



# Belay competence testing

Chris Onions **Ogwen Valley MRO**

Members of Ogwen Valley MRO recently visited Lyon Equipment at their Work and Rescue facility at Tebay in Cumbria to evaluate the performance of their prussik belay cordage. The testing was a recommendation made by Kirk Mauthner during an external audit of OVMRO's rope rescue capability, a process which proved to be highly beneficial as a top to toe review of training and operational levels, right down to how equipment could be better packaged.



DROP: KEVIN DE SILVA OBSERVES THE RIGID TEST MASS IN FLIGHT

The team had established a working party to address the findings, specifically to evaluate the performance of the chosen Mammut 8mm accessory cord when used as a rescue prussik belay with Singing Rock 10.5mm low stretch kernmantel rope. Lyon were approached to do the testing as they have an excellent testing and certification pedigree and are familiar with the challenges that mountain rescue teams face when evaluating the performance of their rope rescue systems. Some team members had observed that new Mammut cordage was shiny and stiff and were

sceptical about their ability to catch a rescue-sized load.

The performance criteria had already been established by the British Columbia Council for Technical Rescue (BCCTR) in the 1980s, who proposed that for a rescue belay to be competent; it should arrest a 200kg load free falling 1m with an initial rope length of 3m (fall factor 0.3).

This 200kg load represents two people (80 kg each) plus equipment, and the drop height with the amount of rope in service represents the fall the barrowboy and casualty would take

should a mainline failure occur while negotiating the edge at the top lowering station. This scenario, sometimes described as the 'worst case event' represents a severe fall as the load is considerable, and there is little rope available to absorb the energy from the fall. The peak force experienced by the system should be less than 15 kN, and the stopping distance should be less than 1m. If that is not challenging enough, the BCCTR also stated that the system should be releasable post drop, and the residual strength of the rope after the belay capture event should be 80% of the specified value. Rescue belay prussiks are not releasable, post capture event, so must be used in series with a suitable releasable system such as the Radium Release Hitch. The hitch's designer was said to be contemplating such issues during a bathe at Radium Hot Springs in British Columbia which resulted in the design of the hitch with the same name. It consists of a Munter hitch and a 3:1 simple MA system tied with 10m of 8mm low stretch kernmantel cordage. It will produce approximately 3m of operator-controlled extension while holding a 200kg load.

On arrival at Lyon, we were warmly welcomed by Bill Batson who had arrived early at work to setup the test site. Our delay on the M56 had cut into our schedule, and we would have our work cut out to complete the necessary drop tests. We noticed that extra padding and packing crates had been positioned strategically underneath the drop test site, which only added to the feeling of apprehension about the performance of the prussiks.

We had previously agreed with Bill to test our current, unused Mammut prussiks; our retired worn and fuzzy Mammut Prussiks and an alternative Beal cord that Lyon would supply. The other consideration was the different colours of the parent Singing Rock rope, so we would test white and red samples of brand new rope fresh from the reel.

Bill needed to confirm some technical points about the test procedure before giving us a health and safety briefing and issuing PPE to

everyone who was to go up to the platform. The team had specific roles which included measuring, photography, videoing and archiving the drop samples.

After being set onto the parent rope, each prussik loop was clipped to the lower karabiner of the Radium Release Hitch (RRH) and the triple wrap prussik hitch shaped into orderly coils. It was made sufficiently snug so they could support the weight of the rope that hung down to the test mass, while being loose enough that rope could rapidly be drawn through the hitch, just like in a real belaying operation. One person set all of the prussik hitches to reduce any variation in coil snugness and a new Radium Release Hitch was installed between the prussik belay and the load cell for each drop.

Bill carefully positioned the test mass using a winch to ensure the required 1m freefall of the load, confirmation was taken that the load cell was functioning and the recording equipment was set accordingly. Team members and Lyon technicians watched at ground level as Bill took a knife to the sacrificial cord that held the test mass.

In an instant, the prussiks had cinched down on the rope bringing the load to a halt. The process could almost be described as underwhelming, such was the controlled nature of the event. Bill placed a mark on the rope where the rope had been arrested by the prussiks, and lowered the winch rope to take the load of the test mass from the rope. The sample was removed from the load cell and passed to the ground team for subsequent residual strength testing, archiving and slip distance measuring. A palpable sigh of relief was detected from the Ogwen members observing below that the first drop had been a success.

After the first drop, a slick routine was established and the team was able to complete twelve drops, including all of the variables we had specified, and replicating each one twice.

### The findings

- All the drop tests resulted in the prussik combination arresting the test mass

- The range of slipping distances of the rope through the prussiks was 13-34cm
- The highest arresting force recorded was 11.25kN.

### Residual strength:

Lyon Technician, Mark Davies took brand new samples of our rope that had not been drop tested to establish a knotted breaking strength and found this to be 22.8kN (red rope) and 21.5kN (white rope). These samples were used to compare the samples that had been drop tested and already arrested the 200kg mass.

The lowest residual rope strength recorded from the drop-tested samples was 21kN.

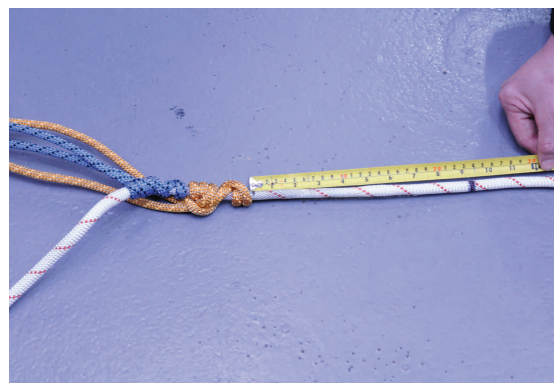
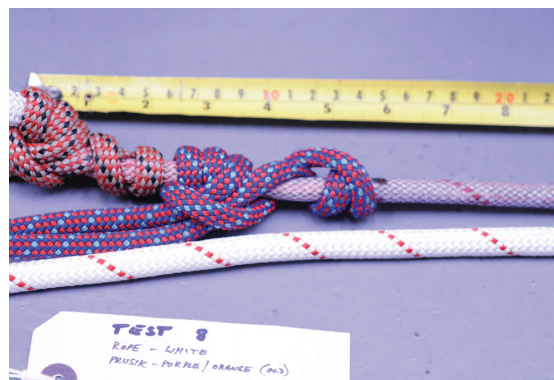
### So what have we achieved?

We returned to North Wales with an increased confidence in our chosen rope and cordage combination. We have an emerging evidence-set that indicates that our rescue-belay works, and that the residual strength of the belay line is strong enough to continue with the operation post drop. We are however keen to point out that this is in no way presented as a definitive description of how prussik-belays work, as the data set is very small (only two repetitions of each prussik/parent rope combination). Teams are therefore encouraged to evaluate their own systems and conduct testing accordingly.

The day was hugely beneficial to us but inevitably has raised other questions and other lines of enquiry related to the performance of muddy and frozen ropes.

We are very grateful to our supporters who assisted us with making the day a reality. Thanks are extended to Bill, Paul, Pete and Mark at Lyon Equipment, and to Rescue 3 (UK) who loaned us a minibus and gave us the fuel to get ourselves to the venue. We are also grateful to North Wales Police who loaned us video and camera equipment to record the day.

Mountain rescue teams are welcome to a copy of the full data set on request.



FROM TOP:  
GLAZING: THE DISCOLOURATION FROM THE GLAZED PRUSSIKS CAN CLEARLY BE SEEN ON THE WHITE PARENT ROPE  
MEASURING: THE DISTANCE THE PRUSSIKS TOOK TO ARREST THE LOAD IS MEASURED FROM THE START POINT (MARKED)  
MELTED: THE PRUSSIKS ARE WELDED TO THE PARENT ROPE POST DROP

## Latest news from DMM

Work here at DMM has been busy as usual trying to get the new products ready for delivery this spring. The Alpha Sport, Alpha Trad and Alpha Light will all be reaching the retail stores before the end of April, and the Chicane Belay device too will hit the shops ready for Easter.

Unfortunately, we have also been very busy managing a recall on the Dragon Cams sizes 4 and 5. This is a good opportunity to remind folk that, if they have a Dragon cam Size 4 or 5, to check our website to ensure it is a new version with a forged axel boss. The images show quite clearly how to check whether the cam is safe to use or not. If you have an old version it is vital to stop using it immediately and return it to us as

per the details on our website [www.dmmwales.com](http://www.dmmwales.com).

If you have any questions please contact us direct so we can help. The recall on the size 6 Dragons is still ongoing and there are a few still unreturned. So again this is a request for anybody with an old style Dragon 6 to return it immediately and stop using it straight away. Our current turnaround time for cams is about a week from receiving them, and the first rebuilt units have already been sent back to their owners along with a colour coded biner.

