

Hitch Climbers' Guide to the Canopy

Treemagineers Ltd
Dall Store
Rannoch Station
PH17 2QH
Scotland – GB

☎+44 1882 632 235

www.treemagineers.com

info@treemagineers.com

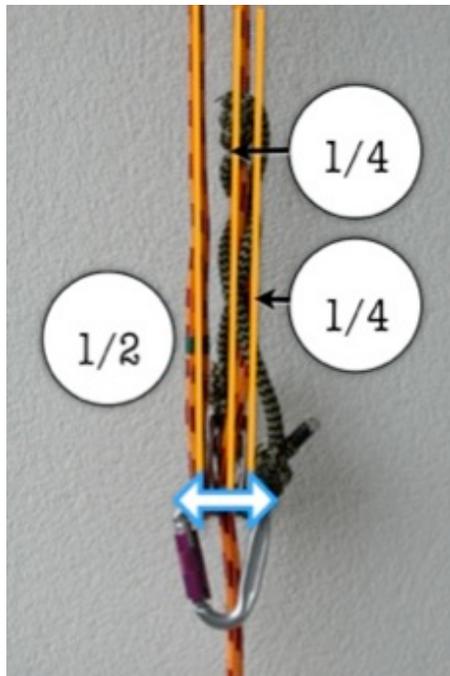


Introduction

The Hitch Climber Story

A few years ago, Treemagineers did some testing on the strength of configured work positioning systems commonly in use. We identified three situations that concerned us, all of which involved karabiners:

- the width of loading on the main attachment karabiner, and the way the load was distributed $\frac{1}{4}$ - $\frac{1}{4}$ - $\frac{1}{2}$;
- the negative effect a close and/or large anchor had on the location of cords within the main attachment karabiner and the consequent reduction of strength of the karabiner
- the on/off loading pattern experienced during ascending by the hitch karabiner when two attachment karabiners were used, with the increased probability of cross loading.



With these three main issues, and many other objectives in mind, we set about trying to come up with a solution. At first we made a few prototypes ourselves which we took to manufacturers for comment. Following a lengthy development period and

an interesting diversity of subsequent prototypes, we finally have a result.

The Hitch Climber system has two components at its' core:

- a rather sexy looking pulley called 'Hitch Climber' from DMM in Wales; and
- a high performance friction hitch cord named 'Ocean Polyester' made by Austrian firm Teufelberger.

These are stand alone products, but make a cracking combo for tree climbers that prefer to use a knot as their adjuster in running (doubled) rope systems.

The Hitch Climbers Guide to the Canopy offers up some thoughts about how to use the two products together. The 'Guide' is meant to help you formulate your own safe working practices.



| H i t c h | C l i m b e r | | | | |

This is where things start to get a bit official!

The Hitch Climbers Guide is not a User Manual and as manufacturers, we have no obligation to offer more than the product information that comes with each unit. But as end users, we know the limitations of most User Instructions. So we wanted to do a bit more to help communicate our visions of how this system could work, to help you understand why some of the new features are there, and how these products may combine to help work positioning in the complex structures that are trees.

Now the difficult bit, as soon as we are offer up information, out of the darkness jumps the spectre of liability. We hope that you will accept what you find in these pages in the spirit in which it is offered, not as definitive instruction and as a substitute for training, but perhaps as an extra tool or two that could be added to your mental tool box. The usual analysis, cross checking, discussion and peer review should be applied to any new data you find here. We want to meet as many of you folk as possible in person and in pleasant circumstances, not in court or in hospital.

Please apply logic to what you do at height, the consequences of a mistake or bad choice can be very harsh on individuals and families.

Chose your anchor points wisely, make sure all the components in your work positioning systems are compatible and suited to the work to be carried out, and ensure that every component is configured correctly. If you are not sure about something, before you do it, ask someone who is truly competent for their input. The inherent risks associated with work at height are without doubt there, but that doesn't mean you can't have fun work positioning with a Hitch Climber system. Manage the risks and enjoy!

Only some of the possible techniques are shown in this guide. Nevertheless they cover simple and more complex work positioning techniques, rescue and hauling applications, and some ways that the pulley can be used in lightweight rigging. If you have any difficulty in understanding the information presented, please contact [Treemagineers](#). Rant over!

Warning!

Work at height is a high risk activity. It is your responsibility to manage those risks.

Before using these products you must:

- Inspect the product for defects;*

- Read and understand all relevant user instructions;*

- Understand the scope of application of the product and its' limitations;*

- Recognise, register and manage the risks involved; and*

- Gain instruction from competent personnel.*



Risk of serious injury or death.





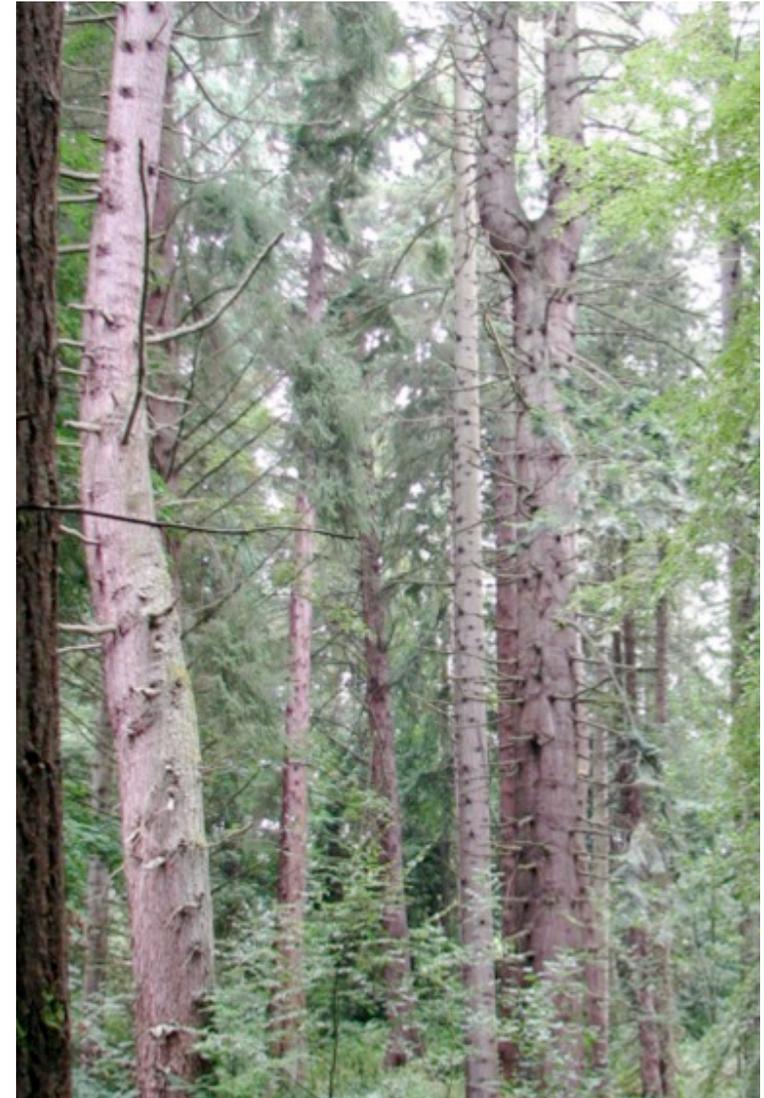
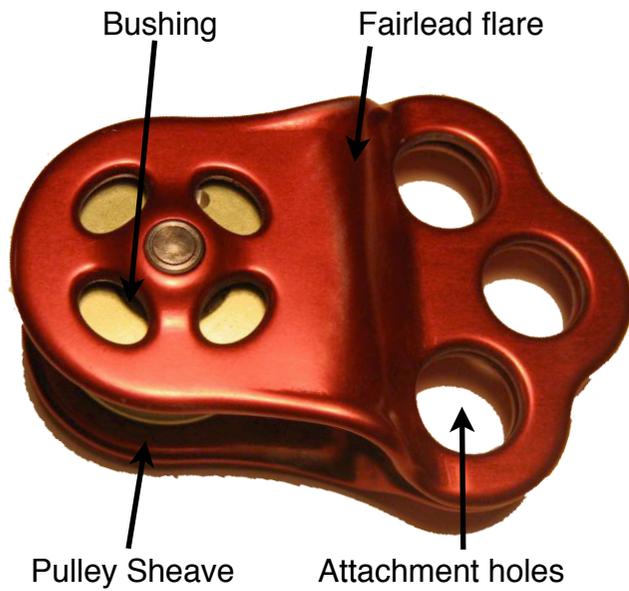
Hitch Climber

Nomenclature and Standards

DMM Hitch Climber Pulley

Standards EN12278, EN795(b and c),
NFPA 1983 (06 ED) Class L

Loading diagram



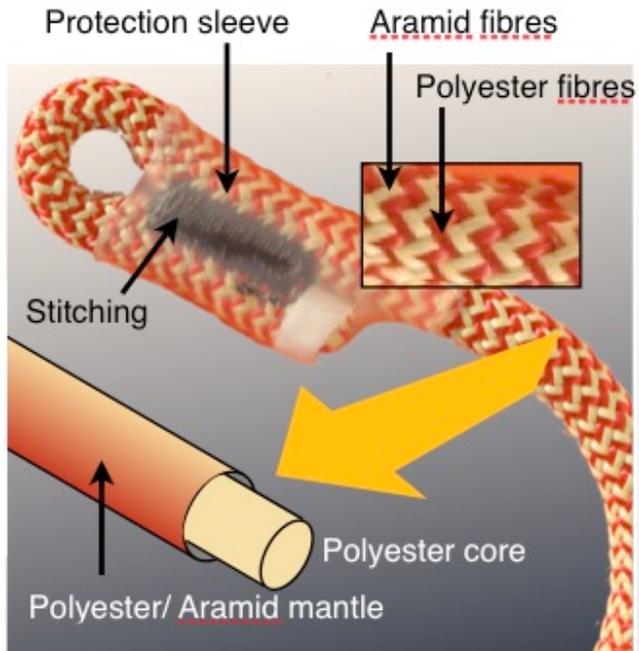


||| Ocean | Polyester |||

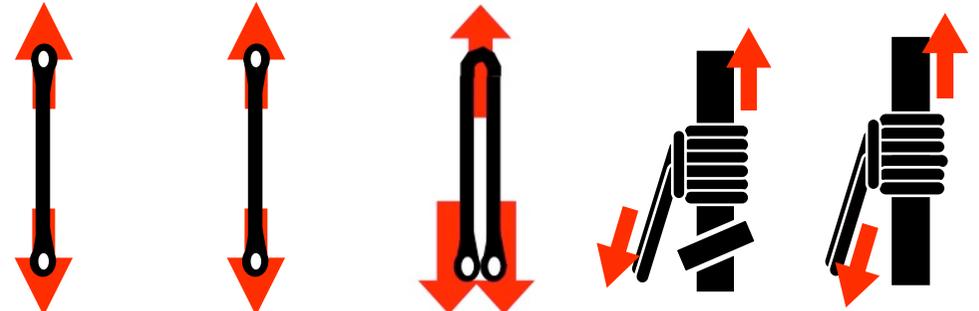
Nomenclature and Standards

Teufelberger Ocean Polyester eye to eye Slings

Standards: EN 566



Cord Type	Minimum Breaking Strength (all tests on 12mm pins)			6 coil Prusik on Yale XTC Plus	Minimum Grab Strength
	Single		Doubled		
	Mantle intact	Mantle Completely Severed			
Ocean Polyester 10mm stitched eye to eye sling	22kN	13.5kN	34kN	15kN/ 3 mins.	4kN





Friction, Cord Selection and the Hitch, orwhy you should use Ocean Polyester and a Hitch Climber!

Running a climbing line over a branch splits the friction in a climbing system between the anchor point and the friction hitch. If you use a friction saver, you will have noticed how much quicker the cord of your friction hitch is now wearing. With more friction now concentrated at the hitch, much more heat is generated there. The situation becomes more extreme with smaller diameter climbing lines combined with small diameter hitch cord. Simply, the friction stays the same, but the surface area that copes with the heat generated is smaller. This is especially true if you climb somewhat 'sporty' and are using a 'pulley saver'. Hence Ocean Polyester. The mantle performance is delivered via a mix of heat resistant Aramid and grippy Polyester. The core is 100% trusty Polyester.

Hitch Climber works with most friction hitches, but ultimately it's up to you, the end user, to configure the system so that it works reliably. Single leg hitches (e.g. Blake, Helical, etc) will obviously require a stronger cord than closed, double leg systems in order to achieve the same strength. To really benefit from Hitch Climber, use a hitch with low 'base friction' such as the braided hitches e.g. Distel or V.T. The coils at the top of those hitches are where the friction is concentrated. The pattern of braid(s) below decides how the friction is presented to the climbing line. There are many configurations for each friction hitch, but as ever, when trying new tools, stay low until you are truly competent with the system before advancing to greater heights. Take the time to match the hitch cord to the climbing line and make sure the hitch grips reliably. Be particularly careful when using both a new hitch cord and climbing line. Use at least one 'run in' rope element.

Ocean Polyester is available in spool lengths and as stitched 'eye to eye' slings. The slings meet EN standards having an MBS of 22kN. The result is the first knot based system where every component is certified, whether it be the rope and its splice, a karabiner or pulley, cord and its terminations.

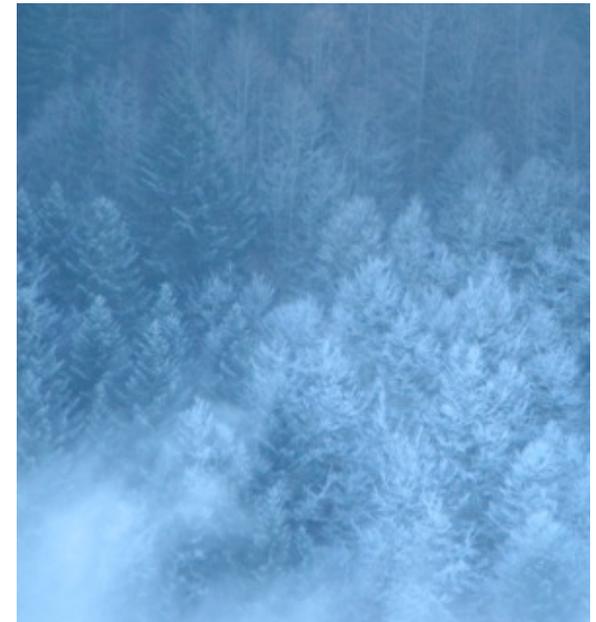
A good overview of arborists knots, including friction hitches is Lingens, D. (2006) Tree Climbers' Knotbook. Schluverlag, Stockelsdorf, Germany. ISBN 3-9810417-1-2. Available online at www.freeworker.de

Less Sit Back, Easier Self-Tailing

'Sit back' is the backward/downward movement experienced by the climber between advancing an adjuster back to the point where the climber's weight is held by that adjuster. For mechanical adjusters, the measurement can be as small as a few mm. For friction hitches the measurement is normally in cm.

There is less sit back with a Hitch Climber system. The knot is pushed by the top of the pulley. The hitch cord terminations are held at the base of the pulley. The distance between the top and bottom of the pulley is the minimum reduction in sit back. It is also possible to use shorter cord lengths, so sit back is further reduced. Less sit back = energy saved, so it's worth experimenting with your hitch to see how you can reduce sit back, whilst maintaining a reliable grab function. Once you've achieved Nirvana, all you have to do is remember the set up and order the same lengths slings next time!

'Self tailing' is influenced by many things e.g. the friction between hitch and rope when not loaded (base friction), efficiency of the pulley sheave, the degree to which the system bends the climbing line and the weight of free hanging rope directly below the climber. Hitch climber systems tend to leave the rope relatively straight and the rolling resistance of the sheave is low, hence self tailing occurs sooner.



Work Positioning Techniques

Single Anchor Set Up, Some Features

The stitched terminations make the whole system more compact, and the rope termination is now relocated to a second karabiner. The compactness allows us to use a different shape karabiner for main attachment.



An Oval here has the advantage that it can accept wider loads at both ends, so it can be rotated if desired. And the load from the splice is transferred through the rigging plate of the pulley to a central position on the Oval karabiner where the loading pattern is now $\frac{1}{4}$ - $\frac{1}{2}$ - $\frac{1}{4}$, which plays to its strengths. Oval karabiners loaded like this often break at well above their rated MBS

When the climbing line is in tension, both karabiners tend to be pulled into vertical alignment. When ascending, slack may form in the rope

below the point where you grip, but the loading on the hardware is maintained. Visual inspection of the system is also clear and simple.

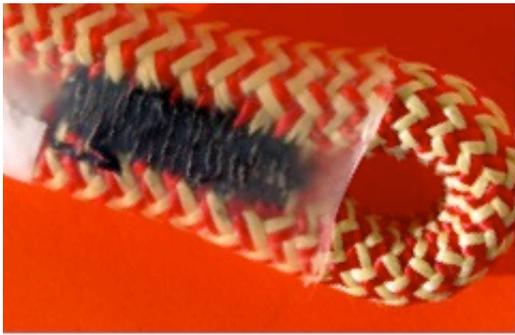
Note:

- Measures should be taken to ensure that karabiners remain loaded along the main axis at all times, this is especially difficult during inconsistent loading patterns. Reliable methods may include fasts or compression fittings (e.g. [Sherrilltree's Blue Band-Its](#)), tight spliced or stitched terminations.

Low profile terminations should be used at the standing part of the climbing line. Conflict between the friction hitch and climbing line end knots may cause the friction hitch to perform inconsistently.

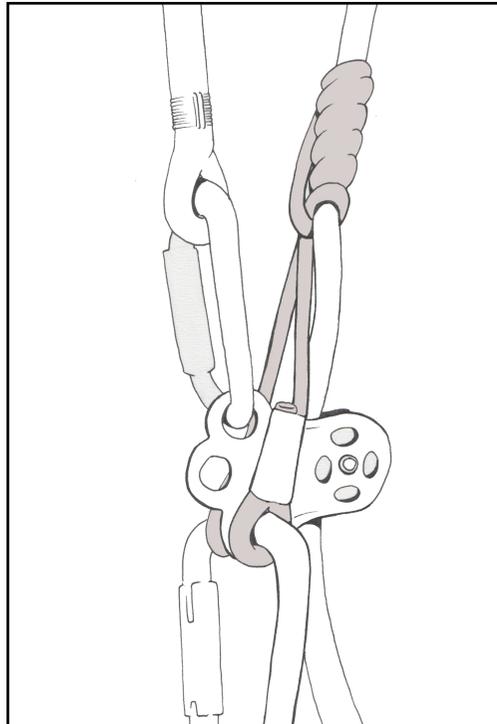
Misconfigurations





Tolerance of Anchor Diameter

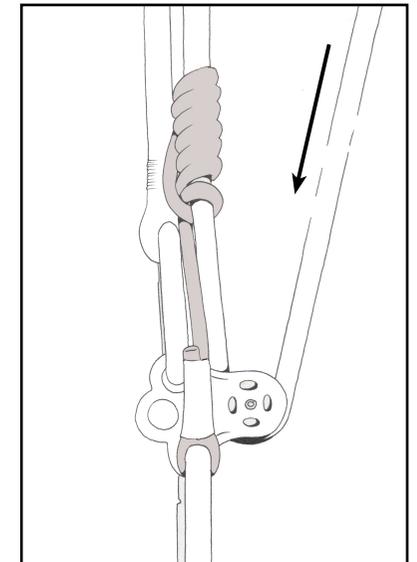
The karabiner holding the termination of the standing part of the climbing line is able to swing in its attachment hole. Anchor points of all sizes can be accommodated without having to reconfigure equipment or accept a compromised system. This includes 'climbing in a triangle' where the rope is routed over two anchor points, often some distance apart.



3F's - Fork Falling and Fairlead

A pulley directly under the friction hitch tends to ensure that the rope is always fed to the underside of the knot in a similar way, thus normalising knot function. Rope fed at an angle to the cheek plates of the pulley will tend to be guided onto the running sheave via the side flairs and cheek plate angles. Extended circular cheek plates tend to ensure that the rope continues to run on the sheave even when the rope is being fed from a slight angle.

When a climber descends in the canopy, the running rope is often bent over a branch or through a branch fork. The rope is bent upwards as the climber descends. There is no way to avoid friction building up on the branch, but the Hitch Climber pulley (without a becket) helps to ensure that only minimal running resistance is added by the pulley.

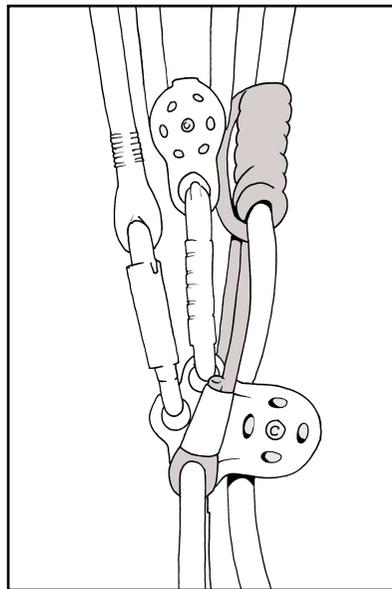




Double Anchor Configurations

Two Anchors, One Hitch, One Rope – the “V” rig

A great technique to have in the tool box. With low running resistance pulleys at both anchors and at the top of the hitch climber, the load placed on both anchors tends to be equalised. This technique may be applied in trees that have been topped (e.g. where the climber feels uneasy about anchoring on a single point) and in trees with spreading crowns. Traversing from one side to the other (and back) may be easier. It also gives more confidence when working in the wet. Branch



walking (in and out) seems to be easier. This system can also be very useful when cable bracing e.g. traversing from one point to another and then back to the original location to complete a ring brace.

Two Anchors, Two Hitches, Two Ropes – double crotching

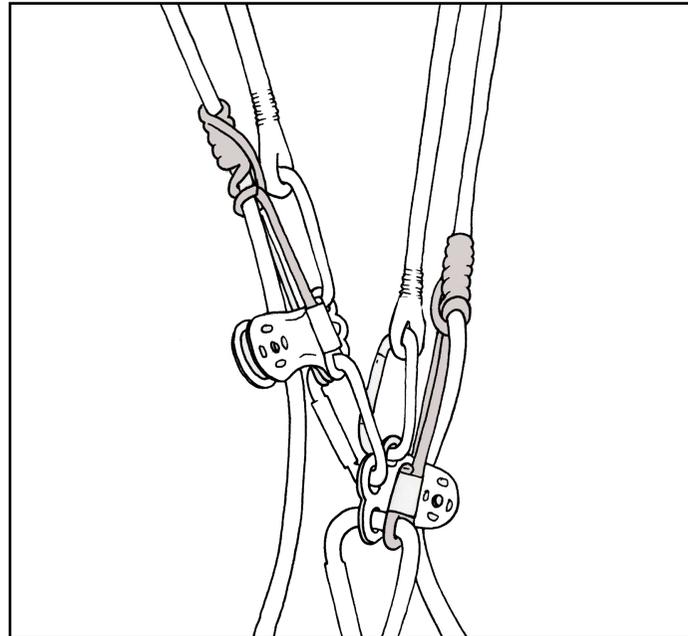
Climbing with both ends of a climbing line (or with two ropes) is preferred by many, but that can lead to lots of clutter at the front of the harness. In this configuration, the second climbing system is mounted in the spare hole of the lower Hitch Climber pulley. There is only one karabiner attached directly to the harness.



Traversing and precise work positioning can be made easier using this system. Again, this can be a reassuring technique to adopt in bad weather. For example, returning from a branch walk on a snow covered limb can be considerably more graceful than the alternative - fearful skating!

Notes:

These are not basic techniques. Training may be essential or advisable. New or unfamiliar techniques should be practiced at low level. Many repetitions may be necessary. When the climber is competent in the individual technique he/she may advance to a working position. Direct supervision by other climbing staff may continue to be necessary.



Friction at the hitch may be less than normal levels. The hitch may need to be modified to perform reliably.

To help ensure anchor forces are equalised, anchor points must be at the same height

Adopting a swivel unit at the harness attachment point is a good idea for these techniques. It's all too easy for torsion to build up in all that hardware concentrated in such a small area – not good!

It is important to avoid placing large lateral loads on the anchors points. Lateral loads increase as rope angle approaches horizontal. Anchor points in trees are often

poorly adapted to lateral loads.

Rescue and Hauling Functions

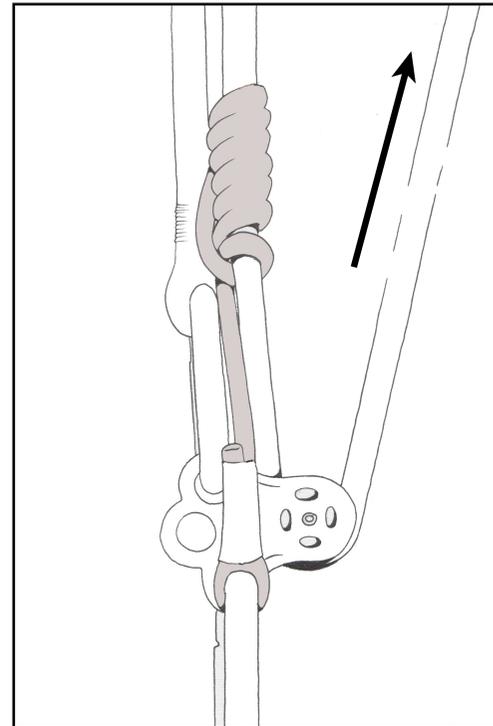
Lifting the casualty

In Hitch Climber systems, there is a pre-installed 3:1, braked, mechanical advantage hauling system on the climber at all times - a Passive Safety feature. This is relevant where the casualty may be located vertically above a hazard or poor landing zone e.g. electrical power lines, water or road. By hauling on the running part of the climbing line, the casualty may be raised higher in the canopy above obstacles, then lowered following a different route to a more suitable landing zone.

Note:

Rescue should only be attempted using the casualty's climbing line if inspection shows the whole system (including anchor point) to be fit for purpose following the incident. Ensure that the rope is long enough.

Rescuer and/or groundworker should provide a backup brake on the hauling line





Pick-off rescue

(mass of the casualty is entirely supported by the rescuers work positioning system)

During a pick-off rescue the load applied to the friction hitch of the rescuer is significantly increased. This may lead to cause difficulty in operating the hitch, leading to a tiring and/or jerky descent.

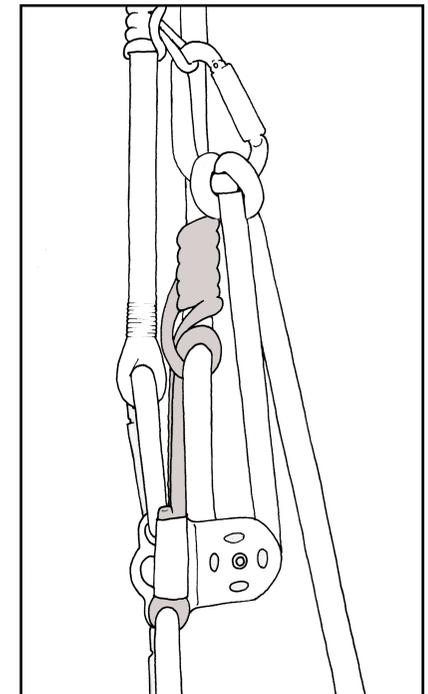
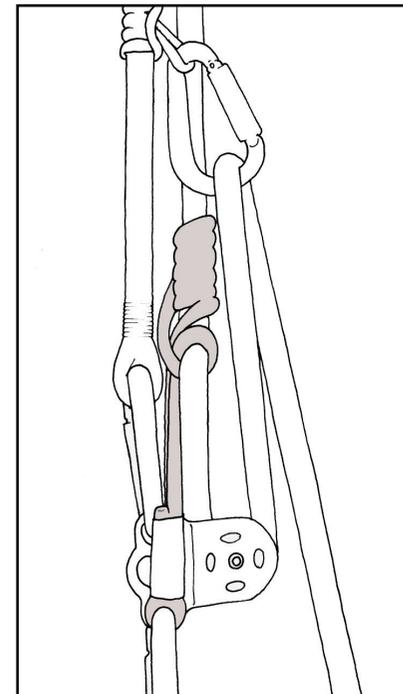
Friction levels can be reduced at the hitch and relocated elsewhere to normalise the performance of the hitch. An adjustable mid-line attachment can be placed above the termination using a compact Prusik loop. Varying levels of friction can be added by routing the running part of the climbing line through a karabiner or by connecting friction devices to the karabiner e.g. a figure 8. If the climbing line is long enough, friction can be created by a ground worker tending the tail of the rope until both rescuer and casualty are on the ground.

Notes:

Forces placed on anchor points and throughout the work positioning systems are often considerably higher in a pick-off rescue than in normal work, especially if the descent is jerky. These forces should be taken into account before attempting to simulate a pick-off rescue and in crisis situations. A change to a stronger anchor point may be

necessary, and different hardware and software may be required in the rescue system.

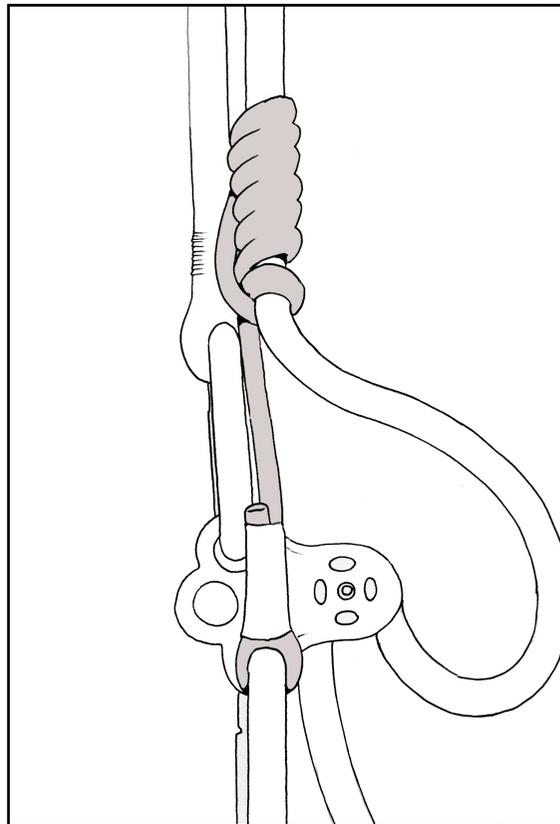
Many other combinations of equipment may be used to add friction in this scenario. It is the users responsibility to ensure that the equipment chosen suits the requirements of the situation.



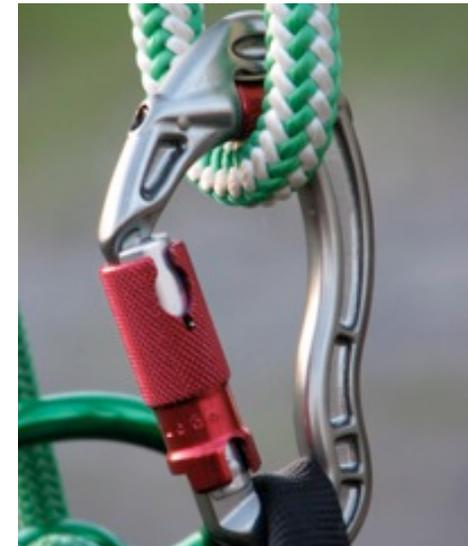


Equipment Hauling

Hauling equipment up to the canopy of a tree can be tiring work. With a Hitch Climber system, the climber can pull a bite of rope from between the hitch and pulley then lower it to the ground worker. Tools (e.g. chain saw, pole saw, rigging equipment) or other supplies (e.g. bracing equipment, lunch or water!) can be attached in the loop and then be pulled up to the climber (using mechanical advantage). The ground worker pulls on the tail of the rope, the loop shortens and the tools go up to meet the climber.



Karabiners incorporating a pulley e.g. DMM Revolver increase the efficiency of the system when used to hang the load. It's never been so easy (for the climber) to get that Stihl MS660!



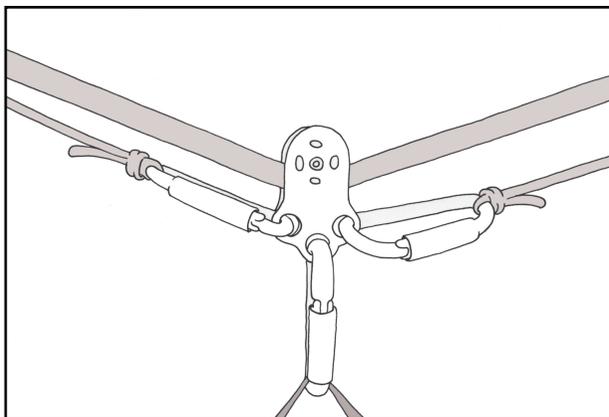


Additional Applications (in brief)

Hitch Climber pulleys are available in two colours so that you can clearly differentiate between those units used for lightweight rigging and PPE.

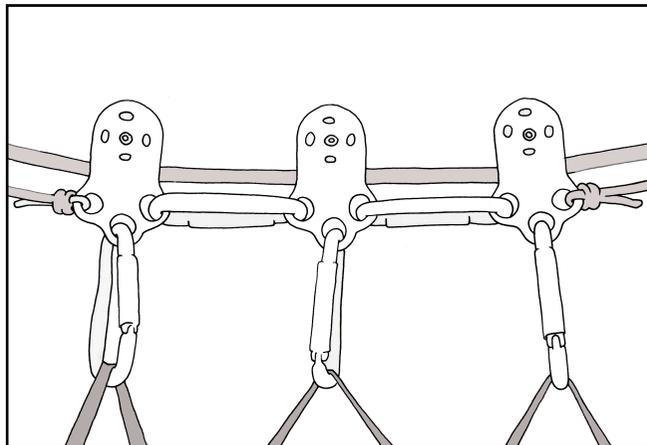
Single pulley speedline

Simple speedline installation for lightweight loads. Load suspended centrally. Haul back and pull lines to either side. Hitch Climber is certified as an anchor for Horizontal Life Line systems.



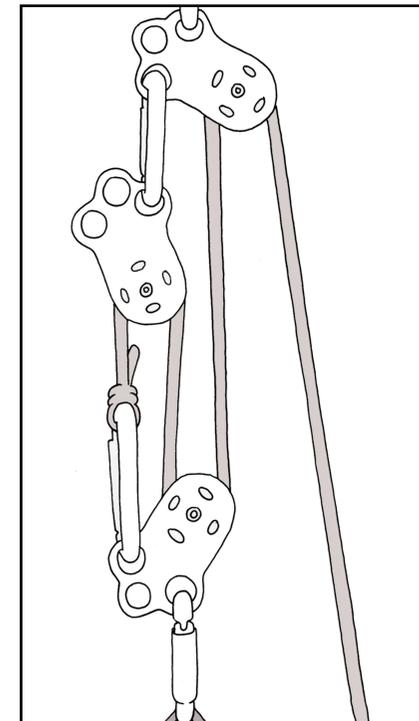
Multiple pulley speedlines

Chain of Hitch Climbers spreads the load along a greater length of rope. The benefits are less bending of rope at any one point, plus multiple attachments to the load. Haul back and pull lines at ends of chain.



Mechanical Advantage Systems

Mechanical advantage systems are normally constructed using multi sheave pulleys. Because Hitch Climber can be hung eccentrically, braked MA systems can now be built with single sheave pulleys.





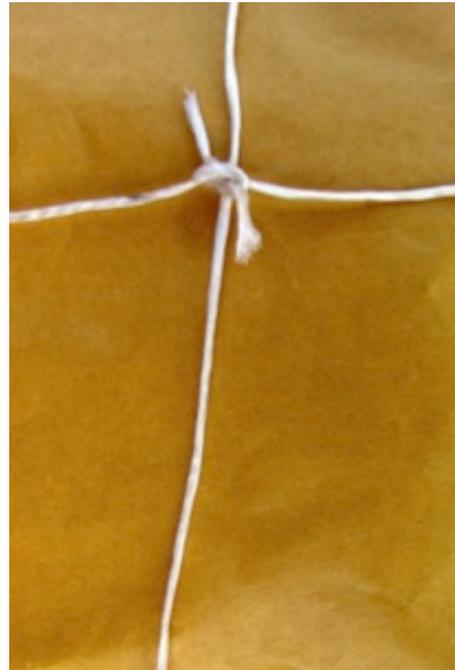
treemagineers

||||| Trees ||||| Imagination ||||| Engineering |||||

www.treemagineers.com

D M M

www.dmmwales.com



This Guide has illustrated some examples of appropriate uses of the Hitch Climber system. We'd love to hear what you think!

If you have suggestions for further techniques please take the time to put them in writing, with copious illustrations, as much explanation as possible and contact details including a telephone number. Our contact details follow below.

The plan is to expand the Hitch Climbers Guide with your help and experience, for all to share.

Treemagineers Ltd
Dall Store
Rannoch Station
PH17 2QH
Scotland – GB

www.treemagineers.com

info@treemagineers.com