Excerpted from TCIA’s Rigging for Removal Workbook

What is Technical Rigging?

When the limbs get heavier, the quarters get tighter and the targets get closer, or the trees themselves become less forgiving, rigging becomes more technical. More knowledge – and often more equipment – must be employed to do the job safely and efficiently.

More equipment, when used properly, reduces wear on all components of the rigging system and makes the arborist’s life a little easier, too.

This chapter looks at speedlining, blocking down larger wood, using lowering devices, and using multiple lines to share or transfer the load.

Section A. The speedline

The speedline is a method for moving brush or limbs from the tree to a staging area some distance away using the force of gravity and a minimum amount of human energy. In other words, the speedline can save a lot of time dragging brush. It can also prevent damage to understory plants and structures.

Speedlining can be the most glamorous and dramatic rigging technique and one that can greatly increase the efficiency of an operation. In reality, you probably won’t need to use it very often. It is also one of the most complex rigging systems to install. Forces, distances and angles must be carefully calculated.

The simplest speedline consists of a tensioned line, angling from the top of the removal tree to a suitable anchor just beyond the landing zone. The arborist places a sling around the branch to be cut, connects the sling to the speedline with a carabiner or screwlink and cuts the branch. The branch’s descent could be slowed or stopped by giving more slack to the speedline. This most basic rig is known as a “Simple Direct” speedline or “Freeline.”

One advantage is its simplicity. Potential disadvantages include: not being able to rig multiple pieces out without carrying a lot of slings and carabiners into the tree, lack of control over the speed of the descent, and damage to lawn areas in the landing zone because of the force of the impact.

The addition of a traveling block and a controlled descent line to the speedline provide complete control over the speed of descent. The traveling block allows the piece to move with less friction and the controlled descent, or delay, allows the line handler to slow or stop the descent. Limbs can be attached to the traveling block with a sling and carabiner or by leaving enough of a tail when tying on the controlled descent line so that it can be used as a sling.

This system is a considerable improvement over the simple direct speedline, but still has some limitations. The key ones are:

1. Single Anchor Point

Large trees usually have a large amount of brush. Someone has to move that brush out of the landing zone if the speedline sends all of it to one place. Limiting your speedline to a single anchor point can also become a major problem if there isn’t a single anchor point available where you need one.

2. Ballast

When setting a speedline, especially one with a long run, there has to be enough counterweight, or ballast, on the traveling block to overcome the weight of the controlled descent line. The longer the run, the heavier the line, and greater the need for counterweight. The ballast is also helpful in keeping the traveling block from bouncing on the line. When that happens, the controlled descent line can flip over the speedline, causing a twist in the rigging.

3. Tension Control

You can use comealongs or sheer muscle to tighten the speedline, but there is frequently the need to take up more slack than is humanly possible. It isn’t easy and can even be hazardous to try to manage line tension with a vehicle and line can’t always be attached to a winch.

There are other options for managing tension on the speedline. A 4:1 block and tackle and Münter hitch can be used for gaining and holding tension respectively. Another way to gain and hold tension is with a ratcheting lowering device mounted to the anchor tree. If you use a lowering device, you must rig a fairlead or guide block – a pulley to guide the speedline into the device. Lowering devices shall never be side loaded – lines must always enter from a vertical point.

Section B. The crossline speedline

A limb being moved to a landing zone with a speedline.

A shackle used to anchor the travel block and give it extra ballast.
anchor can be created using a line rigged horizontally at ground level – the crossline.

(427) When we are specific about the equipment used in a cross-line speedline setup, it is because a substitution could make a big difference in performance! For instance, although the specific choice of controlled descent line is not critical, the speedline rope is. The components’ suitability to their task, their service life and your need for the rigging should be your main concerns.

Section C. Getting started

Starting with the basics and building up in complexity to the cross-line speedline, here are the components you’ll need to build a working system:

Speedline. This line needs to be single braid, 12-strand line if you are using the Münter hitch to control tension. Coated, double braid lines simply will not feed smoothly through the HMS carabiner.

Blocks. In the video, we show the use of ¾ inch (16mm) stainless steel rescue pulleys with 2 ½-inch (63mm) sheaves for the traveling block as well as the guide blocks. By standardizing to one pulley, you never have to worry about which pulley goes where! Stainless-steel rescue pulleys are recommended. They are stronger and more durable than lighter-weight, less expensive aluminum pulleys.

To set up a successful rig, observe the following pulley precautions. The traveling block must run freely on the speedline without binding at any angle of inclination or pull. Many pulleys may ride the speedline down, under load, well enough, but will cause the cheek plates to pinch the speedline severely on the haul-back.

The controlled descent line must pull in line with the sheave. A side pull can create such a bind that, once again, the pulley will not run back up the line to the climber.

Controlled descent line. This rope is attached to the traveling block and provides the braking control to the load being managed. The controlled descent line must be long enough to go from the ground to the guideblock in the tree and back down the speedline to the landing zone. This can often require a rope that is 240 feet long (73m) or longer, but one that does not have to bear a considerable load.

Connections. As a rule, screw links should be used for static connections, meaning those that don’t have to be opened or closed frequently. Carabiners connect slings to the traveling block. Instead of a Rigging Plate®, you can use a large screw pin anchor shackle on the traveling block to gain enough ballast to make your system run smoothly.

Aluminum HMS-style carabiners are necessary for use of the Münter hitch.

Crossline. The specific rope selected is not too important, but single braids are a little easier to work with than coated double braids. In keeping with the weak link rule, remember to make sure that the weakest link in your rigging system is the load line and not the anchors or supporting hardware.

Slings. Endless slings are ideal for securing the traveling block to the load. The cross-line can be anchored with deadeye slings or Whoopee slings, or the line can be tied directly to the anchor points and tensioned with a trucker’s hitch. Just make sure that the length and rating of the slings selected is appropriate to the loading.

Figure-8. The figure-8 makes a great rigging point when set into the crossline with a double pass hitch. You may use either a steel or an aluminum figure-8 here, but it could be a rescue type with ears. A ¾ inch (19mm) rope capacity and two rigging holes are features that are desirable.

Gibbs Ascenders. You may need attachment points along the crossline and the speedline to anchor an HMS carabiner or block and tackle, respectively. The ¾ inch (19mm) stainless-steel Gibbs ascenders accomplish this task very well.

Block and Tackle. The block and tackle shown in the video was a 4:1 ratio fiddle block with a cam that holds the line under tension. A 4:1 ratio means that 100 pounds (45kg) of muscle are converted into 400 pounds (180kg) of pull. The cam is essential to hold your gains firmly. If you use a block and tackle, make sure its strength rating meets or exceeds the other components in your system.

Section D. Setting it all up

Up in the tree, the speedline can be tied off to the stem of the tree with a double clove hitch (or clove hitch and half hitch keeper) leaving the tail long enough to secure the guide block with a bowline. The guide block is necessary to keep the controlled descent line in alignment with the speedline. The speedline anchor – the tree – as well as the speedline itself, have to handle forces well in excess of the weight of the limbs being lowered because in addition to holding the load, the “legs” of the speedline pull against one another. Make sure you anchor the speedline to a main leader of the tree that is sound.

The controlled descent line runs down the tree trunk to the ground where it is belayed...
by spiral wraps or a lowering device.

The figure-8 is set into the crossline, the ends of the line are anchored, and the line is cinched taut. The guide block attached to the figure-8 leads the speedline to either a Münter hitch set onto the crossline or a ratcheting lowering device mounted on one of the anchor trees. A screw-link connects the guide block to the figure-8.

With the Münter hitch setup, a 4:1 block is anchored to the figure-8 and attached to the speedline with a Gibbs Ascender. Note that the rigging is designed to keep all lines parallel without tangling.

Two important tips:
1. As you are tailing the slack in the speedline through the Münter hitch, be sure to reverse direction on the hitch before you place the line under load. Remember that the Münter rotates in the carabiner as it adjusts to taking in or letting out. If you don’t let out just enough slack to rotate the Münter into the “letting out” attitude, you may find it locked under load.
2. Slack the fiddle blocks after you’ve secured the speedline to the Münter and before you place the system under load. The blocks are not designed to bear the shock load of dropping limbs into the system.

Once you have the speedline rigged, there are various ways to attach branches to be removed. Small branches may be “free-lined” (sent down the speedline on a carabiner and sling without a delay). Alternately, you can attach them with the tail of the controlled descent line, or on a carabiner and sling attached to the traveling block. With a long branch, you can butt tie the controlled descent line, attach a sling to the brush end, then attach the sling directly to the speedline with a carabiner. Review the video to see the various ways limbs were speedlined out.

You need to experiment with the speedline in non-critical removal situations before you attempt to speedline wood over a house or other target. You should become accustomed to how the speedline operates with various sizes and shapes of brush hanging from it. You must be able to anticipate the amount of sag in the speedline created by the load to be able to clear structures under the rigging. Speedlining of larger wood should be avoided due to vector forces, unless you are sure you have “bomb proof” anchor points!

1. Lowering Devices

Especially when you get into heavier wood and more critical rigging situations, tree-mounted lowering devices offer some real advantages over simple trunk wraps. The main ones include:

- A predictable amount of friction can be produced from tree to tree.
- Wear on the line from abrasion on the tree surface is eliminated, extending rope life.
- Time between setups is significantly reduced.
- The crew will generally have more ability to take slack out of the lowering line, and slack can be critical. With a ratcheting device, limbs can even be lifted.

Here are some general lowering device precautions:

- Make sure the device is firmly secured to the tree. The simpler friction devices — carabiners, figure-8s, brake tubes and Porta-Wraps™ — are attached with a sling. The larger fixed drums and ratcheting drums attach with webbing. Make sure that these devices seat firmly against the trunk. The webbing should be drum tight. Test to make sure it is secure before loading it, and test the tension after loading it once or twice.
Lowering devices should be mounted plumb (level) and in line with the rigging. If they cannot be mounted in vertical alignment with the rigging above, you must use a guide block to bring the lowering line into the device vertically.

- The line handler should stay well clear of the device immediately before and during the lowering operation to avoid getting a hand pinched. The handler should stay back from the work being performed overhead.

- Using a ratcheting device is a two person operation: one to turn the ratchet and one to tend the line. The only time it can safely be operated by one person is when the load line is being tensioned prior to cutting.

- Follow the manufacturer's instructions for their use, inspect lowering devices frequently and lubricate moving parts as required.

- If you are unfamiliar with a device, practice with it in non-critical situations until you are comfortable with its use.

Section E. Blocking down heavy wood

Once the brush is removed, you are left with a vertical trunk section, or spar. Two fairly straightforward options for further removal include lowering the trunk on itself in sections, or lowering sections off of another nearby tree or spar, referred to as a gin pole.

Here is the basic equipment needed for blocking down heavy wood:

- An arborist block designed for false crotch rigging and handling heavy loads
- A sling of suitable size and length to attach the block to the trunk section
- A lowering line matched to the other components of the rigging
- A friction, or belay, device at the base of the tree for the lowering line
- A tagline to help pull the pieces over

Section F. Load transfer

The load transfer line allows two things. First, as the name implies, it transfers part or all of a load to a second lowering line, reducing the strain on the primary system. Second, it allows a lot more choice of landing zones. Basically, the entire area directly between the two lowering points becomes the potential landing zone.

This is how a transfer line can be set up from the ground. First, a throw line is placed in a suitable crotch that is more or less the same height as the wood you are rigging out, and in a tree that is on the opposite side of the intended landing zone from the removal tree.

The throw line is used to set a suitable pulley line. One end of this line will be secured at the tree base. The other end will be tied to a suitable block which has been threaded with a suitable second lowering line that is the same construction as the first lowering line. The pulley and line are then pulled up to the tree crotch.

The second lowering line must be long enough to reach from the pieces to be lowering, over to the transfer line false crotch, down to a belay device, and out to the rope handler.

The transfer line may be used to catch some, but not all, of the initial load dumped into the rigging. Its main function is to swing the load out from the removal tree during lowering. It can also keep the wood from slamming into the trunk as happens when butt-hitching.

Safety Note: Industrial ratings of equipment are commonly 5:1. Arborist equipment should have ratings that range from 10:1 to 20:1. That is why you must know the ratings of the equipment that you are going use and make your adjustments accordingly.

The Rigging for Removal Workbook is designed for use with an accompanying video. Several references to the video have been excluded here.

Rigging for Removal Set:
2 Videos and Workbook

This two video set focuses on techniques and equipment that tree workers can apply in the field. The “rigging team” is made up of experts Don Blair, Ken Johnson and Robert Phillips. Includes Basic Rigging video, Technical Rigging video and workbook. 4 ISA CEUs.

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