the abseil device (Photo 109). When this is done it is then possible to attach the prussic to the belay loop as opposed to the leg loop – as to whether this confers any advantage is a matter of opinion.

Photo 113 The prussic can be controlled with one hand if necessary. The client is still attached with the safety rope



This method is successful and if done correctly is effective and causes very little damage to the prussic and rope so is inherently safe. By the prussic being below the abseil device it can grip the rope adequately even with the weight of two people. With practice the knot is easily controlled and can even be done with just one hand allowing the rescuer to deal with other matters such as protecting the abseiler however two hands are better utilised by the bottom hand controlling the prussic and the top hand the rope (Photo 113).

A set up with the French prussic above the abseil device is not, for the purposes of long drop abseils particularly effective or useful. If set up as in Photo 114 with the prussic directly attached to the carabiner then it is a versatile system which allows the rescuer to move up and down the rope safely without having to change the set up.

The disadvantage is that the full weight of the rescuer (and then, subsequently abseiler as well) is transmitted through 5mm of cord which is not considered safe. However as a technique it is useful should someone need to abseil a short distance over the edge to provide support to a determined but scared abseiler. The rescuer can then safely return to the stance.

Insert 31

I have used this method successfully a number of times unfortunately as a consequence of working with people that I have not trusted to keep me safe. I call it the 50p gri-gri and it does take a lot of practice and familiarity with the prussic cord before you know exactly how many wraps to add. As well as this using the right sized carabiners is crucial – there is no set way, just the way you are familiar with and know works.

With an extended abseil device it is possible to use a sling as your 'auto-bloc'. Ensure you use a klemheist and that again, you are familiar with the technique. This has the advantage of using full load bearing equipment but a sling is much more prone to damage from abrasion so could, arguably over a long abseil become catastrophically damaged.

Mechanical Auto-Locking Devices

Photo 114 Laura demonstrating the 50p Gri-gri

The fundamental problem with mechanical devices is by their very nature they provide the friction and therefore control of the rope which significantly increases the heat generated. Many are also not 'intuitive'; the natural reaction to fear is to grip this causes the device to release. Many (normally minor) accidents are well known with certain devices that have been over gripped at the wrong time.

So when considering mechanical devices they must be put into context of their effectiveness and the experience and competence of the rescuer. They are *advanced* pieces of kit and should only be used in appropriate circumstances by experienced practitioners.

A big disadvantage for mechanical devices over the system described above is the need to use two hands at all times. This means that either the rescuer is abseiling or performing a task but never the both. For an access worker this is not a problem but a rescuer needs to have a hand free to support the abseiler and possibly prevent further harm. This is always a compromise and the safest option should be considered with the equipment available and the skills of the rescuer.

Photo 116 Petzl ID

Another disadvantage to mechanical devices is the need to keep them close to the body in order operate effectively. They should be clipped direct to the harness loop in order for them to be reached with both hands easily. If the device is extended with a Y-hang a rescuer in a full body harness with a terrified abseiler clinging onto them would be unable to reach the controlling handle and would be stuck.

The y-hang is not essential but does mean that when picking up the abseiler they are in a position slightly in front of the rescuer and protected from harm by the rescuer's legs or they can walk next to the rescuer. Having the device attached to the harness means that the abseiler will swing below the rescuer which is far from ideal.

Overall, however the mechanical devices on the market are excellent and should be considered as the way forward and a 'dulfer now' attitude does not benefit the industry or contribute to the implementation of best practices.

For completeness, however we will discuss all the popular devices and known techniques here.

Petzl ID (Photo 116)
The industry standard and should be seriously considered. It has an anti-panic facility where if the user over-grips and pulls the handle past its release position it will automatically lock

Photo 117 Petzl Rig

Petzl Rig (Photo 117)
The standard device for rope access without the anti-panic facility and if over gripped by a panicking abseiler will release. Slightly cheaper and preferred by IRATA technicians

Petzl Gri-gri 2 (Photo 118)
The original gri-gri is no longer manufactured and due to its size it is slightly easier to use then the newer version so is still a favourite of route-setters. Neither the original nor the Gri-gri 2 are good devices for abseiling however as they are both a bit twitchy and should remain in your sport climbing sac.

Photo 118 Petzl Gri-gri

Photo 119 Petzl Stop

Petzl Stop (Photo 119)
It has a large release handle which when gripped causes the abseiler to descend but is a popular and effective device in certain quarters (caving) but only appropriate for long drop abseils in expert hands due to the potential for over-gripping causing complete release.

Edelrid Eddy (Photo 120)
This device was the first real contender to the Gri-gri and operates in a similar fashion to the ID – pull the handle too hard and it locks. It has its detractors but generally works very well to abseil although requires a little bit of practice despite being a 'beginners' device.

Photo 120 Edlerid Eddy

Photo 121 DMM Anthron

DMM Anthron Double Stop (Photo 121)
A relative newcomer to the market and works by creating friction through the passing of ropes around movable (but not rotating) heads. The friction generated causes the device to lock and squeezing the handle too hard also increases the friction. The device is not 'hands free' and also doesn't convert to an ascending system even for short distances.

Trango Cinch (Photo 122)
With arguably the best name this device has been around for a while now and works on similar principles to the Gri-gri but is smaller and lighter. Is still a bit twitchy and not a lot of fun for abseiling

Petzl Shunt
This is not an abseil device but a 'rope clamp device' which is nevertheless still often used by climbers as it can be attached to a fixed line for practicing on routes (Photo 123). If combined with a standard abseil set up and used as a replacement for a prussic it can be used really efficiently and effectively by an experienced abseiler. In order to make it practical a small loop of cord can be used for the wrist and it can be operated with one hand. Sometimes known as a 'dead man's hand' it should be pointed out that this is not in any way recommended and could fatally interfere with the working mechanism of the device; should the abseiler be rendered unconscious then their weight will pull on the cord and release the shunt. This system, however has the advantage over all the other systems in that with this (potentially lethal) loop of cord it is possible to operate this system one handed and on longer drops the danger of a melting prussic would not be relevant.

Photo 122 Cinch

Gloves are generally required.
Again – it should be stressed that this is not recommended by the manufacturer.
It is also not recommended for use on two, independently anchored ropes. The issue here is that if the device is on two independently anchored ropes and one fails then this rope expands due to no longer being weighted. This would then cause the device to slip on the other rope. Where it is acceptable is being used on a retrievable abseil system – in effect 1 rope. It is perfectly acceptable to use the shunt on one rope.

Photo 123 Shunt being used by Danny. The sling has been shortened and the rope is weighted down with a rucksack.

If used above the abseil device it can then be used as a back-up *and* a high attachment for ascending or for setting up a hoist to unweight the abseiler's ropes (see below).

Ascending

The ability to ascend a rope should be well within the comfort zone of any rope rescuer using a variety of equipment. Within the rope access world there a very specific ways to do it as it assumes an uncomplicated necessity to move up the rope using specific equipment and techniques (Fig 18).

- Two lines are required in this context.
- Attach a self-locking device (such as a Petzl Asap or DMM Buddy) to one of the fixed lines.
- Attach an ascending device with a large handle to a second rope.
- Attach an appropriately sized sling for use as a foot loop to this hand ascender. Ensure that a cowstail from the harness is used to maintain a connection to the hand ascender.
- Attach a chest ascender from the harness directly to the same rope as the hand ascender.
- Ascend a short distance and then stop to ensure that the back-up device is moved up the rope.

Climbers tend to do it a bit differently. The circumstances where a climber needs to ascend a rope are very rare and tend to be labelled under the heading 'problems'; a retrievable rope getting mysteriously caught, a fall into a free hanging position where it is not possible to be lowered to the ground, not being able to follow a strong leader or just escape from worsening conditions.
In these circumstances it is likely that a climber will only have at their disposal a couple of prussiks i.e. two 50cm loops of cord. These can solve all of these problems and many more.
Although such situations are inherently dangerous and test the mettle of the best climbers it is interesting to note that more equipment wouldn't really help. As these scenarios are covered extensively in other books then they will not be covered here.

From an abseil rescue context it is a mixture of the above. Using mechanical devices and known variables but by the very nature of 'unforeseen' being applied in an improvised manner. It could be much more complex which is why it is essential to be familiar and practiced with a wide range of techniques and pieces of equipment.
First we should consider why a rescuer might need to ascend.

- After assisting an abseiler over the edge they may not be needed to continue with the abseiler the rest of the way. This would be a prepared for possibility.
- Due to a misjudgement the rescuer might have overshot the abseiler and be underneath them and are unable to be effective.
- The rescuer might need to take the abseilers weight off the ropes (discussed below) and needs to get up a little higher.

It can been seen that where there is a need for the rescuer to ascend it is imperative for them to do so but that due to the nature of the emergency that they might not have prepared themselves. As there is always a likelihood of ascending being required then it is more advisable that a rescuer has the skills and the equipment on their harness to do so as opposed to pre-rigging.

It has to be assumed that the rescuer is abseiling on one rope although a back-up device can be placed on the second rope attached the stuck abseiler.

The only way to safely ascend the rope, even over short distances is by using an ascending device *above* the descending device which is attached to the harness by a cowstail. This gives you a couple of options; for short distances, such as in the scenarios described above it is possible to take the 'dead rope' coming out of your descending device and clip it to the ascending device above. This creates a pulley system which allows a fairly strong person to pull themselves upwards. Attaching a foot loop to the ascending device makes this a lot easier and can negate the need to create the pulley system and is more effective for longer distances.

Backing up

As a rescue abseiler it is not necessary to have a system incorporating two ropes as discussed in Chapters 5. However, it is important to consider options which may only prove precautionary.
It is unlikely to be practical to use two lines but if picking up an abseiler you will already have their line in-situ. Is it possible to use this? Even if there is one twist with the abseil and safety rope it will not be possible so should be avoided. However you could clip a carabiner around both the abseil and safety rope which would mean you would only fall as far as the abseiler. This technique makes the most sense in windy conditions as it brings you to the abseiler.
If using the rope which your abseiler is currently dangling from as a back-up it is important to remember that you cannot guarantee the rope will not be untied once you have picked them up. In

Photo 127 Back up devices

Petzl Asap

Pettl Shunt

DMM Catch

DMM Buddy

Wild Country Ropeman (above)
Camp Goblin (Below)

Safe-tec Duck-r

fact you may be depending upon it. You must be very clear to the person belaying what you expect from them and it is often advisable to use walkie-talkies.
Upon reaching the abseiler it is highly likely you will be 'picking them up' so clipping to them immediately will always be your back up unless the problem is with the safety rope in which case you should be considering your options prior to descent.

If you choose to back up you could do so with any prussic or the devices listed below (Photo 127):

Petzl Asap
The industry standard and should be considered. Ensure it is within reach but remember it is not designed to be loaded except during a fall so is only of use as an emergency arrest.

Petzl Shunt
A staple of climbers and route setters for 25 years. Ensure it is within reach and it has the advantage over the Asap in that it can be regularly weighted and even, with the addition of a small piece of cord, released under a light load. In this context do not attach a loop of cord (Photo 124) but a single piece which would be let go of by the rescuer should they lose consciousness (Photo 127). It has been shown in live tests, however that even trained users would still grip this cord so it is no longer advised to attach any cord to the device.

DMM Catch
A one way device for use on 11mm ropes it is a bit limited in its scope but is very smooth. Not appropriate for rescues as will not follow you down, only up.

DMM Buddy
A more versatile device that will move freely up and down and catch you in the event of a fall. Also can be used with 10.5mm – 11mm (or 11mm – 13mm) ropes.

Wild Country Ropeman
A small device designed for climbers to give them a reliable and lightweight prussic replacement. Like the Catch it only moves one way so is not appropriate for abseil rescue back-up.

Safetec Duck-r
A device using a similar braking method as the Shunt but designed specifically for use on one rope. Has the same 'dead man's hand' drawback but easily avoided if only a short piece of cord is used – as pictured

Camp Goblin
Works very well up and down and can be adjusted. For use with 10mm – 11mm ropes.

Setting up a rescue

It is extremely unlikely that a situation will occur where someone has to be rescued immediately and is normally a gradual process that gives a rescuer time to set up and prepare. However consider the most unlikely of scenarios:

- The abseiler inverts and traps a particular body part into the abseil device whilst twisting the safety and abseil rope so comprehensively that they can no longer descend. The trapped body part causes extreme pain and with the inversion results in the abseiler passing out. You have only a matter of minutes (10 if you remember) before the abseiler dies. There is not enough safety rope to lower the abseiler to the ground.

Photo 128 A pre-rigged rescue bag

This situation might seem ludicrously unlikely but it is important to consider that given the high risk environment in which abseiling operates it is not enough to write risk assessments retrospectively and that if a situation is foreseeable by the author of this book then it must have been considered by others. This means that in a court of law when faced with the question, “was this a foreseeable’ event?” an experienced technical advisor for the prosecution would have to say, “yes”.

So, we need to be prepared.

Having a pre-prepared rescue bag is a necessity on long drop abseils but remember to utilise an adjacent line first if there is one free. Never discount the possibility that while one rescue is being performed that another might have to be initiated. As a general rule there should be one rescue line per rescuer – whether you choose to include the abseil leader into that equation is dependent on circumstances.

The most important role of the bag is to allow for a safe paying out of the abseil rope as the rescuer descends which removes the need to throw a rope down. It also means that in the event of unforeseen windy conditions that there will be no further complications from twisted ropes. Carefully feeding the rope into the bag is crucial to ensure a nice clean pay out and this should always be done immediately prior to the event. Do not store the rope in the bag.
This bag can then be clipped to a harness during the descent but be aware that 100m of abseiling rope can weigh up to 4kg and should be clipped to appropriate attachments.
Often it is convenient to use a sling to attach the rope so it dangles beneath the rescuer or attach to the leg loop (less comfortable).

The other end can be pre-rigged with an appropriate rescue system as discussed above if expediency is required meaning that it will take a matter of seconds for the rescuer to attach themselves. The system shown in Photo 128 is a Rig extended with a made-for-purpose y-hang with maillons and thick, nylon extenders of different lengths.

A figure-of-8 knot is all that is required to anchor the system and pre-tying the knot removes the likelihood of rescuer error should it be a high stress situation. It may even be worth designating a specific rescue rope attachment point. Most are happy with attaching directly to the same point as the abseilers rope and are often reassured by also clipping the belay loop as well. Factoring in enough rope so a second anchor could be attached and tied might be considered excessive and if a rescuer insists upon another attachment point it takes a matter of seconds to feed out some rope to do this.
It can be seen that this system is safe and controllable and easily adopted and as mentioned earlier a simple addition to the system is a carabiner clipped around the ropes of the abseiler to ensure you connect and as a back-up.

An important consideration is the health of the rescuer and it is unlikely that the belay team are wearing full body harnesses or chest harness so having a chest harness as part of the rescue set up allows the rescuer to make that decision. An improvised chest harness such as a *Parisien baudrieir* (see Photo 39) is not familiar to many and can be difficult for inexperienced climbers to get right 'on the hoof'.

Releasing an abseiler

Consider this other worst case scenario:

> The abseiler has twisted all the way down a free hanging abseil, the belayer inadvertently let the slack on the safety rope dangle down the building as well and it became caught in the twists. In their frustration the abseiler pushed the abseil rope through the fig-8 and it larks-footed which when weighted became stuck. They are heavy.

You have some options:

- Pick them up and cut the abseiler's safety and abseil rope (not recommended)
- Drop down to them with a spare safety rope being controlled from the top, attach them to it then cut the abseiler's ropes (not recommended).
- Drop down to them with a spare safety rope set up with a haul rig at the top. Attach them to it, haul them up a bit, release the ropes from the abseiler then lower them to the ground – you could also pick them up as a precautionary measure (recommended).
- Abseil down to them, pick them up, unweight their ropes and release them then abseil to the ground (recommended). This is the most complicated system and is discussed in detail below.

It should be pointed out that hauling someone up sufficiently to unweight the ropes is almost an impossible task over 50m as there is too much stretch on both systems and if the abseiler is heavier than the rescuer then almost impossible over 20m. In these circumstances then a knife will solve a lot of problems.
Cutting away an abseiler from a full set up i.e. from safety rope and abseil rope is considerably easier and safer if a short extender is used to extend the abseil device which will avoid having to cut the harness belay loop.

The set up shown has the rescuer using a y-hang and standard belay plate with a prussic. It is even easier if you use auto-locking devices as your abseiler will finish dangling beneath you anyway due to the hauling requirement. The set-up is important for this as you will need a high attachment point above your abseil device for your hoist. The best device for your high attachment is a mechanical one that doesn't require inertia to grip the rope such as a shunt however a prussic should be adequate.
You will also need on your harness a 240cm (or longer) sling and a 120cm sling and a few spare carabiners.
Have a carabiner already attached to the receiving end of the y-hang.

- Descend to the abseiler and stop with them just in reach below you.
- Extend your y-hang by larks-footing the 120cm (to avoid confusion) sling and clip to the abseiler.
- Attach the shunt above your device or on the abseilers rope.
- Clip the 240cm sling to the abseiler and pass through the shunt
- Stand on the other end and lift (and pull) the abseiler to unweight the rope.
- You can then clip them directly to the y-hang.
- Release the abseilers ropes and descend with them to the ground.

It is important to reiterate the need for good skills, experience and practice. This situation is, ultimately and thankfully very avoidable and the employment of experienced and well qualified staff will mitigate against such occurrences.
However we need to move forward professionally and with one eye on the future as there will always be changes and developments and it is better that those changes come from within the industry rather than being imposed on it from a reactionary state.

Continuous Professional Development (CPD)

This is an important part of any profession. Taking responsibility for one's own competence and skills is part of that; not being dictated to about what you can and can't do to ensure your practice is current and competent shows a mature and responsible industry and in return one that expects compliance from its practitioners.

The fundamental skills of risk assessment and rope work is part of that which can always be enhanced by being in the mountains and going climbing but if working on buildings is your bread and butter then learning the right stuff is as equally important.