

# Safe and Efficient Tree Ascent: Doubled Rope Techniques (DdRT)

By Mark Adams

Set a ladder against the tree. Climb to the top of the ladder and throw a lanyard around the tree. Toss the climbing line up as high as possible, or use a pole saw to place the line on an overhead limb. Flip or pull the line back down, tie the climbing hitch, take off the lanyard, and body-thrust up to the tie-in. Put the lanyard back on, untie the climbing hitch, and repeat: set line, tie hitch, and body-thrust up. Keep repeating until reaching the tie-in point that will be used to work the tree.

Safe? Yes. Efficient? Not at all. But that is how many climbers accessed trees in the past. And, despite the time and energy that this method requires, and despite—or perhaps because of—the fact that there is a bewildering array of equipment and gear from which to choose, many climbers still use this method to access trees.

This article is first in a series of articles that will illustrate and describe some of the different systems that are available to climbers to make tree ascent fast, safe, and efficient. The focus of these articles is the systems and combinations of gear and equipment that can and cannot be used together. Readers are cautioned to practice using new gear and equipment carefully and thoroughly while on the ground, before attempting to use them in a tree. Training organizations and additional reference materials are provided in this series of articles.

## Setup and Definitions

One of the problems that hindered early arborists in gaining access to the top of a tree was how to set the climbing line high in the canopy. The evolution of throwlines, throw weights, and throwing techniques, and the advent of the Bigshot, have made it possible for most climbers to easily and accurately place a line in the top of almost any tree. Once the line has been set, there are many different systems that can be used to ascend the tree. These ascent systems can be categorized based on how the climbing line moves (or does not move) when the climber ascends into the canopy. Following are some common terms and their acronyms that are used to describe ascent systems.

- **Doubled Rope Technique (DdRT)**—a climbing line is doubled over a crotch (branch union), and both legs of the line hang parallel and fall to the ground without any branches between them. DdRT may be further broken down into
  - *dynamic DdRT*—both legs of the line move (one up, one down) as the climber ascends. Body-thrusting is an example of a dynamic doubled rope technique.
  - *static DdRT*—both legs of the line are stationary as the climber ascends. Secured footlocking is an example of a static doubled rope technique.

Some systems allow the climber to alternate between ascending the doubled line in either a static or dynamic manner.

- **Double Rope Technique (DRT)**—two separate ropes and two separate anchor points are used. In tree climbing, this is usually referred to as “double-crotch.” This system is not often used for ascent but may be used for hazardous situations in which the climber desires a second system as a backup, to aid in positioning in hard-to-reach locations, or in very tall trees for which it may be difficult to evaluate the security of the tie-in point from the ground.
- **Single Rope Technique (SRT)**: A single rope is placed through a suitable crotch (branch union), and one leg hangs where it can be used by the climber to access the tree. The second leg of the line may run to the ground over any number of branches and may be secured on the ground by a number of means, or the line may be secured in the canopy at the branch union.

For all the techniques discussed in this article, it is assumed that an arborist's climbing line has been set high in the tree with a throwline. All of the techniques described in this article are examples of doubled rope technique (DdRT). It is important to understand that in both static and dynamic DdRT, both legs of the rope can move. In a dynamic system, their movement is what moves the climber up (or down) in the tree. In a static system, the climber grasps both legs of the line and climbs them together as if they were one, but, if either leg of the doubled line were pulled by itself, the other leg would move in the opposite direction.

## Secured Footlock

The traditional, and simplest, way to ascend a static doubled line is to use the secured footlock technique. The climber is secured to the climbing line with a tether, usually with what is commonly called a Prusik loop (Figure 1), and uses his or her feet to grip the rope and advance (footlock) up the climbing line (see the article by Daniel Murphy for some good points on the technique of footlocking). The tether is attached to the doubled line with a friction hitch, usually a Prusik or a Klemheist. There are some precautions that the climber needs to take when using this setup that can easily be remembered with the acronym THADDS.

**T** stands for “Tie, dress, and set the knot” (Prusik, Klemheist, etc.). Tying the knot means simply forming the knot on the line; dressing the knot means aligning all of the parts; and setting the knot means applying some pressure so that the knot firmly holds its form.

**H** stands for “Hands off of the knot.” A friction hitch will securely grip the host line when the hitch is properly tied, dressed, and set—but a friction hitch will release the line (slide) if the climber applies pressure to and/or bends the hitch. A climber may inadvertently cause a friction hitch to release its grip if his or her hand contacts the hitch, so care should be taken to avoid unintentional contact with the friction hitch.



**Figure 1.** A Prusik loop consists of a length of cord formed into a loop by tying the ends together with a grapevine knot. The loop is attached to the doubled climbing line with a friction hitch (here a three-wrap, six-coil Klemheist).

A stands for “Ascent only.” In a static doubled rope system, a friction hitch will reliably grip the host line if the hitch is repeatedly pushed up the line. But in that same system (a static doubled rope system), a friction hitch will not reliably grip the line if the climber attempts to descend with a friction hitch. The hitch may cease to grip and could send the climber into a freefall to the ground.

D stands for “Descending device”—because the ascender cannot be used to descend, the climber must carry some device that will allow him or her to descend to the ground in an emergency. Many climbers carry a figure-8 or an extra HMS carabiner specifically for forming a Munter hitch.

D stands for “Debris.” If debris (small pieces of leaves, bark, or twigs) gets into the friction hitch and prevents the hitch from having consistent, steady

friction with the host line, the hitch could fail. It is important to keep the friction hitch clean and free of all types of debris.

S stands for “Spread.” The friction hitch works only if both legs of the doubled line are close together. If the legs of the line are spread too far apart, the hitch will open and lose its grip on the host line. As the climber approaches the branch that is supporting the line, the branch creates a spread or gap between the legs of the climbing line. The bigger the branch is, the greater the spread between the legs of the climbing line and the greater the chance that the hitch may fail. A rule of thumb is that the climber should stay below the branch a distance that is at least five times the diameter of the branch (for example, if the branch is 6 inches in diameter, then the climber needs to keep the friction hitch at least 30 inches [ $5 \times 6$ -inch-diameter branch] below the branch).

One of the problems with using this type of tether is that the tether has a fixed length. A fixed length works well when the climber is actually ascending the climbing line, but there are instances when the climber might desire a shorter tether so that he or she can be closer to the friction hitch. Examples are small branches that the climber needs to clear away from the friction hitch or when the climber reaches the top and needs to step onto a branch while maintaining five times the distance from the tie-in point.

One solution is to attach a short, rated (that is, ratings for that piece of gear meet the requirements of ANSI Z133.1-2006) webbing sling to the primary tether with a three-wrap, six-coil Prusik, and attach a rated carabiner to the short webbing sling (Figure 2). The climber can clip into the rated carabiner and adjust the sling as needed during the ascent. The grapevine knot (often incorrectly called the double fisherman’s knot) that is used to form the Prusik



← **Figure 2A.** A rated, short webbing sling (red) is girth-hitched to a rated, fixed-eye carabiner (“rated” means that the ratings for that piece of gear meet the requirements of ANSI Z133.1-2006.) The short webbing sling is then attached to the primary tether with a three-wrap, six-coil Prusik knot. The webbing sling provides an adjustable attachment point on the tether.

↓ **Figure 2B.** Close-up of the carabiner and webbing sling.



loop serves as a stopper knot for the webbing. The key chain carabiner at the bottom of the tether can be clipped to the saddle to prevent the end of the sling from becoming entangled in the climber’s feet while

→ **Figure 3A.** Another way to have an adjustable length tether is to place a MicroGrab on both legs of the tether. The key chain carabiner is clipped to the saddle while the climber ascends and is easily unclipped when the climber wishes to adjust the length of the tether. The MicroGrab provides very easy one-handed, up-and-down adjustment on the tether.

→ **Figure 3B.** Close-up of the MicroGrab on the tether.



footlocking. This allows adjustability, but once the Prusik knot of the short webbing sling is set, the setup requires two hands to loosen and adjust the placement of the web sling.

Another way to have an adjustable-length tether is to place a MicroGrab on both legs of the tether (Figure 3). The key chain carabiner is clipped to the saddle while the climber

wishes to adjust the length of the tether. The MicroGrab provides very easy, one-handed up-and-down adjustment of the tether even if the climber has rested on the tether during the ascent.

Both the webbing sling and the MicroGrab allow the climber to work close to or above the friction hitch that connects the tether to the host line. While this makes it easy to clear small branches and debris away from the friction hitch, the climber needs to be careful to set the hitch firmly on the climbing line and avoid contact with the friction hitch. Accidental contact with a loose hitch could cause the hitch to release its grip on the host line.

## Secured Footlock with Ascenders

### Footlocker and Dualcender

A tether and the art of footlocking form the basic components of many ascent systems. Some people find it difficult to push the friction hitch up the line, however, and instead use a system with one or more of various types of ascenders (see Tim Walsh's article for a good overview of ascenders). The climber may use any style of tether—adjustable or not—to connect him- or herself to an ascender, and the ascender is placed on the climbing line to secure the climber against falling.

One early ascender that was used in tree work was simply called the Footlocker (Figure 4). The Footlocker is a twin-cammed ascender that has a quick-release pin and can be used on a doubled line. The drawback to this device is that the cams are locked together with either a carabiner or, more often, a delta link. When one cam moves, the other cam also moves. This means that if the climber pulls down on either leg of the doubled line, both cams will open, and the entire unit—along with the climber—will fall to the ground.

The Dualcender is an upgrade of the Footlocker. The Dualcender also has two side-by-side cams, but there is a single piece of webbing connected to both cams (Figure 5). The climber's carabiner is



**Figure 4. The Footlocker is an ascender that has a quick-release pin and twin cams for use on a doubled line. The drawback is that the cams are locked together with either a carabiner or a delta link (pictured). When one cam moves, the other cam also moves. If the climber pulls down on either leg of the doubled line, both cams open and the entire unit—along with the climber—falls to the ground.**



**Figure 5. The Dualcender also has two side-by-side cams, but there is a single piece of webbing connected to both of the cams. The climber's carabiner is attached to the bottom of the webbing. This allows the climber's weight to "float" between both cams. If either leg of the rope is pulled, the one cam that is on that leg of rope will be released, but the other cam will remain engaged.**

attached to the bottom of the webbing. This allows the climber's weight to "float" between both cams. If either leg of the rope is pulled, the one cam that is on that leg of rope will be released, but the other cam will remain engaged—a very important difference between the two devices!

Both the Footlocker and the Dualcender require the climber to grip the doubled rope in order to ascend. For some people, this creates an uncomfortable position for their wrists and forearms, or they simply do not have the strength to repeatedly lift themselves in this manner. To reduce some of the stress on their arms, many people use some type of handled ascender to grip the climbing line. Even many competitors use handled ascenders in their day-to-day work because handled ascenders reduce fatigue, are easier to install, and offer more options than a simple Prusik loop.

### Double-Handled Ascender with Twin Cams

There is only one handled ascender that has been designed specifically for a doubled rope ascent system. Manufactured by Kong, the ascender has two cams and two handles that allow the climber to hold the device in a comfortable position. Commonly referred to as the "Kong double-handled ascender," Kong lists it simply as the "Twin."

Some accidents have occurred with these ascenders because of improper use by the climber. In some cases, one leg of the rope had been forced out of the cam because the climber pushed the ascender too close to the tie-in point. This may have been prevented by staying a safe distance below the tie-in and/or by placing a key chain carabiner in the small hole behind the cam (Figure 6). In other

instances, either the climber accidentally released the cam with his or her thumb (Figure 7), or debris of some sort prevented the cam from properly and completely engaging on the rope.

In some ways, ascenders are very similar to friction



**Figure 6. The cams of the Kong Twin can be prevented from opening by placing a key chain carabiner (blue) in the small hole behind the cams.**

## A Word on Ratings

Ascenders and other mechanical devices are becoming more and more common in the various worlds of tree climbing. Mechanical devices can now be found at all levels of competitive, recreational, arboricultural, and research-oriented tree climbing. Yet virtually all of the ascenders that are used in tree work were originally designed to be used in other vertical disciplines. Consequently, these devices were manufactured to conform to standards that do not easily align with all of the current standards that guide the tree industry.

European tree climbers must use gear that has a CE marking per an appropriate EN standard, where such standards apply. The EN standards (derived from UIAA standards) are generic to all work at height, and the majority of ascenders, descenders, and other mechanical devices do have the required CE marking. But, because each industry has specific risks from its own unique work environment, consideration also needs to be given to whether each piece of equipment is “fit for the purpose” for which it is being used.

Arborists in the United States, however, must use gear that complies with ANSI Z133.1-2006. That document does not directly address ascenders, and it uses a blanket minimum tensile strength rating for assessing suitability of other pieces of equipment that are used for climbing. Recent articles that discussed ascenders in tree care seemed to have been unaware of, ignored, or contained separate discussions about the ratings of mechanical devices and the Z133.1. This is not meant to discredit the authors, but only to point out that in the United States, certain pieces of equipment have been quietly accepted into the tree industry without any discussion or research.

Mechanical devices can make tree climbing safer, more efficient, and more ergonomic. Arborists need to learn how these devices were intended to be used and to integrate them into their work in appropriate ways. Because these tools are so useful, it is hoped that there will be more discussion and consideration of these devices in the Z133.1. These tools are like any other tool. If used properly, they can be a great asset, but if misused and misunderstood, they can fail. The safe use of a certain piece of gear is not simply a matter of tensile strength but of knowing that the item is “fit for the purpose.” The user must thoroughly understand how the item works and how it functions as a component in different types of climbing (and rigging) systems.

hitches, and the cautions that were presented for friction hitches can also be applied to ascenders using the THADDS acronym:



**Figure 7. Even with a key chain carabiner behind the cams, the climber can accidentally release the cam with his or her thumb (as pictured), or debris of some sort can prevent the cam from properly and completely engaging on the rope.**

T stands for aTtach”—the ascender must be properly attached to the host line

H stands for “Hands off of the cam(s)” so that the cam(s) is not accidentally released.

A stands for “Ascent only”—ascenders are not to be used for descent.

D stands for “Descending device”—because the ascender cannot be used to descend, the climber must carry some device that will allow him or her to descend to the ground in an emergency. Many climbers carry a figure-8 or an extra HMS carabiner specifically for forming a Munter hitch.

D stands for “Debris”—if debris (small pieces of leaves, bark, twigs, or even candy) gets onto the rope and prevents the cam(s) from having consistent, steady friction with the host line, the ascender could fail. It is important to keep the ascender clean and free of all types of debris.

S stands for “Spread”—twin-cammed ascenders will work only if both legs of the doubled line are close together. If the legs of the line are spread too far apart, the line may pop out of the cam. The same rule of thumb applies as for a friction hitch: The climber should stay below the branch a distance that is at least five times the diameter of the branch.

Ascenders can be easily backed up by one of several methods, depending on the ascender that is being used. Because this particular ascent system is a doubled rope system, each leg of the doubled line must be backed up independently.



◀ **Figure 8A. A backup system for the Kong Twin: A bow shackle is placed in the holes that are above the cams. A piece of 3/8-inch Tenex is spliced to the bow shackle so that there are two legs of equal length coming off of the shackle. One leg is tied with an appropriate friction hitch to each leg of the doubled climbing line.**

↑ **Figure 8B. Different view of Figure 8A.**

For one backup system, a bow shackle is placed in the holes that are above the cams of the Kong ascender. A piece of 3/8-inch Tenex is spliced to the bow shackle so that there are two legs of equal length coming off the shackle. One leg is tied with an appropriate friction hitch to each leg of the doubled climbing line (Figure 8). Thus, if either cam of the ascender fails, it is backed up by one of the friction hitches.

Another method to back up the Kong Twin is to place a Dualcender above the Kongs and use a separate tether to attach the climber to



**Figure 9.** Another method to back up the Kong Twin is to place a Dualcender above the Kongs and use a separate tether to attach the climber to the Dualcender. This creates a backup system (the Dualcender) that is completely independent of the primary (the Kongs).

the Dualcender (Figure 9). This creates a backup system (the Dualcender) that is completely independent of the primary system (the Kongs).

It is important to remember the difference between the Footlocker (Figure 4) and the Dualcender (Figure 5). The Dualcender will work very well as a backup on a doubled line, but the Footlocker

will not work at all. If a climber is using the Footlocker as a backup for the Kongs and the Kongs fail, then the climber will go to the ground. The Dualcender can be used as a backup for the Kongs, but the Footlocker cannot be used as a backup for the Kongs.

### Warning!

There is one method that has been used as a backup that will not work and should not be used. In this method, the climber is attached to the climbing line with a tether and a friction hitch as in the traditional secured footlock technique. A pair of Kong double-handled ascenders is placed below the friction hitch and used to push the friction hitch up the doubled climbing line. There is no tether on the ascenders (Figure 10).

The rationale for this is that the climber is using the ascenders because they are easier to hold than the doubled climbing line. The climber appears to be secured from falling by the tether and the friction hitch on the doubled climbing line. But the ascenders actually create a spread in the doubled line below the ascenders.



**Figure 10A.** A system that should not be used! A pair of Kong double-handled ascenders is placed below the friction hitch and is used to push the friction hitch up the doubled climbing line. There is no tether on the ascenders.



**Figure 10B.** A system that should not be used! The ascenders create a spread in the doubled line, and the friction hitch has to be very, very loose. If something prevents either one of the cams from holding on the line, the climber will most likely continue to hold the ascender and will fall to the ground.

To reduce friction to the point that the climber can push the friction hitch up the line, the friction hitch has to be very, very loose. If the climber stops to rest on the tether, the friction hitch is still very, very loose, and the tether resting on the ascender is what's actually holding the climber in the tree. If the climber is ascending and something prevents either one of the cams from holding on the line, he or she will most likely continue to hold the ascender and will fall to the ground.

This illustrates how important it is to examine and test the whole system to see how all of the components work within the system. Too often there is a preconceived perception that the system is safe because the individual components are safe, but this is not always true.

When ascending a tree, as with every part of tree work, safety should be the number one concern. There are many systems available for tree ascent, and it is up to each climber to decide which system will work best for him or her. Each climber also has the responsibility to make sure that he or she understands all components of the system individually, how the system works, and what could cause the system to fail. It is important to receive thorough, proper training before using any piece of equipment, particularly if that piece of equipment is used to support someone's life. Please climb and work safely.

### Credits

The acronym DdRT for "doubled rope technique" was suggested six or eight years ago by Tom Dunlap on the (now defunct) discussion forum of ISA's Web site.

The acronym THADS for "Tie, dress and set; Hands away from the knot; Ascending only; Debris; and Spread" is often used by ArborMaster Training as a mnemonic for tying the Prusik loop to the host line. THADS was suggested to ArborMaster by Tom Green when he was a student in one of their classes. I added the second D, for Descender, and applied the same acronym to ascenders.

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