

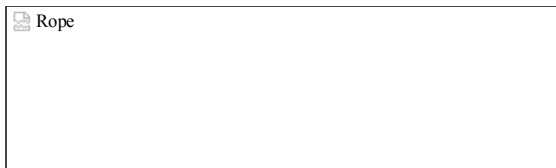
[subscription information](#)[gallery](#)[articles](#)[calendar](#)[links](#)[software](#)[new](#)[©copyright information](#)[pushing it desk top publishing](#)

© pushing it desk top publishing and technical rescue magazine 1996-9

counter

TECHNICAL RESCUE ????

BELAYING RESCUE LOADS



One of the failures !

21 K

The following article has been taken from an issue of

Technical Rescue Magazine.

During 1990 John Dill, Reed Thorne, Arnor Larson, Hal Murray and others published some preliminary results of tests on belay systems. There was at that time and indeed still is, some doubt as to the holding ability of a rescue belay system based on standard single person climbing belays. The problem is that manufacturers haven't really addressed the unique problem of rope rescue which is to arrest a consistently higher load than is the norm in sport climbing/caving. We have therefore had to use lightweight arrest systems which may or may not arrest a fall in the rare event of an anchor or equipment failure exposing the belayer to a double body weight falling load. Dill et. al's tests were never intended to be taken as gospel but nevertheless strongly implied a problem in using devices such as the figure 8 descender, sticht plate, munter hitch on an HMS carabiner and even some prusik configurations. There were, not surprisingly, catastrophic failures when using Gibbs and Rescuedenders for belaying on certain types of rope but they proved successful when using others. The conclusions therefore were that tandem prusiks with a minimum 10cm spacing and using 8mm low stretch on half inch rope was the most likely successful rescue belay configuration.

Six years on we thought it was about time to have a look at the state of play now. Manufacturers have come up with the Petzl Gri-Gri and the Rock Exotica Soloist both intended as single person sport devices, the Salewa Antz mentioned in Dill's original report has failed to have any impact on the market and is largely forgotten, the CMI Rescue Belay Brake shaped like a Maltese Cross was withdrawn but the figure 8, sticht/belay plate and Munter hitch are as prevalent now as they were at the beginning of this decade. So has anything really changed? Are we satisfied that our safeties really are safe or is it simply that nothing else has come along and there have been few, if any, deaths attributable to ineffective equipment to prompt further exploration of the subject?

TERMINOLOGY & DEFINITIONS

Our definition of 'Belaying' is the incorporation and manning of a separate safety line connected to a rescuer and/or casualty via an independent anchor and suitable belay device which will arrest and hold a falling load in the event of a system failure. (NB: not to be confused with a lowering line which is permanently loaded and not subject to possible shock loading). In almost all rescue work this will be a top belay in which the belayer will take in or pay out rope in time with the descent or ascent. The belayer ensures that as little slack as possible develops between the belay device and the load but will be careful not to inhibit free movement of the load by keeping the belay too tight. If a belay line is under continual load it is no longer a belay but a lowering line. This article uses kg as the mass and kN as the unit for impact force. To date most teams operate on the following premise - Top belays may use dynamic or static rope. Dynamic rope has greater elasticity and therefore shock absorbing qualities and should always be used where a fall factor greater than 1 is expected. However, static rope may be preferable in a well managed top belay because even on a fall factor 'negligible' (depending on how far down the face you are) the stretch in dynamic rope may deposit the load many metres below the initial failure point and produces far more bounce. Our tests are intended to verify or disprove these assumptions concerning rope type using high weight rescue loads as well as the question of specific belay devices. Regardless of the validity of the above statements the following are true for all belaying:

- o The Belayer should NEVER be part of the system as may be the case in sport activities.
- o The belay line should be connected directly to separate anchors.
- o The belay should be set up so as to be parallel as possible to the main rescue line such that if there is a failure there is minimal re-alignment of the load to the new anchor.
- o Slack between the load and the belayer should be kept at the minimum possible.
- o If possible the belayer should have line of sight contact with the load - if not, experience and feel of the rope will have to suffice - perhaps assisted by audible appraisals by a colleague who can see what's going on.
- o The belayer should remain alert at all times and not be distracted - if there is a system failure and you are not well braced and prepared this is one of the few occasions when blame can be laid squarely at your door.

The buck stops at the belayer. Remember that the belay does not only come into play in the event of a catastrophic system failure - it could be that a tripod collapses or a series of ledges has allowed the main line to become snagged with some degree of slack above which could then fail causing the load to drop - a good belayer can make the transition much smoother for the rescuer and casualty.

Strictly speaking all belay devices for a full rescue load are being operated outside of manufacturers recommendations.

BELAY DEVICES

One thing that surprises me is the lack of mention of standard rescue descenders as belay devices - it is obvious from the 1990 tests that practically all of the sport belay devices are inappropriate for rescue loads and that it would be useful to use automatically activated devices which take the initial braking responsibility away from the belayer. Belay plates are out, Munter hitch is out, Figure 8s are out, so what about a 5 or 6 bar rack (with prusik) or a Petzl Stop, SRT D1 or D2 - in short, any descender with a brake action. Well, the first drawback is that they may not be rated to take such a high shock load in contrast to a steadily lowered heavy weight and secondly, in common with all our belay equipment - no manufacturer will state that the device can be used for rescue belaying. Strictly speaking all belay devices for a full rescue load are being operated outside of manufacturers recommendations (because they specifically haven't been designed for 200kg loads). We tested both automatic and manual devices but there are still several that we would like to have tried but did not have at the time of the tests - amongst these the Black Diamonds ATC and the Lowe Tuber although we suspect that results would be similar to the belay plates and rack configurations in conjunction with a prusik which we now think may be very good.

WHAT ARE OTHERS RECOMMENDING?

As is usual with these articles we referenced some core texts and people to check all the angles and it was disappointing to see that Tom Vines & Steve Hudson have skirted around the issue in their section on belaying in High Angle Rescue Techniques - despite 14 very valid pages on belaying in general, they have slipped in a single sentence "Belay Plates are designed for catching single-person loads and may not be the most appropriate device for catching rescue loads" with no further reference to what can actually be done to arrest rescue loads. James Frank and Jerrold Smith in the CMC Rescue Manual recommend a Rack in conjunction with a prusik with the proviso that they are unhappy with the belay situation in general and are seeking alternatives. Keith Jones of Lyon Equipment (Petzl in the UK), was adamant that none of the current crop of devices was appropriate if the ultimate aim was to arrest a fall and then perform a controlled lower. This was a wise observation and one which we already knew to be at least partly true since we had destroyed one or two devices in some preliminary tests. Many others we spoke to did not use a belay at all or only used it on single body weight loads which are not connected to a stretcher system or to another rescuer/casualty. This is fair enough - if you can guarantee that the belayed load will never increase due to failure of a connected system, however remote a prospect that may be, then this article doesn't raise any problems for you. If, like us you rarely use a belay at all for rescue descents they will still be mandatory in your hauling systems which, it could be justifiably argued, is the activity most likely to cause a failure that would require belaying. The upshot is that everybody is assuming that their belay system is adequate which, if using lighter loads and running the rope over an intermediate edge (not advisable) they may well be. If not then the worst case scenario could have dire consequences especially if later investigations show that the device you were using was inappropriate for the possible loads generated.

THE TESTS

Our tests have been carried out with a rigid set of guidelines and with as much continuity as can reasonably be achieved outside of laboratory conditions. As with the 1990 US tests we have gone for worst case scenario with a direct line between the load and the belay device. We have used short drops on short sections of rope imitating a system failure close to the edge of a drop. The forces at the anchor will tend to be reduced as more rope becomes available to arrest a falling load (hence more stretch). It will also be reduced by friction such as edges between the belay device and the falling load (not that we recommend running your ropes over unprotected edges!). In a good belay the transition from main system to belay system should be as smooth as possible but factors such as high winds will conspire to increase the amount of slack rope in the system.

Our tests are for discussion purposes only - there are so many variables possible in the real world that we cannot hope to come up with definitive statements other than to say that this is what we used, this is how we did it and this was the result - It is up to you to follow up any issues prompted by this article.

Our tests are a modification of the British Columbia Council of Technical Rescue's test criteria requiring a 200kg load to be arrested within 100cm on a 3m length of rope imparting a load of not more than 15kN to the anchor. This was their ultimate measure of a pass or fail and in the real world represents a situation where the main line or its anchor fails whilst a stretcher handler (barrow boy/litter attendant) negotiates the edge close to the belayer. In our tests the same person always tied the terminal figure 8 knot connecting the belay rope to the load and this was tightened over the knee not subjected to bodyweight tightening prior to the test. (NB: At the beginning of these tests which spanned three months we might have assumed that the weak point in most systems was the knot in the rope but in over 100 factor 1/3 drops with a 200kg load there has never been a hint of a problem and all failures have occurred either at the belay device or the intervening carabiner).

LOAD CONFIGURATION

Our tests were carried out on a 25ft high raised 'I' section girder. A steel Stubai carabiner (4000kg) connected the Tirfor 'DYNAFOR' LCD load cell to a heavy duty wire anchor sling. A steel DMM Klettersteig connected the belay device to the DYNAFOR (following failure of two alloy screwgate carabiners!). Approximately 50cm further along the girder a CMI 4" Bearing pulley was positioned to allow a realistic feed of rope into the belay device and down to the belayer at ground level (if used). On the other side of the Belay device was a pulley running down to the EVAK500 winch used to haul the load back into position after each drop. (Despite our misgivings in the EVAK500 review a couple of issues ago there was never any sign of damage in raising a 200kg load on the toothed cams). The load consisted of two 80kg concrete blocks secured and suspended on two Spanset Heavy Duty lifting strops, the balance of the 200kg was made up with two bags of rope and a heavy chain. 200kg represents one rescuer, one casualty and the associated equipment and is far from the maximum weight we have seen in some systems currently in use.

PASS or FAIL CRITERION

Our PASS criterion, which differs slightly from the BCCTR above, is for arrest of the load to be achieved within 130cm (slightly more generous than the 100 cm allowed by Dill but somewhat arbitrary anyway) and imparting not more than 12kN shock at the anchor/belay device (Dill allowed 15kN but we feel this to be too high for both anchor and older alloy carabiners!). The automatic devices were tested only with 100cm drops on a 3 metre rope (factor 1/3) because we felt that there was little value in shorter rope lengths other than to set an upper limit for use of a particular device which would be impossible to adhere to in the field. Had we had more time and resources there probably would be merit in testing 150cm and 200cm drops as Dill et. al. did for one or two of their tests.

Our first tests were to ascertain whether standard manual devices could hold a 200kg load. We began with simple load holding ability by gently lowering the load onto the belay device being held by a well braced belayer with his single dominant hand (gloved). The same belayer was used for all relevant tests.

LOAD = 200 kn - 3m length of rope between belay & load - NO drop - static load

11mm Edelrid STATIC (USED) 11mm Marlow DYNAMIC (NEW)

FIGURE 8	could not hold	could not hold
DMM BETTABRAKE	held	held
MUNTER HITCH	held	held

The figure 8 was almost impossible to hold even with two hands and can clearly be discounted in its standard mode for heavy load handling with no intermediate friction. The Bettabrake (which is DMM's version of an unsprung Sticht plate and fairly indicative of all such devices) held easily as did the Munter/Italian Hitch on an HMS carabiner. Next we tried a factor 0 drop using 3 metres of rope and the belay rope taken in firmly with the belayer anticipating the shock. Although there is theoretically no drop, rope stretch should account for quite a few mm of drop.

LOAD = 200 kg - 3m length of rope between belay & load - 0cm drop (just rope stretch)

11mm Edelrid STATIC (USED) 11mm Marlow DYNAMIC (NEW)

DMM BETTABRAKE	held - 20cm slippage	held - 54 cm slippage
MUNTER HITCH	could not hold	could not hold

The Bettabrake again held but not without some strain on the part of the belayer. The Munter Hitch, which is not good for your rope at the best of times, surprisingly did not hold despite its rope locking action. We should have tested this one again but A) we feel that the action of rope on rope is so destructive as to be a non-starter for heavy loads and B) we already know from Petzl's own figures that the Munter fails at 3kN with an 80kg load so there's no chance with a 200kg.

LOAD = 200 kg - 3m length of rope between belay & load - raised by 100cm - fall factor 1/3

11mm Edelrid STATIC (USED) 11mm Marlow DYNAMIC (NEW)

DMM BETTABRAKE could not hold could not hold

Absolutely not a chance in Hell !

Be warned that if you carry out heavy load belay tests yourselves the belayer has to be well briefed to release under duress. The tendency is to increase grip once the load snatches but these are such heavy loads that serious injury could result. Make sure your gloves are up to the task and make doubly sure that there is no tail of belay rope wrapped around your feet or that the belayer has not added a wrap around his belay hand! Obviously placing a live belayer in the system makes the tests more subjective since you may have a 17 stone giant on your team that could hold a falling elephant - our man Phil is a stocky 13 stones and probably just above average in terms of strength and well trained in belaying. Nevertheless, we are now more convinced than ever that manual devices are not suitable and that the belayer needs to be taken out of the system and replaced with a belay system 'tender' operating an automatic arresting device - it's just a question of which devices (and ropes) are suitable for heavy loads.

AUTOMATIC BELAY DEVICES

We decided to centre our tests on automatic devices not tested by Dill - the Petzl Gri-Gri since we're always extolling its virtues, the Petzl Stop and SRT DB2 as representative of auto lock descenders, single and double prussic as a direct comparison with Dill's tests, Rock Exotica Rescuescender because we use them as line tensioners in tyroleans and a Petzl Shunt for the same reason. We carried out numerous drops on various types of rope but have included only results for which 3 consecutive test drops on one type of ropes and one device were carried out. The numerous single tests carried out corroborated the triple tests printed here unless otherwise stated. The ropes we used were:

Static

used Edelrid Superstatic 11mm

new Beal 11.5mm

new Beal 10.5mm

used Spelunca 11mm

new Marlowe 11mm

used Beal 11.5mm

new New England KMIII 1/2"

used Bluewater II 1/2"

Dynamic

used Edelrid 11mm

new Marlowe 11mm

new Beal 11.5mm

LOAD = 200 kg - 3m length of rope between belay & load. Load raised by 100cm. Fall factor 1/3

PETZL SHUNT

STATIC ROPE

11.5mm Beal (New) FAIL (2.76kN) Failed to lock out fully - some braking but load hit ground.

11.5mm Beal (New) FAIL (2.94kN) Failed to lock out fully - some braking but load hit ground.

11.5mm Beal (New) FAIL (3.46kN) Failed to lock out fully - some braking but load hit ground.

Comments: The Shunt is designed to slip at 250 - 300kg load and therefore stood no chance at all of succeeding in shock load using a 200kg mass. It was however very much more effective at anchor load limiting than other devices tested when belaying loads of less than 120kg. The biggest problem is that once arrested you cannot lower on the Shunt - a haul system will need to be employed to recover the load. Very rope friendly device.

PETZL STOP

STATIC ROPE

11.5mm Beal (New) FAIL (7.40kN) Sheath severed - load hit ground.

11.5mm Beal (New) PASS (6.90kN) Sheath severed but 4 strands held - 25cm slippage.

11.5mm Beal (New) FAIL (7.22kN) Sheath severed - load hit ground.

(NB: in the second test the strands got caught between the cam and the plate and it is highly likely that had this not occurred the load would not have been arrested).

10.5mm Beal (New) FAIL (5.98kN) Rope completely severed - load hit ground.

10.5mm Beal (New) FAIL (6.54kN) Rope completely severed - load hit ground.

10.5mm Beal (New) FAIL (6.72kN) Rope completely severed - load hit ground.

11mm Edelrid (Used) FAIL (9.83 kN) Rope completely severed at first cam - load hit ground.

11mm Edelrid (Used) FAIL (10.68kN) Rope completely severed at first cam - load hit ground.

11mm Edelrid (Used) FAIL (9.96 kN) Rope completely severed at first cam - load hit ground.

DYNAMIC ROPE

11mm Edelrid (Used) PASS (9.06kN) Some sheath melt and severe flattening - 19cm slippage.

11mm Edelrid (Used) PASS (9.24kN) Some sheath melt and severe flattening - 15cm slippage.

11mm Edelrid (Used) ---- (6.90kN) Alloy klettersteig carabiner failed (subjected to 8 shock loads).

11mm Edelrid (Used) PASS (9.10kN) Some sheath melt and severe flattening - 17cm slippage.

11mm Beal (New) PASS (6.16kN) Slight sheath tear then severe flattening - 22cm Slippage.

11mm Beal (New) PASS (7.04kN) Some sheath melt then severe flattening - 20cm Slippage.

11mm Beal (New) PASS (6.70kN) Some sheath tear then severe flattening - 24cm Slippage.

Comments: The Petzl Stop proved to be 100% effective when using dynamic rope with the added bonus that on every occasion the load could be easily lowered following arrest. Unfortunately all of the static rope tests failed due to cam severing of the rope or sheath and this casts doubt over its applicability for such use. Keith Jones (Mr Petzl in the UK) further points out that there may be a fundamental flaw with use of autolock descenders in that the cam needs to be held open to allow rope feed and a positive release action is required to arrest the falling load. Keith quite rightly has reservations about this aspect of its use but we feel (and have verified through a series of 100 foot tests) that providing the belayer is releasing rope on demand (i.e. not using his dominant hand to feed rope out from the top of the stop and allowing the load to pull rope through) and has firm control of the trail or control rope exiting the descender a swift brake action is quite instinctive. No tending of the device was used for these tests but in the real world NO DEVICE SHOULD BE LEFT UNATTENDED.

GRIGRI
STATIC ROPE

11mm Edelrid Super (Used) PASS (9.62 kN) Slight flattening. Slippage 83cm. GriGri jammed -couldn't lower off.

11mm Edelrid Super (Used) PASS (10.26kN) Slight flattening. Slippage 74cm. GriGri jammed -couldn't lower off.

11mm Edelrid Super (Used) PASS (8.82 kN) Slight flattening. Slippage 67cm. GriGri jammed -couldn't lower off.

11mm Marlow (New) PASS (6.90 kN) Slight flattening. Slippage 65cm. GriGri jammed -couldn't lower off

11mm Marlow (New) PASS (7.55 kN) Slight flattening. Slippage 70cm. GriGri jammed -couldn't lower off

11mm Marlow (New) PASS (7.87 kN) Slight flattening. Slippage 69cm. GriGri jammed -couldn't lower off

DYNAMIC

11mm Edelrid (Used) PASS (7.90 kN) Slight flattening. Slippage 34cm. GriGri jammed -couldn't lower off.

11mm Edelrid (Used) ---- (7.42 kN) Alloy asymmetric carabiner (2500kg) failed. Subjected to 7 drops.

11mm Edelrid (Used) PASS (9.12 kN) Slight flattening. Slippage 54cm. GriGri jammed -couldn't lower off.

11mm Edelrid (Used) PASS (8.70 kN) Slight flattening. Slippage 70cm. GriGri jammed -couldn't lower off.

Comments: Some results show slight anomalies with loadings not seeming to correspond with the degree of slippage but the overall results are very positive with 100% pass rate on new and used ropes. The main drawback was that we could never force the cam back enough to use the handle to lower the load so a separate haul system needs to be employed. After each test a light 'tap' with a heavy wooden mallet returned the cam from its temporary jam and we continued to use the same GriGri for all tests.

SRT DB2
STATIC

11mm Edelrid Super (Used) PASS (7.66 kN) Some glazing. Slippage 77cm. Could lower off.

11mm Edelrid Super (Used) PASS (11.42 kN) Some glazing. Slippage 28cm. Could lower off.

11mm Edelrid Super (Used) PASS (8.40 kN) Some glazing. Slippage 65cm. Could lower off.

11mm Marlow (New) PASS (6.34 kN) Some glazing. Slippage 78cm. Could lower off.

11mm Marlow (New) PASS (6.81 kN) Some glazing. Slippage 76cm. Could lower off.

11mm Marlow (New) PASS (7.41 kN) Some glazing. Slippage 69cm. Could lower off.

Comments: These tests made us very happy since the SRT has been our descender of choice for many years now. Outstanding results which could not realistically be continued for a full series of dynamic rope tests due to the poor state of the descender. It is important to place the rope on the inside cam if using the double rope version as we did. Because of the cam configuration (both cams and the handle are part of a one piece casting rather than two separate cams as with the Petzl Stop) the rope did not sever but the top cam bent under compression. Initially this wasn't that noticeable and we continued with the second test unaware that there was increased friction between the cam and the side plates which led to a harsher snatch on the second test and a higher anchor impact load. With judicious use of a hammer this fault was corrected to bring the third test's figures down to a more respectable level. Having completed the next three tests on a new shiny Marlow static and a single Dynamic rope test just to confirm its holding ability we buried the sad looking and seriously battle scarred DB2 with full honours. As a belay device, use of the double brake attachments make smooth rope feed more difficult and taking in is almost impossible but there is less chance of inadvertently holding the cam wide open as mentioned with the Petzl Stop. The single rope versions may not suffer from the leverage action which damaged our twin rope version and would therefore be, we suspect, superior, however taking in rope on an ascent is

much easier on a Petzl Stop than it is on an SRT descender.

SINGLE PRUSIK (7mm & 8mm Marlow static cord)

STATIC ROPE

11mm Edelrid Super (Used) FAIL (8.10 kN) 8mm 3wrap. Prussic melted onto rope. Load bounced then held.

11.5 mm Beal (Used) PASS (9.30 kN) 7mm 4 wrap. Some melt. Slippage 56cm. Could not lower off.

11.5 mm Beal (Used) PASS (8.66 kN) 7mm 4 wrap. Some melt. Slippage 96cm. Could not lower off.

11.5 mm Beal (Used) PASS (9.35 kN) 7mm 4 wrap. Some melt. Slippage 50cm. Could not lower off.

DOUBLE PRUSIK (8mm Marlow static cord - 10cm spacing)

STATIC ROPE

11 mm Marlow (Used) PASS (9.24 kN) Some prusik melt onto rope. Slippage 35cm. Could not lower off.

11 mm Marlow (Used) PASS (7.98 kN) Some prusik melt onto rope. Slippage 60cm. Could not lower off.

11 mm Marlow (Used) PASS (8.18 kN) Some prusik melt onto rope. Slippage 54cm. Could not lower off.

Comments: Very good results on the Beal static rope shown and several single sample tests. We had a couple of failures on single prusiks when using a three wrap on 8mm where the load bounced off the ground and then held at the second attempt although the main rope was never severed. Using a 7mm and 4 wraps we had 100% success but this may be too close to call overall so we would recommend sticking to double prusiks using 7 or 8mm cord and 3 or 4 wraps. This confirms Dill's original tests which ultimately recommended only double prusik for rescue load belaying.

ROCK EXOTICA RESCUCENDER

STATIC

11.5 mm Beal (Used) PASS (7.34 kN) Some sheath melt. Severe flattening. Slippage 40cm. Could not lower off.

11.5 mm Beal (Used) PASS (8.40 kN) Some sheath melt. Severe flattening. Slippage 65cm. Could not lower off.

11.5 mm Beal (Used) PASS (8.02 kN) Some sheath melt. Severe flattening. Slippage 55cm. Could not lower off.

DYNAMIC ROPE

11mm Marlow (New) PASS (8.74 kN) Some sheath melt. Severe flattening. Slippage 27cm. Could not lower off.

11mm Marlow (New) PASS (8.20 kN) Some sheath melt. Severe flattening. Slippage 24cm. Could not lower off.

11mm Marlow (New) PASS (7.98 kN) Some sheath melt. Severe flattening. Slippage 35cm. Could not lower off.

Comments: This was a surprise. Although Dill had stated that they had had some success on certain ropes we did not expect any joy with the Rescucender arresting such high loads. In the event it had no problem on ropes around 11mm. We tested the Rescucender not so much as a belay device but to confirm that our use for it as line tensioners on a tyrolean could be justified which, for our ropes, it clearly can.

CONCLUSIONS

o New ropes need to be 'broken in' before being allocated to belay duties.

o In our preliminary tests the manual devices were, without exception, entirely inappropriate in arresting a 200kg load. We could not even hold the load as a dead weight let alone falling on some devices. Although we initially said we could not make any definitive statements based on these tests our own team will not allow use of the following devices for heavy load belaying (not that we ever did!): Figure 8 Descender, Fig 8 Descender small eye, Belay Plate (Sticht, Cosmic, Beta-brake etc.), Munter Hitch, Single Prusik - If forced to make a choice in a marginal call definitely choose the latter. As we stated in the introduction it is possible that friction via an intermediate edge (which is a dangerous situation in itself) may reduce shock to the belay device sufficiently to make heavy load belaying viable but as far as these tests go they were non-starters.

o The Petzl Stop works very well with DYNAMIC ROPES ONLY and can not only arrest a heavy load but enables easy lowering - one of only two mechanical devices to do so. Shock to the anchor is high but acceptable - just make sure the anchors are bombproof. Overall, though there are question marks over the severing action of the cams in the severest falls and of belayer 'panic grabbing' of the handle. Best to use only in an emergency or ensure complete familiarity.

o The SRT DB2 was the most successful overall in terms of arresting and lowering ability. Its only drawback is that it is more difficult than the Petzl Stop & Gri Gri to take in slack. Use of the double brake attachment may help restrict the dangers of panic grabbing but will further inhibit take up of slack.

o the Petzl GriGri which was the only other unqualified success on the particular types of rope we used. It too has a good automatic action on both DYNAMIC AND STATIC ROPES - its only drawback was that the cam invariably jams making lowering impossible but at least the load has been successfully arrested. This will almost certainly only occur near the top where there is very little rope to absorb the impact should a fall occur further down you will probably have no problem lowering off on the GriGri. Again shock to the anchor is high but within our stated limits.

o The Petzl Shunt is not a belay device. IT DOES NOT WORK FOR LOADS OVER 100 KG. and is specifically designed not to do so but we tested loads of 112kg at factor 1/2 for which the Shunt was far and away the best at arresting the load and limiting shock to the anchor. Impossible to unload though until all weight is taken off. We are more than happy to continue using the Shunt as an automatic (untended) back up attached to a single rescuers main rope in order to safeguard an anchor/knot/sling /carabiner failure.

o Single Prusik - although we did achieve some successes with 4 wraps, results were not consistent enough to be able to recommend it as anything other than an emergency measure although as a more or less automatic measure (providing the rope feeds into the prussic knot correctly) this is still superior to the previously discussed manual devices.

o Double Prusik - An unqualified success on all triple and random tests (not listed). If you have got no Gri Gri or SRT descender you cannot go far wrong (in dry conditions!) with a well tended double prusik - 6 or 7mm on 11/11.5mm - 3 or 4 wraps.

OUR OWN RECOMMENDATIONS

We feel that the Petzl GriGri for ease of operation looks to be favourite for all rescue belaying. That said, should a failure occur within the first few feet you may well require a separate haul or rescue system to recover a heavy load and this should always be available close by. DYNAMIC or STATIC ropes are OK for belaying but certain configurations of device to rope work better than others and you need to confirm the ability of your own system. The SRT auto-locking descenders would be our second rather than first choice only because the ability to lower off after a very heavy load failure is offset by the more cumbersome taking in of slack. The Petzl Stop also provides fully automatic belaying but on DYNAMIC ROPES ONLY with the added advantage of easy take in of slack. You will have to satisfy yourselves that the risks associated with severing of less dynamic ropes and the panic grab reaction of a belayer warrants its use. There is certainly always a place for the double prusik and a set should always be to hand. The main reason they would not be our first choice is because of their restriction to dry weather use, inability to lower off after a fall and requirement to be tied and dressed correctly for effective use.

NB - These tests and our stated opinions are for discussion purposes only. Despite the time, effort and cost involved, a hundred odd tests is not enough to make categorical statements only categorical opinions! and only then for the specific rope types and situation tested. The next logical step would be to take one of the more successful devices discussed and conduct in depth tests on a range of ropes and a range of conditions and drop heights. We have not dwelled too much on tests carried out by Dill other than to confirm his results as a comparison with the automatic device tests - We strongly recommend you read Dill's article for more detail on prusiks etc. contact NASAR on +1 703 352 1349. This publication, its publishers and the authors of this article can accept no responsibility for accidents arising from use of any equipment or systems discussed here. Rescue Belaying (and these tests) are inherently dangerous and readers must ensure adequate training, safety precautions and experience before attempting any procedures discussed.

ADE SCOTT

PHIL CROOK

CHRIS HAWKINS

June 1996

Thanks to:

Keith Jones - Lyon Equipment

Chris Ware - Lyon Equipment

Tirfor Ltd

Spanset Ltd

Marlow Ropes Ltd

New England Ropes

Mark, Pete & Dan

The UPDATE

Technical
RESCUE
www.pushdtp.com/trm/

© 1999 pushing it desk top publishing

info@pushdtp.com

<http://www.pushdtp.com/trm/be.html>

