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TECHNICAL RESCUE ????

RESCUE BELAY TEST PARAMETERS FLAWED ?

Earlier this year we published an article on rescue belaying which gave preliminary impressions on a number of descenders being used to arrest a 200kg load in a factor third fall. (Technical Rescue Magazine issue 10 or Internet http://www.pushdtp.com/trm/art/be.html) Our conclusions were:

1) Manual descenders such as the figure 8 and sticht/belay plates are entirely inappropriate for belaying a full rescue load (200kg).

2) Some models of autolocking descender provide a much safer lock on high loads and are not only able to control a 200kg load but can arrest automatically taking pressure off the belayer (although vigilance is still called for).

Since then we have continued testing different descenders and different rope types and we hope to bring you a full update in the winter '97 issue. In the meantime we have a couple of observations which may or may not prove to be critically important if rescue belaying is an area of concern for you at the moment. Remember these are preliminary observations based on a substantial number of new tests but we have not yet explored all the avenues or finished verifying some initial findings.

If you have not yet read the original article I will just recap our rationale behind a rescue load of 200kg and the factor third standard. 200kg represents the weight of a rescuer, a casualty, a stretcher and all the associated hardware. Our factor third drops were for a 1 metre fall on a 3 metre length of rope (3m from belay device entry to the load). A tail of approximately 2 metres maintains the same weight of rope feeding into the belay device - any excess is hung up or coiled so as not to add to the weight. This was to imitate a fall close to the anchor points and should be about the worst you are likely to encounter because any further down and you have more rope to absorb the shock. In a lowering system you might also generate a factor third (or something close) by manoeuvring over a flat ledge close to the top of the drop, momentarily unloading the rope then continuing the descent before all slack has been taken in - not real good technique but certainly not beyond the realms of possibility. Anyway we figured that any device that can arrest 200kg in a factor third fall with less than 1.5 metres of slippage and imparting not more than 12kN of impact (shock) load to the anchor is going to be able to cope with most situations. Better to start out with something which is over specified for the majority of your jobs than a device which works well for most of your jobs but come the once in a blue moon situation it fails catastrophically.

TEST PARAMETERS

We opted for a 12kN limit rather than John Dill's original 15kN because we felt the latter to be too high for both anchors and some components (including your body!). It was realised long ago in some US Air Force tests that the limit of human body endurance to shock is around 12kN. We increased the original rope slippage figure of 100cm to 130cm and said at the time that we thought this was somewhat arbitrary anyway. But we now feel that this whole part of the test is flawed. In the real world you wouldn't worry if you'd slipped down 100cm before being arrested or 300cm as long you arrested (unless you were 250cm from the bottom!). This is important because we failed some devices based on this criteria and yet specified that the Petzl Stop could be used on Dynamic rope ONLY even though it had severed all static ropes in our tests. We now feel that we were wrong to specify a particular rope group and should have declared that any of the 'destructive' devices be deemed not suitable for rescue belaying. Devices that failed to arrest the load within a given distance or even those like the shunt (although that's possibly not the best example) which slowed the load but never actually stopped it would still give you a viable rope with which to attempt a manual arrest - this would not be the case if your rope was severed on the initial auto- brake. What you can say is that any load over 200kg will be very hard to arrest manually even after the autolock has taken the initial shock and slowed the descent. For this reason our assessment of the prusik knot as suitable under certain conditions was too generous and they should probably also be relegated to emergency use only because the braking action - even when it has arrested to within acceptable limits - is too destructive. If you move outside of the test parameters - slightly higher load or slightly higher fall factor it is going to fail. Again, descenders with a limit of cam closure may fail to arrest the load completely without manual assistance but they won't sever the rope. The important difference between a manual belay and an auto-lock

is in the initial brake action - If you fail to arrest a rescue load immediately on a manual it will accelerate away from you. With an auto-lock the device will provide the initial brake and slow things up enough for you to make a secondary, manual braking action. However, whilst mulling all this over we suddenly realised that we'd missed something blindingly obvious regarding the slippage limit of 1m (or so) - the problem of being situated more than a metre above the ground or a ledge when a failure occurs. In this case the failure of a device to stop you within the metre limit means you and your casualty will hit the ground or ledge heavily. This made us think that maybe the metre limit wasn't so arbitrary after all and one of the main points of this update was invalidated. But realistically it's going to be impossible to legislate against every eventuality in our ultimate aim of providing broad guidelines for belaying rescue loads and we feel that the question of load arrest within such narrow margins is a secondary risk to that of severing the rope or of imparting too great a shock to the anchor and the rescue-load. You may not agree with this assumption - especially if your patch consists of vertical cliffs with lots of ledges, in which case consider the one or two devices which have so far passed all of our tests.

ROPE 13mm & 11mm

Most of our tests were carried out on 11mm rope. We are now extending our 13mm testing so that US rescuers can more readily identify applicable options. Some devices like the GriGri and Kong Speleo cannot be used on 13mm so it's an academic issue for them.

At the moment we can state that ropes which need to be 'pre-shrunk' in order to tighten the sheath on the core should not be used for rescue belaying. The compression action of the cams gathers loose sheath behind the cam, puffs it out to 14 or 15mm and stiffens to a rod of iron before severing the sheath. This applies even to devices that pass every other test - if the rope is susceptible to sheath slippage DO NOT USE IT FOR RESCUE BELAYING. An Edelrid Superstatic or New England KMIII for instance never suffers from this problem, not when we've used them anyway. It was not our original intention to have to state that a particular device could only be used on such & such a rope and if it failed on any rope it failed, period. However, several hundred metres of rope further on we now know that certain ropes may have to be named & excluded for rescue belaying (although they may be fine for abseiling and lowering) rather than fail a device which will work well on every other rope.

IMPORTANT NOTICE - SRT Equipment DESCENDERS

We have also been testing the SRTE NOWORRIES, FALLRIGHT CRD (TROLL ALLP derivative), SRTE D1 and the KONG SPELEO. Amongst these are at least two and probably three very highly recommended devices which will be reported in the next issue. However..... During the course of our testing we have discovered that the SRT devices which worked extremely well have an 'hexentric' cam which can be adjusted to alter the speed of descent - this will alter its ability to arrest a rescue load in terms of our test parameters and you MUST verify that it is correctly set before using for such a purpose. It should be set on a higher friction setting. A further complication is that there was a cam modification enforced after a large rescue customer insisted on the device being able to withstand a 1200kg static pull! The cam modification is now being rectified to address the much more realistic 200kg belay test but anyone with an SRT descender that may be used for rescue belaying should check with the manufacturers that their particular model is suitable.(tel: +61 2 97963455 fax: +61 2 97963488). Regardless of the setting the SRT devices have either arrested fully or slowed the load but hit the deck so if you haven't verified use of your own device the worst that should happen is that you will need to perform a secondary braking action to arrest the load. NB this is just supposition at the moment - the authors of this report, the tests and Technical Rescue Magazine accept absolutely no liability for belaying activities undertaken in relation to our tests.. You should satisfy yourselves that this potentially very dangerous activity is carried out correctly and with equipment which will work.

CONCLUSIONS

Manual belay devices remain unsuitable for rescue belaying - they may be OK for most of your lower load jobs but when you really need it for something heavy, it's probably not gonna work! Certain specific types of static rope may be entirely unsuitable for rescue belaying. Test parameters limiting rope slippage through the device to 100cm or even 130cm are a nonsense. Any device/knot which severs a rope cleared for rescue belaying or is unduly destructive to the rope having otherwise arrested the load within the stated limits should nevertheless be failed and declared unfit for rescue belaying because in the real world your load and fall factor may be higher than in the tests. We will be re-examining both these aspects of the tests and try to define which devices are suitable according to our revised criterion. In the short-term we would surmise the following:

DEVICES WHICH HAVE NOT SEVERED OR SEVERELY DAMAGED THE ROPE:

Petzl GriGri

SRT D1

SRTD2

SRT Noworries

Kong Speleo

Troll Allp (CRD version)

DEVICES WHICH HAVE SEVERED OR SEVERELY DAMAGED THE ROPE:

Petzl Stop

Singe Prusik

Doube Prusik

DEVICES NOT YET TESTED:

AML Descenders

Gemlok

Further updates will be posted on our internet site Belay Article Page.

ADE SCOTT December 1996

Part One of the Belay Article