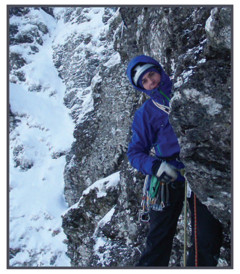


CRITICAL INCIDENT ANALYSIS CPD WORKSHOP

JAMES THACKER

For quite a few years now I have held anecdotal views as to the cause of many climbing accidents in the Peak District, having attended many as a former member of Edale MRT. Ultimately, I was interested in finding out what was happening historically, and whether any significant conclusions could be made about what we teach. Much of this might be blindingly obvious, but I'm sure it will be of interest to many AMI members.

In deciding to review the statistics it became apparent quite quickly there were a couple of significant factors in a large proportion of accidents. As such these formed the basis of our discussions (thanks Caroline, Simon, Jon, Chris and Andrew) at the CPD workshop held on the 24 September. Following this, the aim was to simply try to identify the greatest risks, consider how we might adjust or improve our teaching and put some things into practice at a single pitch venue.

Firstly, it must be said I have a suspicious view of statistics being a Mountaineering Instructor and Guide rather than mathematician. Please keep the following caveats in mind – the statistics represent:

- Climbing incidents on the Eastern Edges eg. Stanage/Froggatt etc in 2010 only.
- Incidents where there was the involvement of a rescue team, in this case Edale MRT or both Edale and Buxton MRTs. ie. self rescues and incidents dealt with by air ambulance assets may not be recorded.
- A primary cause can sometimes be difficult to establish.
- There can be no differential made between those injured who have had formal instruction and those who have not.

In 2010 there were 28 climbing incidents with MRT involvement (only surpassed by 2008 which saw 31).

TYPES OF INJURY

Of these incidents there were three main types of injury mechanism.

1. Fall from height onto feet resulting in injuries to the heel (calcaneous), lower limbs, lower back (lumber vertebrae).
2. Fall from height with lateral landing (sideways) resulting in injuries to the ankle and wrist (due to reflex) followed by injuries to the chest, long bones (femur/humerus), head, upper spine and neck (thoracic/cervical spine).
3. Poly-trauma, significant life threatening multiple injuries, in significant falls from height eg. all the above plus internal injuries.

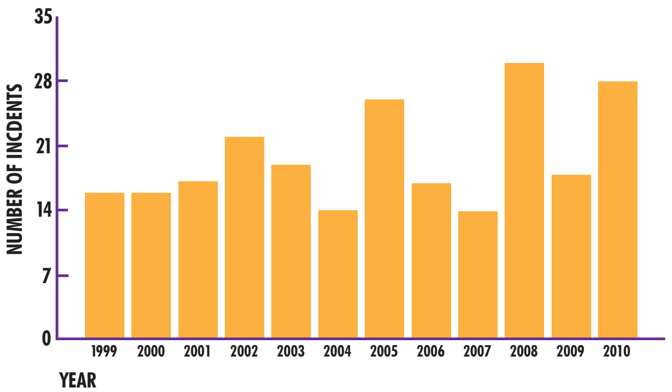
Generally, the greater the fall, the greater the force transmitted through the body (kinematics of trauma principle). However, many incidents are complicated further by runners ripping, or hitting the deck just as the rope is coming tight all of which reduce the forces dramatically. Great news for those who are lucky or get away with it!

USING KIT TO REDUCE OR LIMIT INJURIES?

An obvious question would be whether we can reduce or mitigate the risks associated with these injuries by using personal protective equipment ie. above and beyond the obvious use of runners and a rope.

The use of helmets is certainly more widespread than ever before – I'm certain most MIs would agree is a positive thing. In the injury mechanisms above I would speculate that a foam design eg. Petzl Meteor or similar offers a greater degree of protection than many classic hard shell models. Currently, there are significant financial barriers against their use for individual mountaineering instructors, in the situation where they are providing them for clients – hopefully this will be reduced in the future as more designs become available.

Another bit of kit that has seen a massive increase in use is the Bouldering matt or crash pad. Gone are the days of doing some big boulder problem and trying to hit a small beer towel as you plummet towards the ground! Mats are also a common sight at single pitch crags now and their use is an option for protecting the initial section of routes prior to placing that first runner.



NUMBER OF INCIDENTS BY YEAR – FALLEN CLIMBER.

CAUSE OF ACCIDENTS:

Of the 28 climbing accidents in 2010, the aim was to establish a primary cause. This is trickier than it sounds given there is often a variety of factors. The incident logs (http://tinyurl.com/cyoxwtu) were reviewed, combined with informal chats with team members present.

We spent some time discussing where we perceived the greatest risks to be, and generally those present came up with a fairly accurate synopsis. In 2010:

1. Gear 'failing' (runners ripping) resulting in ground fall: 16.
2. Failed to place adequate runners or fell before placing runners: 8.
3. Bouldering or soloing: 4.
4. Anchor 'failure' while abseiling: 2.
5. Bottom roping: 1.
6. Fall from the top of the crag: 0.

NB. 'Failing' and 'failure' is used in this context to describe runners or anchors ripping rather than mechanical failure.

By far the greatest number of incidents involve runners failing during a fall. Nearly always this resulted in a ground fall, the small number of exceptions (2) being impacts onto ledges. Although, it's obvious to speculate that poor runner placement is the only factor there will be other contributing issues such as belayer position, extension of runners, the type of rope system used and the nature of forces generated in small falls (with a short pitch length).

Next up was a leader fall before runners were placed or failure of the leader to protect a pitch adequately – running it out. In may cases these incidents occurred on routes where good protection did exist. Sadly, one of these incidents was fatal.

DAMAGED PETZL METEOR FOLLOWING A GROUND FALL OF ~10M ON HEAVEN CRACK, STANAGE EDGE.

Bouldering and soloing incidents accounted for a greater number than I suspected but might demonstrate the greater numbers participating. This also included 'high ball' routes above stacks of pads.

Evidently the two remaining categories actually resulted in the most significant injuries. There were two incidents in which abseil anchors failed resulting in taking significant falls to the base of the crag –10m plus in both cases. Finally, there was one bottom roping incident in which the anchor was positioned inadequately, resulting in a pendulum. The climber sustaining a near-fatal head injury.

Interestingly, the perception of those MIs (and myself) was that runner failure would be the most significant issue. This being reassuringly demonstrated by the statistics. Falls from the top of the crag was also cited as potentially a significant risk whilst, in fact, this accounted for no incidents in 2010 (or the previous five years). Everybody thought bottom roping incidents to be fairly rare, this being evidenced by the statistics with the exception of one high profile incident.

CONCLUSIONS AND CONSIDERATIONS IN THE TEACHING CONTEXT:

Following plenty of discussion on the above we decided to visit Froggatt Edge to consider if we could strengthen our teaching in light of the above knowledge. We considered:

- The teaching/coaching of runner placement at ground level and in context.
- Protecting a pitch adequately, and ensuring that we demonstrated the 'big picture' ie. what happens to the runners, rope, and the climber/belayer in the event of a fall.
- The idea of 'critical runners' ie. every one is important on a single pitch crag.
- How we teach at the top of the crag eg. stances, anchor selection etc.
- Rope systems, single rope vs double ropes.
- Small pitches and big forces – the effect on the climber/belay and gear.

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WEATHER

WIND CHILL

GEOFF MONK
MOUNTAIN WEATHER INFORMATION SERVICE

Wind chill occurs frequently, but it is in cold windy conditions when it is most severe. The bigger the difference between the body's skin temperature and the surrounding air, the greater the rate of cooling of the skin, and hence the greater the chill, this accentuated in strong winds. In very low wind speeds, air adjacent to the skin in warmed by the body, but is not immediately taken away by the wind.

The warmed air near the skin acts as a blanket, reducing the air-skin temperature difference, and thus the rate of skin cooling. The windier it is, the quicker air near the body is replaced, and the more effective the cooling. The table of wind-chill equivalent temperatures used in Britain uses theoretical values, although subsequently in the USA, wind tunnel measurements have been use to calculate wind-chill values. Thus, there are more than one set of tables of wind-chill, each slightly different.

There are complicating factors regarding the rate of cooling of the human body. The obvious one is clothing. People have suggested that, with modern windproof clothing, wind-chill becomes irrelevant, but I would suggest that for many who are on the hill all day, at some stage, clothing layers are removed, if only for the call of nature or map reading. There will also be those who want to limit their hill walking to benign summers days, and thus may possess only basic waterproofs. More about clothing in a moment.

But the more scientific complication is air humidity. On a hot day, generally you feel much more comfortable when there is a breeze, as body sweat is quickly taken away by the wind as water vapour. It is a crucial fact that the water molecules that escape as vapour are those with most energy. Particles with less energy (those that do not escape) have a lower temperature and thus, the more rapid the evaporation of sweat, the colder the skin becomes. When it is hot and humid, less sweat escapes as vapour, as the air already contains nearly as much moisture as it can take at that temperature, thus you do not cool. The effect of evaporative cooling is smaller at lower temperatures (eg. typical UK mountain temperatures), but still occurs. The evaporative cooling effect is not catered for in the wind-chill table.

Temperature	5mph	20mph	45mph
10 (Celsius)	9	3	-1
5	4	-3	-8
0	-1	-9	-15
-5	-7	-15	-22
-10	-12	-21	-29

Extracts from the Table of wind-chill equivalent temperatures (Steadman)

Some of you may say: 'But I feel colder when damp (or soaking wet) and in cloud (eg 100% humidity). This brings us back to clothing. Lets imagine being in cloud, working hard going up-hill on an unusually warm day in summer. You are sweating profusely! But with all the best wicking of moisture from your skin by clothing, the moisture has nowhere to go, it cannot evaporate into the saturated air, and the result is you get damp (and maybe complain about the failure of your clothing to keep you dry). Having got a damp layer next to your skin, the skin cooling rate increases, as water is more effective at pulling heat away from the skin – if you were swimming in water, your cooling rate would be 23 times faster than if in air.

There have been debates as to whether mountain forecasts should include a quantitative value of the equivalent wind-chill temperature. Some find it valuable, others don't. Yet it provides a guide, perhaps aimed more at those who don't pretend to have clothing appropriate for use in windy conditions, particularly in winter. MWIS quotes a forecast equivalent temperature for the next day when the wind-chill temperature is about twelve degrees or more below the actual temperature – although in the summer, on the odd day with severe gales, we may quote a value when the difference is a little less. We use the words 'severe wind-chill' when that difference reaches 15C.