

Hitch Climbers' Guide to the Canopy

Guidance for the use of the certified Hitch Climber System

DMM

treemagineers

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



TOGETHER IN MOTION



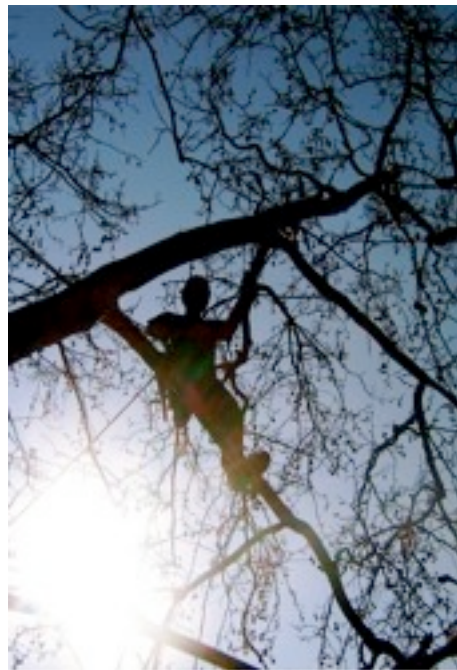


Table of Contents

Introduction	3
Disclaimers	4
HC Pulley Nomenclature and Standards	5
OP Hitch Cord Nomenclature and Standards	6
Ultra O Karabiner Nomenclature and Standards	7
Braided Safety Blue and Tachyon Nomenclature and Standards	8
Friction, Cord Selection and the Hitch	9
Less Sit Back, Easier Self-Tailing	10
Why certify the system?	11
Suitable and sufficient measures	12
Single Anchor Set Up, Some Features	14
Misconfigurations	15
Tolerance of Anchor Diameter/ 3F's – Forks Falling and Fairlead	16
Double anchor Configurations	17
Managing Slack	18
Floating Prusik	19
Managing Slack	20
Rescue and hauling functions	21
Add-in Prusiks	22
The "Lift Off" Add-In Prusik	23
Comments Regarding Pick-Off Rescue	24
Equipment Hauling	25
Additional Applications	26
Contact Details	27

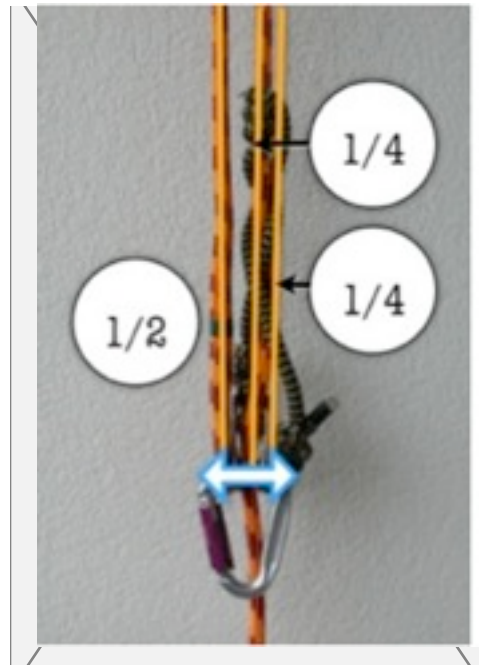
Introduction

The Hitch Climber Story

Some years ago, Treemagineers did some testing on the strength of configured work positioning systems commonly in use. Three situations 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 that 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 certified Hitch Climber System has a number components at its' core:

- a rather sexy looking pulley called 'Hitch Climber' from DMM in Wales;
- a symmetrical oval karabiner from DMM called Ultra O;
- a high performance friction hitch cord named 'Ocean Polyester' made in two diameters by Austrian manufacturer Teufelberger; and
- two climbing lines from Teufelberger - Braided Safety Blue and Tachyon

These are stand alone products and each carry their individual certification. Together, they 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 some thoughts about how to use these products together. This 'Guide' is meant to help you formulate your own safe working practices. It should be viewed in combination with the system user instructions.



This is where things start to get official!

The Hitch Climbers Guide is not a User Manual. Manufacturers have no obligation to offer more than the product information that comes with each component. End users, however, know the limitations of most User Instructions. 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 offer 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 nor 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 enjoy safe 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, plus additional ways that the pulley can be used in lightweight rigging.

If you have any difficulty in understanding the information presented, please make contact with us.

Warning!

*Work at height is a high risk activity.
It is your responsibility to manage those risks.
Before using these products you must:*

- *Inspect all components 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.

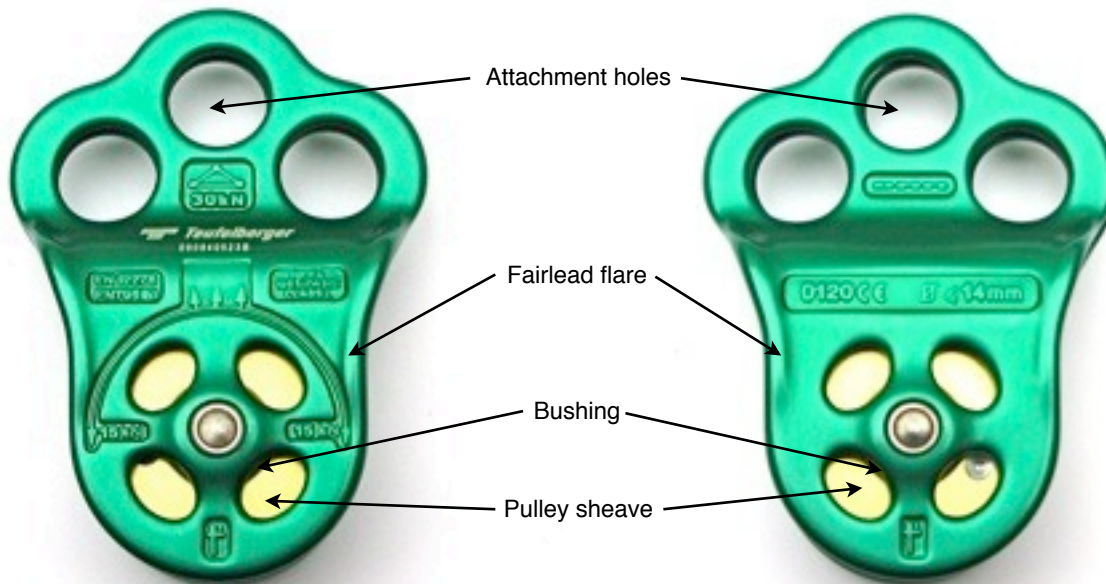


The Hitch Climber Pulley

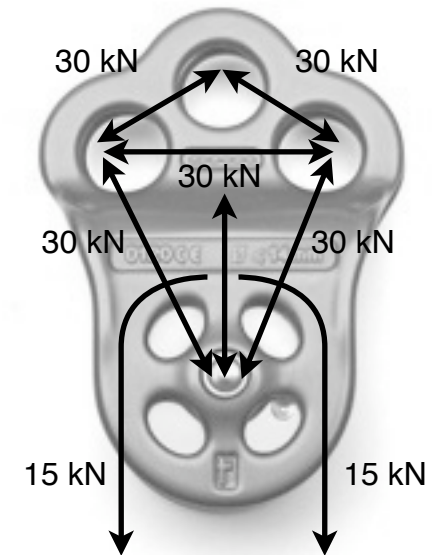


Standards: EN795(b):1996, EN12278:1998, NFPA 1983 (06Ed) Class L

Nomenclature



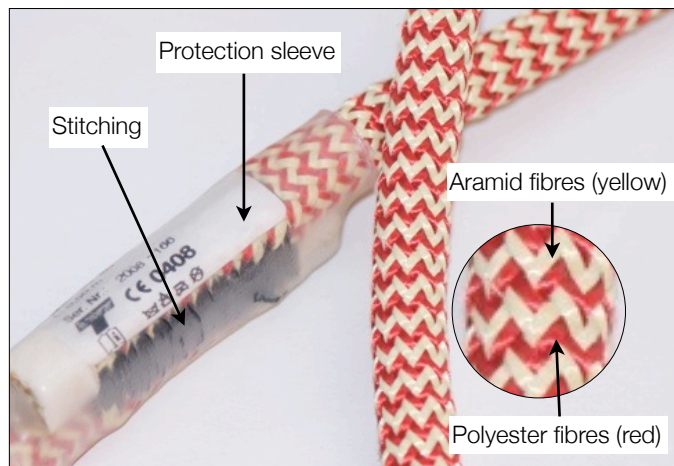
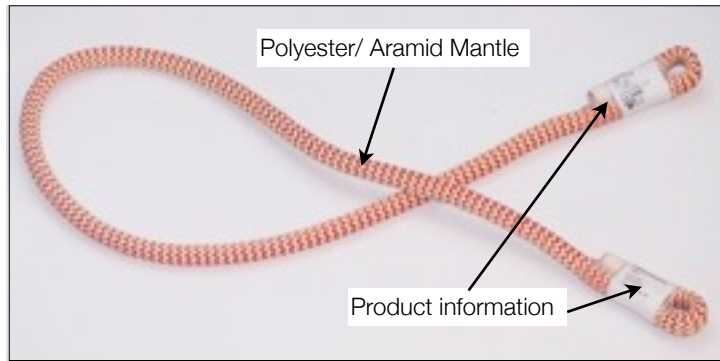
Loading diagram



Ocean Polyester Friction Hitch Cord



Standards: EN566:2006, EN795(b):1996

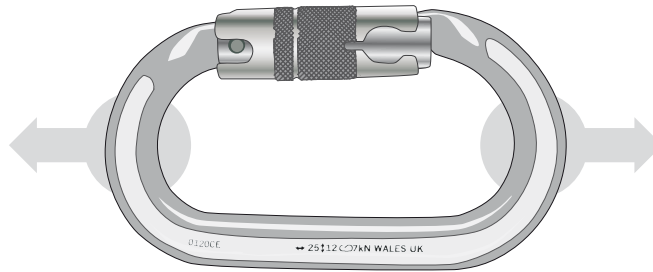
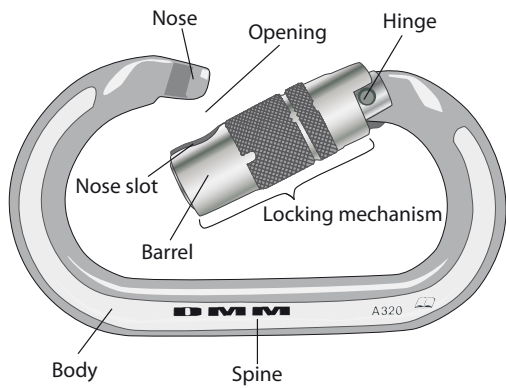


Cord Type	Standards	Minimum Breaking Strength (All tests on 12mm pins)				Minimum Grab Strength 6 coil Prusik on New England Braided Safety Blue and Tachyon
		Single		Doubled		
		Mantle Intact	Mantle Completely Severed	6 coil Prusik on Braided Safety Blue and Tachyon	Mantle Intact	
Ocean Polyester 8mm eye to eye sling	EN795(b):1996	20kN	10kN	15kN/3mins	23kN	4kN/3 minutes
Ocean Polyester 10mm eye to eye sling	EN566:2006 EN795(b):1996	28kN	14kN	15kN/3mins	33kN	4kN/3 minutes

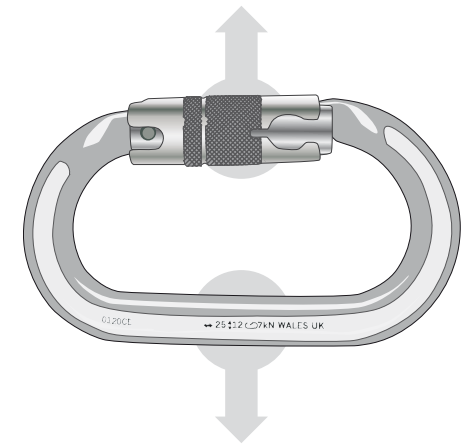


Ultra O Karabiner

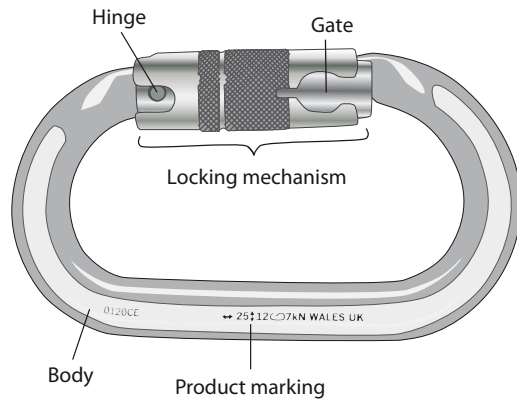
Standards: EN362:2004, EN12275:1998, EN795(b):1996



Major axis loading ↔



Minor axis loading ↑↓



Individual serial number



Gate open loading ↺



Braided Safety Blue & Tachyon

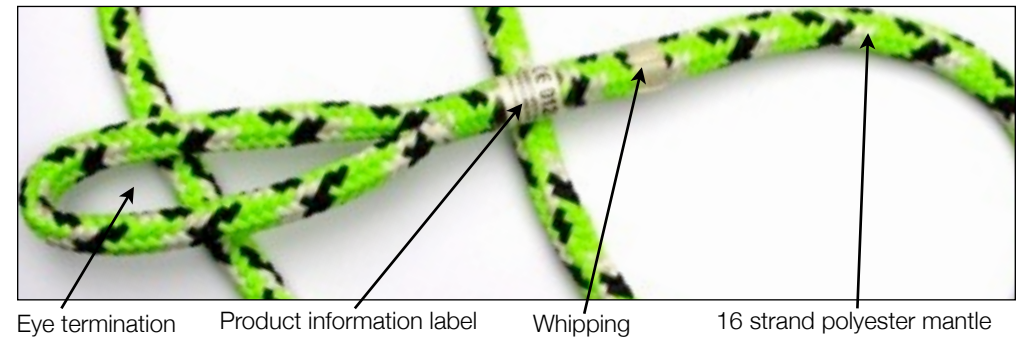


Standards: EN1891 Type A

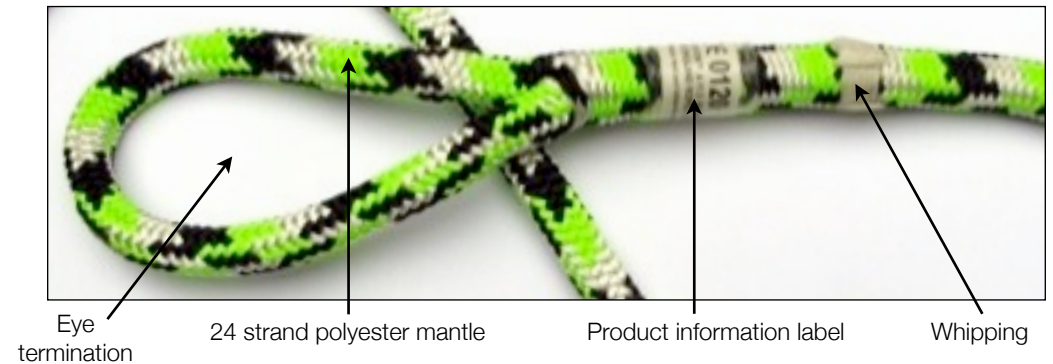
Tachyon	EN1891A Information	Braided Safety Blue
11.2	Rope Diameter mm	12.7
2.2	Elongation %	3.2
58.2	Cover mass %	83.6
41.8	Core mass %	16.4
86.4	Mass per unit length (g/m)	107.6
26.7	Static strength without termination (kN)	26
Polyester	Sheath material	Polyester/ MFP
Nylon with Polypropylene core	Core materials	Nylon
EN 1891 Type A	Standards	EN 1891 Type A
	Strength with Figure 8 knot (kN)	
	Strength with spliced termination (kN)	
≤6	FF 0.3 impact force (kN)	≤6

Nomenclature

Braided Safety Blue (stopper knot must be present at least 500mm from the end of the rope)



Tachyon (stopper knot must be present at least 500mm from the end of the rope)



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

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 is 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 new climbing line. Try to 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 $\geq 20\text{kN}$. 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 hitch 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.

Why Certify the System?

The Hitch Climber System came about because Treemagicians wanted to coordinate, and demonstrate, some of the amazing abilities of doubled (running) rope systems with friction hitches. That original objective remains. Legislation and logic sit alongside that original passion as motivators for certification.

Increasingly, national health and safety organizations, insurance companies, contract specifiers, employers and end users demand some sort of verification that the tools being used are appropriate for the task. Commonly, in Europe at least, EN standards are seen as the benchmark, and the presence of a CE mark is a legal requirement when selling Personal Protective Equipment within the European Union.

Key requirements of the EN standards are that:

- components are compatible with their neighbours;
- each component is configured correctly;
- equipment is strong enough for the job it is specified to do;
- ergonomic considerations are taken into account; and
- suitable and sufficient information is available to the end user to enable correct and safe use.

Why Certify the System?



There is no EN standard that directly applies to doubled (running) rope systems for connection to the ventral attachment point of a work positioning sit harness for industrial purposes. For that reason, certifying both components and complete systems is less straight forward than for some other techniques.

Each individual component of the Hitch Climber System has been certified to at least one EN standard and therefore carries a CE mark. The system as a whole has been certified to a 'Manufacturer Standard' developed by Teufelberger working in close association with both Treemagineers and DMM. Independent verification of performance has been overseen by the Notifying Body TÜV, Vienna. Hitch Climber Systems also carry the CE mark, as a demonstration of their abilities. The key performance criteria of the Manufacturer Standard can be summarized as below:



Function Tests

- Grab function test 1 – 4kN five times after advancing the friction hitch (single rope);
- Grab function test 2 – 4kN for 3 minutes (single rope);
- Controlled descent with a 150kg mass; and
- Controlled descent with a 280kg mass.

Strength Tests

- Minimum Static system strength – 23kN for 3 minutes;
- Minimum Dynamic system strength – 2500mm impact load with 100kg test mass; and
- Minimum Dynamic system strength – 600mm impact load with 280kg test mass.





Suitable and sufficient measures

In addition to certification tests, Treemagineers carried out further test series that more closely mimic the conditions experienced by the friction hitch cord under working use. One series assessed the strength of Ocean Polyester 10mm eye to eye slings after a number of different 'low load/high cycle' regimes. The results can be seen in the tables below:

Fixed load (0.6kN) over a range of cycles

Number of Cycles	Retained strength after low load cycles
10 000	>22kN
20 000	>22kN
40 000	>22kN
60 000	>22kN
80 000	>22kN
100 000	>22kN

Fixed number of cycles (40 000) with a range of loads

Load (kN)	Retained strength after low load cycles
0.9	>22kN
1.2	>22kN
1.5	>22kN
1.8	>22kN
2.1	>22kN
2.4	>22kN
2.4 (180 000 cycles)	>22kN

Suitable and sufficient measures



It is widely believed that rope-on-rope abrasion is a problem. This can be true when component compatibility and correct configuration have not been assured. Equally, poor end user habits can lead to accelerated wear e.g. cordage glazing may result from excessively fast descents. Treemagineers tested Ocean Polyester friction hitch cord in different 'simulated descents'. For each 'descent', 20m of rope was passed through a friction hitch (six coil Prusik) as a 50kg mass was lowered on a single line. (This is approximately equivalent to a 10m descent with 100kg mass attached to doubled system).

Three rope speeds were used, equivalent to 1m/s (fast descent), 2m/s (full speed descent) and 3m/s (out of control) descents on a doubled rope system. Between each 'descent', the Prusik was taken apart and assessed for abrasion damage. The test was stopped when the Polyester of the mantle had been sufficiently abraded that the 'tactile gradual control' of the friction hitch had been altered to that of an 'on/off switch'. At this point, the number of descents was noted and the length of rope passing through the friction hitch was calculated. It is important to note that the mantle had not been ruptured. The Aramid component remained, therefore the cord retained considerable strength and its' tolerance to heat. The function of the friction hitch had however altered, to the point where a climber might want to exchange it, but solely because of its handling characteristics. The results are included in the table below:

Speed of Descent	Length of Rope through the Friction Hitch Prior to loss of "tactility" (m)
1m/s	≥1000 (test stopped due to time constraints)
2m/s	≥220
3m/s	≥40

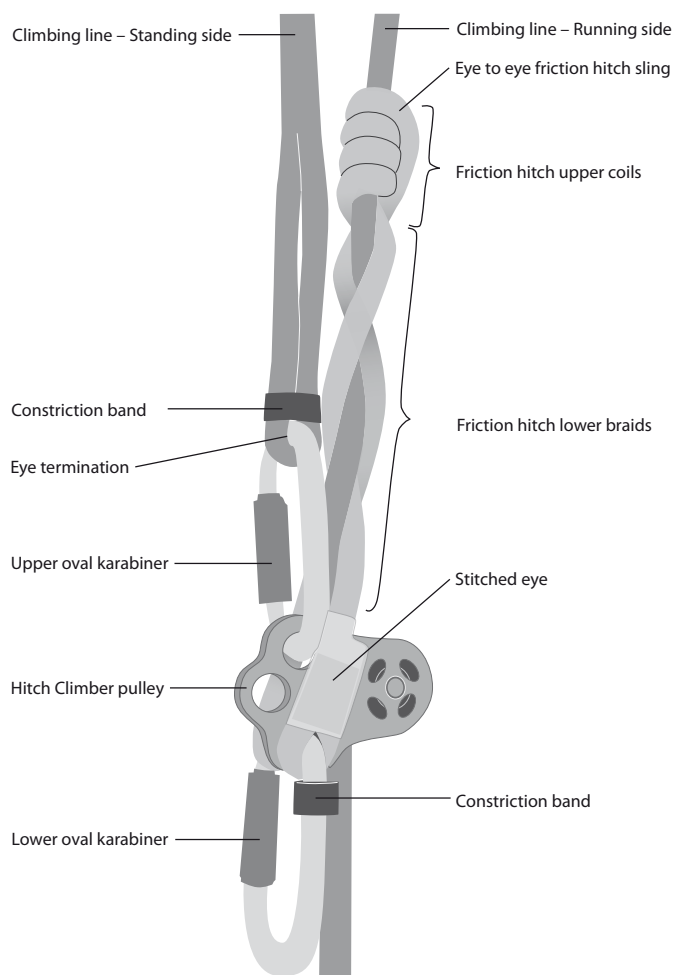
The rope-on-rope tests help demonstrate that:

- When correctly specified, friction hitch cord can be both reliable and long lasting when used as a rope adjuster;
- Increased speed of descent has a clear detrimental effect on the lifespan of friction hitch cordage;
- Lifespan may be equal to, or better than, that of metal wear parts in mechanical adjusters; and
- Rope-on-rope is not necessarily a problem.

By sharing Treemagineers test results in combination with outlining the certification process, we hope to have established that suitable and sufficient care has been taken to ensure that both the components and the system are appropriate for the tasks intended. Does this mean the system is perfect? Of course not! Does this mean the user can delegate all responsibility to the system? Again, obviously not! The contribution to safety and efficiency that we feel has been made by certifying the Hitch Climber System, is to eliminate some of the variables that can lead to accidents and to provide a flexible platform which can be used as a base for many work positioning possibilities. If all components are well suited to the task(s) they perform and to functioning with each other, the user can concentrate on their part of the safety equation more easily e.g. monitoring the grab function of the friction hitch, the closing and locking of karabiners, the wear and tear on components and ensuring good quality work positioning before performing a task, etc.

With a Hitch Climber System, all personnel can be confident about its' specification, whether they be in an office (e.g. health and safety staff, contract specifiers, Responsible Persons) or on site (e.g. Competent Persons, tree climber, designated rescuer).

Work Positioning Techniques



Single Anchor Set Up, Some Features

The stitched terminations on OP slings 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 karabiner here has the advantage that it can accept wider loads at both ends, so it can be rotated if desired. 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 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.

Misconfiguration

Misconfigurations



Knotted termination interfering with correct hitch function



Cross loading of karabiner due to non-captive eye of termination



Stopper knot tied behind an attachment hole



Directly tied into an attachment hole

Work Positioning Techniques

Tolerance of Anchor Diameter

The upper karabiner holding the termination 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.

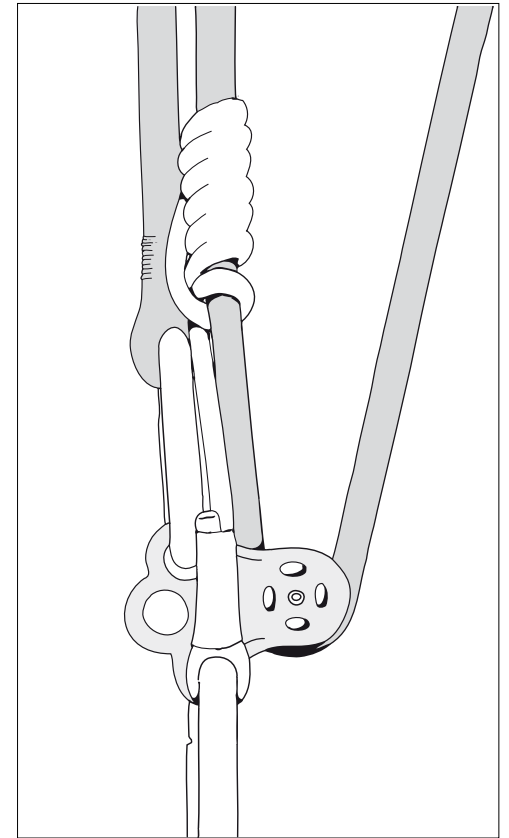


3F's - Fork Falling and Fairlead

A pulley directly under the friction hitch tends to ensure that the rope is always fed to the underside of the friction hitch in a similar way, thus normalizing hitch 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 thus bent upwards as the climber descends.

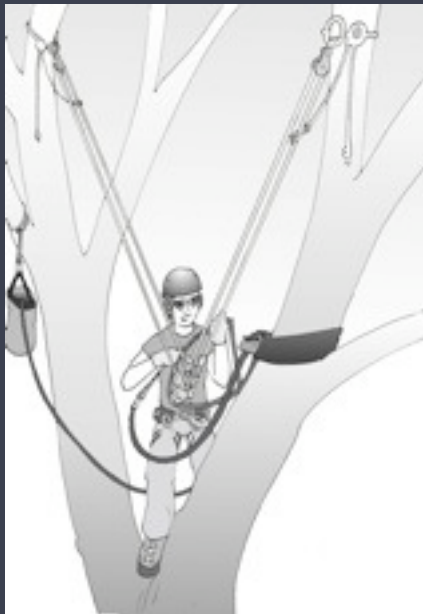
There is no way to avoid friction building up on the branch, but the Hitch Climber pulley (without a "becket") helps to ensure that only minimal running resistance is added by the pulley



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.



Two anchors, one hitch

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 may be considerably more graceful than the alternative of fearful skating!

Notes:

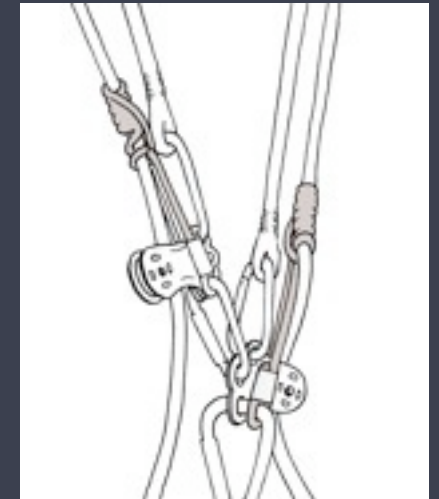
These are not basic techniques. Training may be essential or advisable. New or unfamiliar techniques should be practiced at low level. Many repetitions may be necessary. When the climber is competent in the individual technique he/she may advance to a working position. Direct supervision by other climbing staff, who are competent with the Hitch Climber system, 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 recommended 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 anchor points. Lateral loads increase as rope angle approaches horizontal.

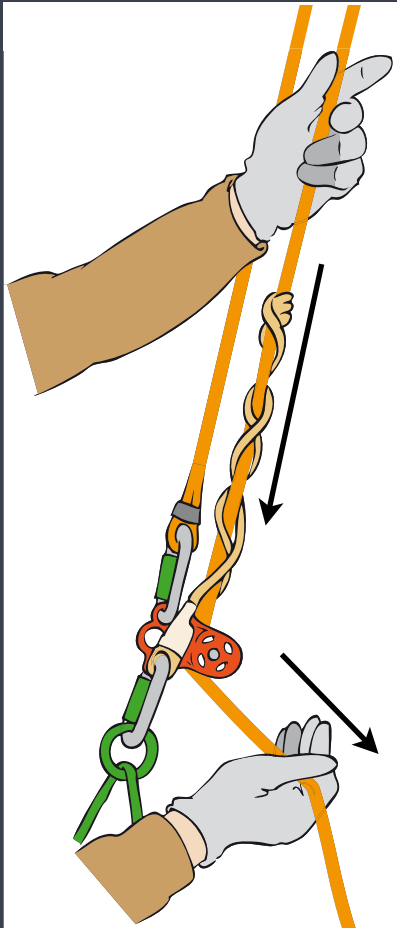
Anchor points in trees are often poorly adapted to lateral loads.



Two anchors, two hitches

Managing Slack

Slack can be bad for your health! It has a habit of accumulating without you realising, normally at those times when the consequences of a fall would be most serious. However, with a bit of good house keeping and a few well chosen techniques, slack can be tidied away!



Avoiding slack in the climbing system

Slack Tending Pulley

Hitch Climber is a cracking slack tending pulley! It's right there underneath the friction hitch, held tightly in position between the two connection karabiners.

The sheave's large tread diameter, the fairlead flairs, the proximity of the pulley to the friction hitch and the lack of sloppiness means that Hitch Climber is pretty efficient at this job.

Simply pull the climbing line underneath the pulley and slack is removed.

All Hands on Rope!

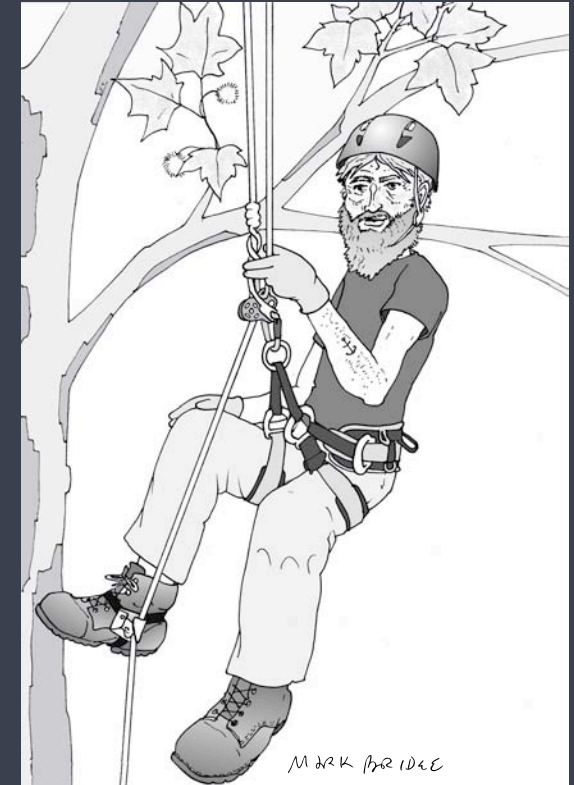
This may not be sexy, new or cool, but it is effective. Reach up with one hand above the hitch on the running part of the line, place the other just below the Hitch Climber.

Now pull down with both hands at the same time (and maybe give a little hip thrust too). True enough, progression is slow, but it is steady, confidence inspiring and slack free!

All feet on rope!

Using foot ascenders, your upper body can be given a break from time to time, and those powerful muscles in your legs can take over.

Foot ascenders and slack tending pulleys belong together like coffee and cake.



Climbing with a foot ascender

Managing Slack



Floating Prusik

This technique is perhaps best suited to bigger spreading trees, whose form dictates that short periods of work in the periphery of the crown are repeatedly followed by a long inward limbwalk and an ascent, before traversing to the periphery again. But this loop system is so quick to configure, it could be used in any tree.

The big advantage is that the friction hitch can be positioned at 'ascent/inward limbwalk' or 'positioning'. The transition from one mode to another takes only seconds. When 'ascending', the friction hitch is floated a suitable distance away

from the climber and 'anchored', so that long pulls can be made with both arms. Slack, that is so often a feature of systems where the hitch is close to the climber, is therefore almost eliminated. For 'positioning', the friction hitch is rolled as close as possible to the climber and anchored again, with the objective of enabling precise hitch control in all work positions.



Other advantages are that one connector is removed from the system, thus making the climbing system simpler. The configured strength of the Floating Prusik system as shown is very high.

Notes:

Pay attention to ensure that the friction hitch is always within easy reach and that the friction hitch grabs reliably.

In our image to the left, we have used a Wild Country Ropeman 1 to hold the loop in position. We have used this ascender because it is compact, light, relatively cheap, plus it allows rope to move in both directions without snagging. There are other mechanical devices that fulfill these criteria. A compact Prusik is another cheap and equally functional alternative (see below).

Managing Slack

For systems that use mechanical adjusters to anchor the loop, there is a tendency for the loop system to 'roll' when inward branch walking whilst taking in slack i.e. the friction hitch moves away from the climber. If a bit of weight is kept in the harness/climbing line, 'roll' can be eliminated. Equally, if you have a hand free, you could hold the bite of rope at the sliding D to stop rotation. This issue does not occur when a compact Prusik loop is employed to anchor the loop.

The length of the eye termination should be dimensioned so that when in 'positioning' mode, a 'bite' can be formed in both legs of the eye. The splice itself should not be bent to form the bite.



The 'Conifer dismantle' MA

Mechanical Advantage Returns

If you were looking for an excuse to buy a locking DMM Revolver, these techniques justify the retail therapy!

The 'Conifer Dismantle' MA

Climb up, establish an anchor point, descend to the lowest braches, start cutting on the slow journey back up. It often makes sense to follow this sequence when dismantling conifers (or other trees exhibiting strong apical dominance).

Slack can be a feature of those short ascents between work stations on the way back up to the anchor. However, a pulley (read Revolver) placed near the friction



DMM's "Revolver" Karabiner

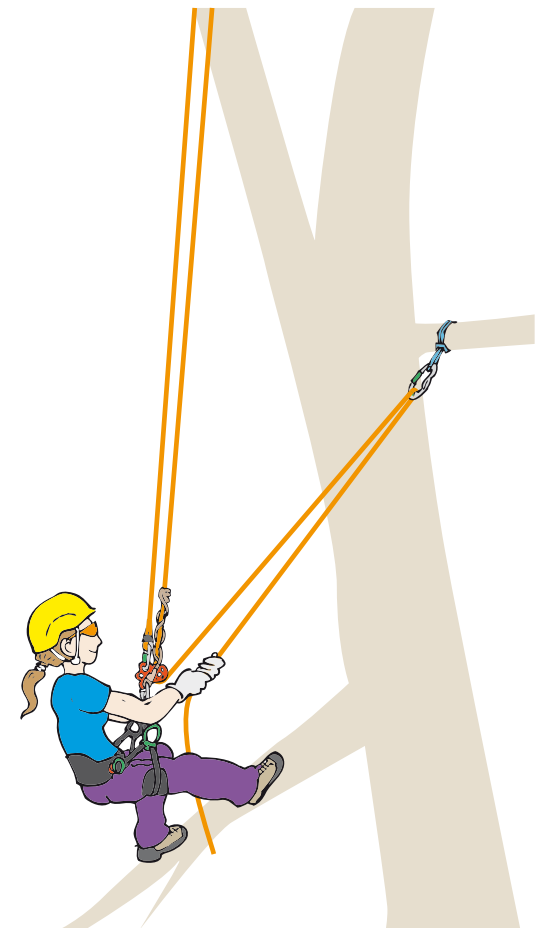
saver enables a mechanical advantage system that not only makes ascending easier, it also eliminates slack. Two birds, one stone, or in this case, a beautifully crafted collection of high grade components!

The 'Descending Branch' MA

A few uncomfortable inward steps, bit of a wobble, take out the slack in a hurry!

Returning from a descending branch at the extremities of a broad canopy can be a tricky operation, and contain a few anxious moments, especially in slippery conditions! If you place that Revolver on a suitably strong and well placed branch during the outward limb walk, you have a mechanical advantage system that helps the return in more than one way:

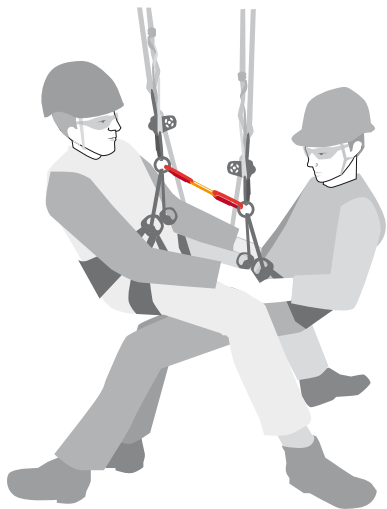
- there are two legs of rope to lean against, so balancing is easier;
- slack is eliminated;
- progress is faster;
- and less effort is required.



The 'Descending Branch' MA

Rescue and hauling functions

Lifting the casualty



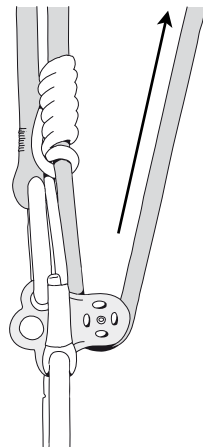
Basic connection to injured climber

inspection shows the whole system (including anchor point) to be fit for use following the incident. Ensure that the rope is long enough to complete the descent. Rescuer and/or groundworker should provide a backup brake on the hauling line.

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



Pre-installed 3:1 hauling system

'Pick-off' rescue



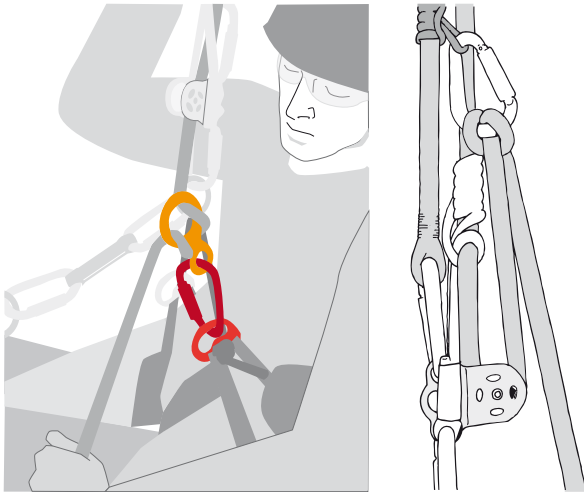
Rigging a 6:1 hauling system

In a Pick Off rescue, the mass of the casualty and any extra material required for the rescue (such as a stretcher/litter) is entirely supported by the rescuers work positioning system. The load applied to the friction hitch of the rescuer is significantly increased. There may be 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 added above the spliced 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 belay plate. 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



Adding friction for a pick-off rescue

in crisis situations. A change to a stronger anchor point may be necessary, and different hardware and textiles 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.

When adding friction after the friction hitch, the additional components and changes in component orientation can lead to

difficulties in ensuring normal control and function of the friction hitch. Take extra care to ensure that:

- descent is controlled;
- some friction is maintained in the top coils of the friction hitch;
- friction is balanced between the friction hitch and the added friction device;
- the friction hitch is free to return to its grab position; and
- predictable manipulation of the hitch is possible.

Add-In Prusik

We've had problems finding where to put this section! Add-In Prusiks can be added during rescue or work positioning operations, single anchor or double. Rather than have a crisis about it, we decided to add on an Add-In section! Add-In Prusiks can take many forms, some have already been

discussed, a few more examples are shown here.

The 'Stay Connected' Add-In

When setting up a Triangle or 'V' Rig, it is common to use a second system (such as an adjustable lanyard) to attach to a stem whilst the main climbing system is disconnected and reconfigured. Using an Add-In Prusik, the main climbing system may continue its safety function throughout the reconfiguration, in addition to the use of a second attachment:

Image 1) Install a Prusik on the standing side of the Hitch Climber System and connect it to the upper hole of the pulley (ensure the grab function of the Prusik is reliable);

Image 2) By alternately adjusting both friction hitches, create slack in the section of climbing line between the add-in Prusik and the Hitch Climber pulley. When sufficient slack has been created, tie a mid line knot (e.g. Alpine Butterfly) as a stopper knot below the Prusik. Check that the middle karabiner is now unloaded before disconnecting the spliced termination of the climbing line;

Image 3) Use the free end of rope to establish a second anchor, this may be a natural crotch or a friction saver. Reconnect the spliced termination to the middle hole of the Hitch Climber

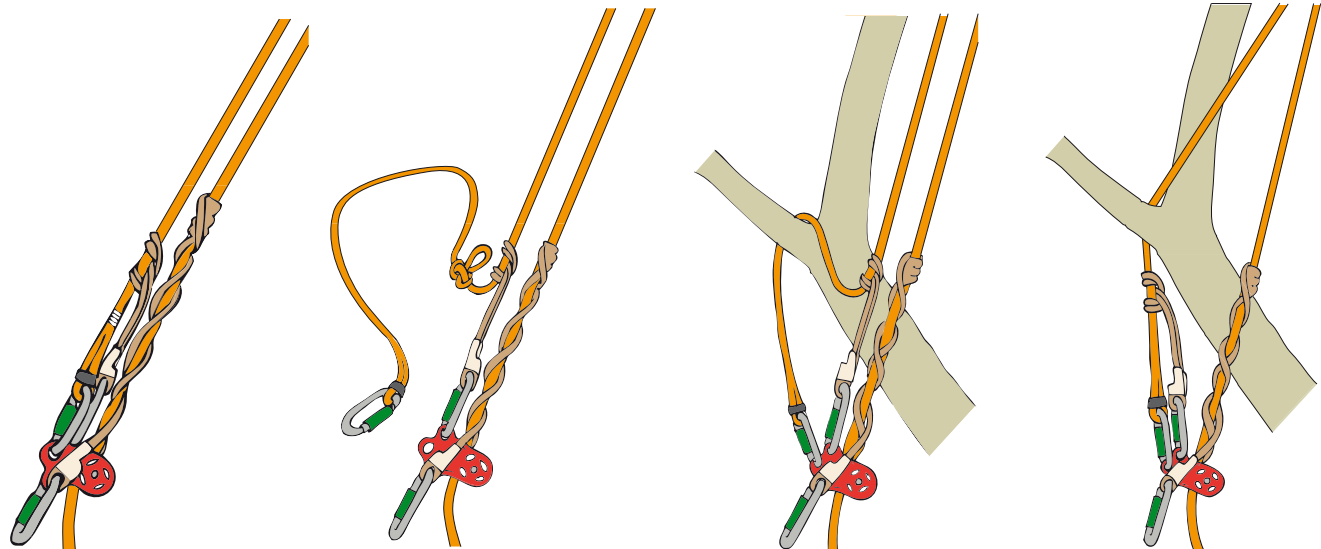


Image 1

Image 2

Image 3

Image 4

Add-in Prusiks

pulley using a karabiner. Remove the midline knot from below the Add-in Prusik, and alternately adjust both friction hitches to remove all slack from the system; and

Image 4) after a newly configured Triangle system is proof tested, it may be possible to redirect the climbing line further, thus involving more of the structural canopy of a tree(s). If the Add-In Prusik is passed through the redirect fork each time, it may not be necessary to remove it from the climbing line before the next redirect. The Add-In Prusik can remain connected to the spare hole on the Hitch Climber so that it doesn't swing around doing damage (e.g. broken teeth or glasses!)

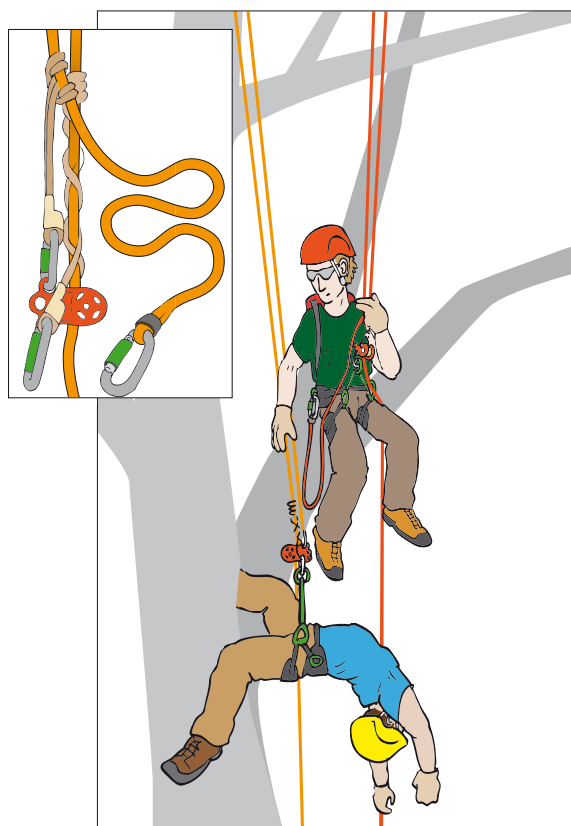
The 'Lift Off' Add-In

During a 'Pick-Off' rescue it is sometimes necessary or desirable to lift the casualty. Whilst this can be easily achieved using mechanical advantage systems, a simple counterbalance can be set up using a Hitch Climber system plus an Add-In Prusik.

When the Rescuer has reached the Casualty, an Add-In Prusik is securely placed above the spliced termination on the standing part of the climbing line. The spliced termination is then connected to a suitable

attachment on the Casualty's harness.

The Rescuer may now ascend a short distance from the Casualty and tension the Pick-off system. When the Rescuer descends, the Casualty may now be lifted (depending on the relative masses of the two climbers). The Rescuer can aid the lift by pulling on the standing part of the line below the Add-In, which is connected to the Casualty. In this way lighter Rescuers may lift heavier Casualties. The counterbalance effect is most efficient when friction is low at the Rescuers anchor point.



Descent to injured Climber



Termination of climbing line attached to injured climber. Rescuer descends on add-in prusik



Descent on main friction hitch, added friction necessary

Add-In Prusik

Comments regarding Pick-Off rescues are also relevant here. Please cross reference with that section including the Notes.

Note: The Add-In Prusik must be tied, dressed, set and tested before disconnecting the standing tail of the climbing line. Place a mid-line knot (e.g. Alpine Butterfly) below the Add-In Prusik before disconnecting the spliced termination.

If the Add-In is retained on the climbing line, ensure it does not negatively affect the reliable grab of the main friction hitch.

Ensure that each anchor point is strong enough (with ample safety reserves) to cope with the range of planned and unplanned loading scenarios that could occur during its use.

Very important:

Practice and become competent at ground level prior to using new techniques at height;

Whenever connecting and disconnecting at height, take considerable care to ensure that at least one connection to a structural anchor point is maintained at all times; and

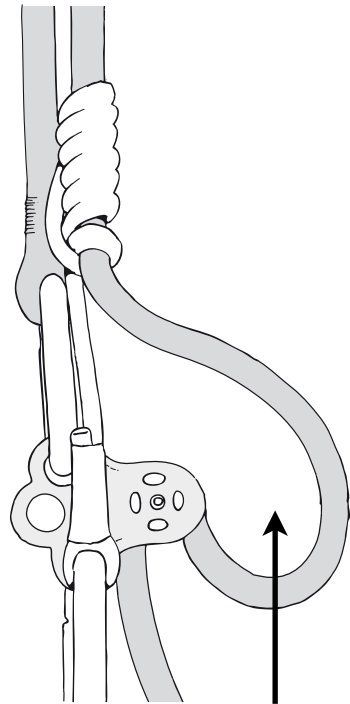
If you have any questions, please make contact before adopting a new work practice!



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 Locksafe 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 in to the tree!

Additional Applications (in brief)

Hitch Climber pulleys are available in a range of specifications (e.g. with bushings and bearings), all with aluminium sheaves. A range of cheekplate and sheave colours help to differentiate specifications and function e.g. PPE or lightweight rigging.

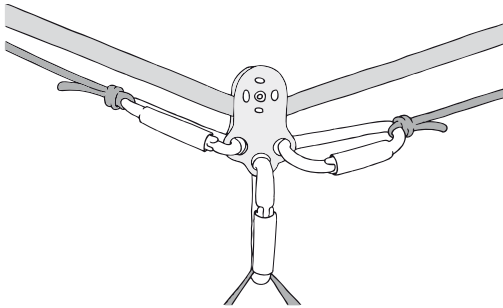


Hitch Climber Pulley with low-friction bearing

Additional Applications

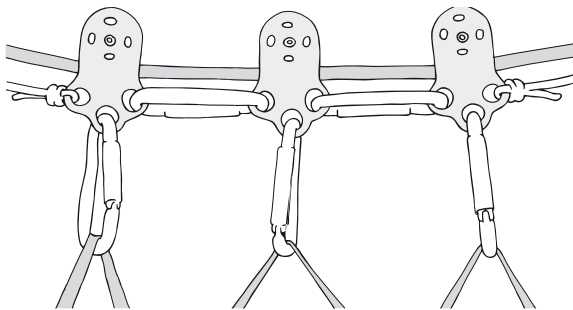
Single pulley speedline

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.



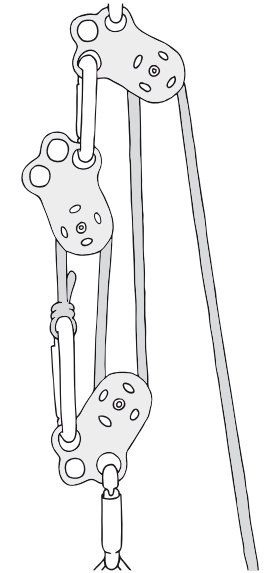
Multiple pulley speedlines

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.



Rigging a mechanical advantage system with Hitch Climber pulleys

... yet another use for your Hitch Climber pulleys!



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

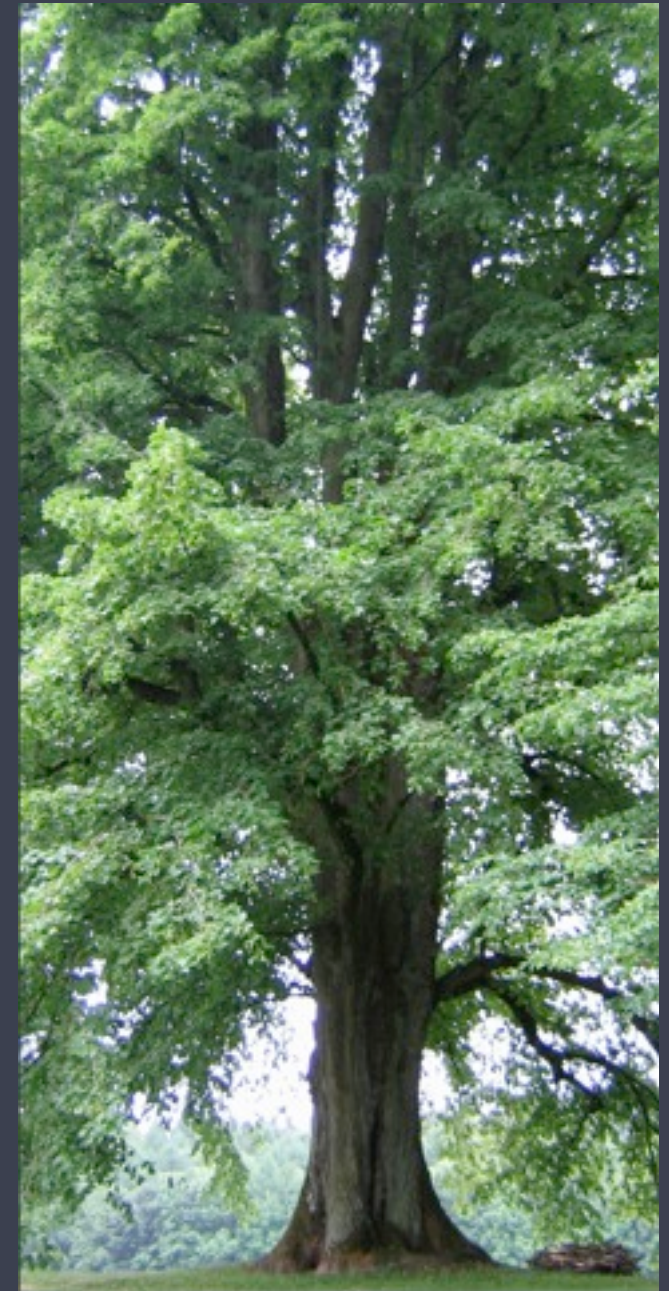
If you have suggestions for further techniques please take the time to put them in writing, with copious illustrations, as much explanation as possible and contact details including a telephone number. Our contact details follow below.

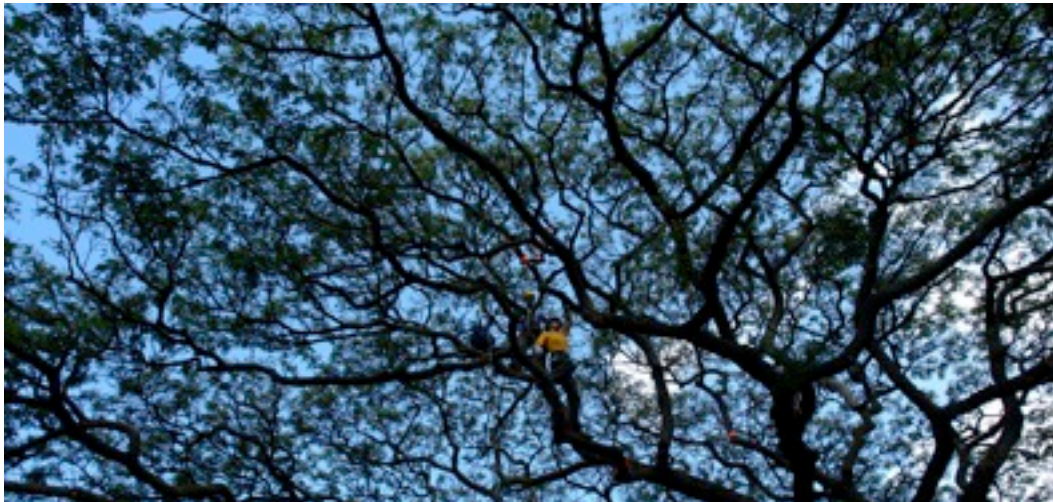
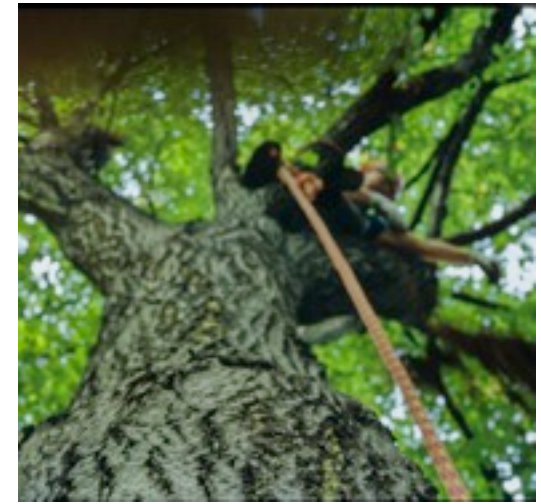
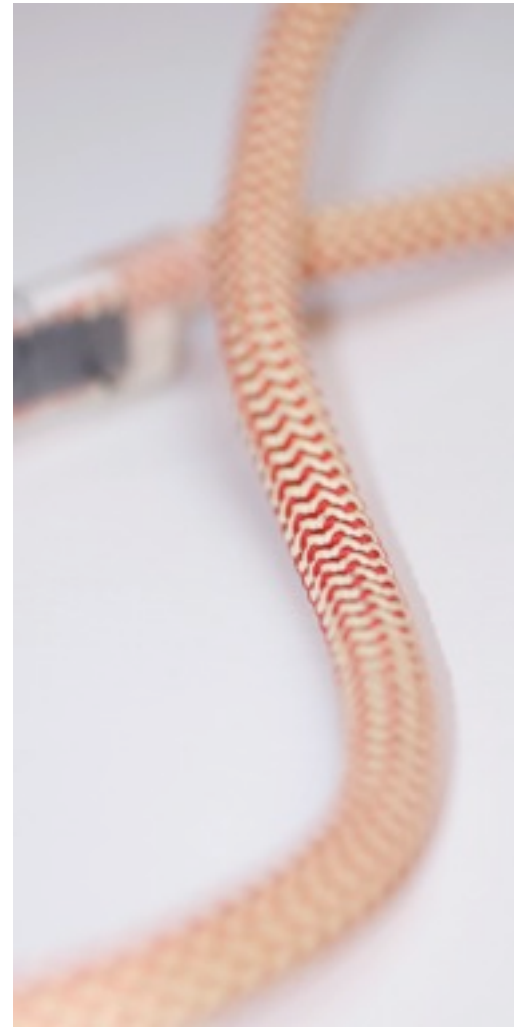
The plan is to expand the Hitch Climbers Guide with your help and experience, for all to share.

Teufelberger Ges.m.b.H.
Vogelweiderstrasse 50
A-4600 Wels
Austria
www.teufelberger.com

DMM International Ltd
Y Glyn
Llanberis
LL55 4EL
Wales – GB
www.dmmwales.com

Treemagineers Ltd
Dall Store
Rannoch Station
PH17 2QH
Scotland – GB
www.treemagineers.com





DMM treemagineers



TOGETHER IN MOTION