

Chapter 8

TREE CLIMBING



LESSON PLAN OUTLINE

PROGRAM: SMOKEJUMPER

LESSON: TREE CLIMBING

OBJECTIVES: Upon completion of this lesson, the trainees will demonstrate the ability to safely, efficiently, and expediently climb (including free climbing) according to proper procedures. They will demonstrate the ability to identify defective equipment and make minor repairs.

INTRODUCTION: Tree climbing is one of many skills that smokejumpers must master. Fire jumps often result in timber landings for smokejumpers and paracargo. Parachutes and cargo must be retrieved skillfully to minimize damage and repair cost. Safe and competent tree climbing is an important part of an effective smokejumper program. Each jumper must possess the ability to safely and expediently retrieve fire equipment from timber hang ups to effectively perform initial attack on wildland fires. Tree climbing has also become an effective means for utilization of smokejumpers in resource management and requires highly skilled, trained individuals.

I. SMOKEJUMPER TREE CLIMBING

A. Preplanning

1. Locate climbing trees 24 to 36” in diameter with nearly uniform trunk size and few limbs for 30 to 40 feet from ground level.
2. Obtain the necessary number of smokejumper tree climbing sets.

B. Equipment

1. Tree spurs (lightweight, adjustable and equipped with shin guards).
2. Nylon climbing harness with D-rings, V-rings, rope adjuster and adapters.

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3. Flip line (hemp, 7/8" diameter, 18 feet long with a steel cable core, heavy duty snap and loop spliced with swedges in one end).



4. Sharp, clean and tight pruning saw.
5. Nylon limb-over strap with two snaps and a sliding V-ring.

C. Pre-Climbing and Safety Procedures

1. **Adhere to Section 3.16**, A through E-2 and F or FSH 6709.11 Health and Safety Code Handbook (Review HSC 6709.11, Sec. 3.16).
 - a. The climbing procedures and equipment outlined in this guide are authorized for climbing in support of smokejumper missions. They may or may not be appropriate for climbing in support of natural resource management. The National Tree Climbing Guide should be referred to for project climbing missions.

2. Inspect the equipment.

- a. Belt (Safety and limb-over).
 1. Check for cuts in the webbing and for broken stitching.
 2. Inspect hardware for cracks and for broken stitching at attachment points.
- b. Flip line
 1. Check for any cuts or excessive wear and abrasion.

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2. Check the loop splice.
3. Check the snap for proper operation and for cracks in the forged metal.

c. Tree spurs

1. Check for worn out or cracked stirrups.
2. Check the ankle and cuff straps for cuts, excessive wear and any broken buckles.
3. Check the gaffs for proper length, tightness, sharpness, and cracks. (Do not field sharpen the gaffs with a file).
4. Check for any missing or damaged pins and retainer rings.

d. Pruning saw

1. Make sure the screw between the blade and handle is tight.
2. Make sure the handle is in good shape.
3. The saw should have a lanyard of suspension line to facilitate attachment to harness for hands free climbing.

3. Wear proper personal protective equipment and clothing.

- a. Leather gloves.
- b. Long-sleeved shirt.
- c. Leather boots, 8” uppers.
- d. Hard hat with chinstrap down.

4. Some additional safety rules

- a. Do not walk around unnecessarily while wearing climbing spurs. Put the guards on the gaffs when not climbing.
- b. Inspect trees before climbing. Determine whether the tree can safely be climbed.

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1. Rot – Do not climb.
 2. Lean – Always climb on the high side of the lean.
If lean is excessive, do not climb.
 3. Snags – Do not climb except to retrieve an injured jumper. Consider establishing a belay point in a nearby tree if available.
- c. Do not climb without the flip line or limb-over belt.
 - d. Keep safety rope properly adjusted to the size of the tree being climbed. Do not wait and put this off, but keep adjusting as the tree bole narrows.
 - e. Always use a pruning saw for trimming limbs. Never use an ax, pulaski, or power saw.
 - f. Take care to avoid cutting any safety gear or yourself with the pruning saw or with the gaffs.
 - g. Do not climb unless there is another jumper to assist as a ground person.
 - h. Climbing above the 4” bole diameter requires a safety tie-in at or below that point.

5. Equipment adjustment and fitting

- a. Spurs
 1. Adjust shank (shin guards and cuffs should fit in the hollow between the knee and the calf).
 2. Fit the stirrup in the arch indentation of the boot.
 3. Buckle the foot strap as securely as possible.
- b. Climbing harness should fit just below the hip bones with the leg straps passing between the legs and secured at the adapters.
 1. Tie the pruning saw to a D-ring on the back of the harness.
 2. Attach the limb over belt adapter snap to the left or right V-ring, depending on which hand the climber wants to

use to adjust the flip line.

3. Attach flip line snap to the left large D-ring.

D. Climbing procedures

1. Secure the flip line.

- a. Throw the snap end of the flip line around the tree.
- b. Attach the snap to the large D-ring, left side.
- c. Thread the flip line through the adjuster.
- d. Take the free end of the rope and feed it through the round hole in the adjuster from the inside, then pass it through the D-ring at the back of the climbing harness. Tie a simple overhand knot in the tail of the rope. To work properly and safely, the rope **must** pass through the D-ring in the back of the climbing harness. (Figure 1).
- e. Take up all of the slack.
- f. To lock the rope onto the hook, with the right hand, grasp the adjuster and rope over the hole. With the left hand, grasp the rope just ahead of the adjuster and cross it to the outside and down into the hook. (Figure 2).
- g. Adjust to allow the body to set an arm's length away from the trunk of the tree.

2. Climbing

- a. On trees less than 36" DBH, grip the rope with both hands and flip it up, approximately 18" above waist level. On larger trees, the "Western Roll" is sometimes necessary to advance the rope up the tree. This technique requires the climber to maintain approximately 15-20" of slack in the flip line between the right hand and the rope adjuster. This slack allows the climber to vigorously snap the wrist while slipping the right arm up and out, while maintaining a positive grip with the flip line. The brisk nature of the throw will cause the flip line to travel in a wave around the tree until it reaches the left hand at which time the rope is then lifted. This technique also enables the climber to advance the flip line over rough bark and short "stobs" or limbs without the need to contour around the tree and manually free

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the flip line.

- b. Place the right or left spur into the tree with the knees out and away from the tree.
- c. Step up onto the spur embedded in the tree bark and sink the opposite spur into the bark about 8-12” above the first spur. (Figure 3).
- d. Keep the body straight and lock the knee of the lower or trailing knee.
- e. Repeat the steps.
 1. Pull the upper body next to the tree to release tension on the rope before moving it up.
 2. Flip the rope up about 18”.
 3. Step up two steps at a time before the next flip of the rope.
- f. Establish a smooth rhythm.
- g. Keep the body weight near the tree by keeping the back straight and thrusting the hips toward the tree with each step. If a spur sticks, rotate the heel away from the tree and pry it out. (Figure 4).
- h. The climber should stop periodically and relax by setting the spurs firmly in the bark, locking the knees and leaning back on the flip line.
- i. To descend, step down, allowing the body weight to engage the spur. Throw the rope down to about waist level with every two steps.

3. Properly adjusting the flip line.

- a. Place the flip line about waist level.
- b. Place feet at an even level. Keep at least one knee locked.
- c. Taking up slack when ascending the tree. (Figure 5).
 1. With the right hand, grasp the flip line between the

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adjuster and small D-ring with the palm out.

2. Grasp the flip line with the left hand an arm's length ahead of the adjuster.
3. Draw the right hand up towards the left hand taking out the slack. (Figure 6).

d. Letting out the slack while descending the tree.

1. Take the flip line out of the hook in the reverse that it went in.
2. Feed the rope through the adjuster by pulling back on the tip of the adjuster. (Figure 7).
3. When the rope is at the proper length, put the rope back into the hook.

e. In the classroom or in the field before climbing, practice making adjustments.

4. Limbing

- a. It may be necessary to remove small limbs which impede progress by snarling the flip line.
- b. Use a pruning saw or for small dead limbs, cut a green limb to use as a beater stick.
- c. Remove broken or small and dead limbs. This will keep the climber from inadvertently using them for climbing steps.
- d. Prune far enough above the flip line to prevent damaging or cutting it.
- e. Undercut larger limbs to prevent breakage or unnecessary damage to the tree.
- f. Cut all limbs flush with the trunk.

5. Burning out of the tree.

- a. Occasionally, spurs will break loose from the tree, due to misplaced spur position. This is caused mainly by knees too close to the tree, spurs not securely embedded in the bark or

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cambium, rotten bark, spurs placed in a crack, crevice, the bark, a knot and not locking the knees when stopping.

b. Corrective action is to:

1. Immediately pinch the flip line in by pulling the elbows down and into the torso.
2. Keep legs clear to prevent gaffing of lower legs.
3. Throw your head back or to the side to prevent contact with the tree trunk.
4. Replace spurs in sound bark and continue.

6. Limb-over. (with limb-over belt)

- a. This procedure is used to go over a limb too large to cut or to make the transition from spurs to free climb or vice versa. This procedure requires the use of a limb-over belt.
- b. Climb as high as possible up to the limb.
- c. Throw the limb-over belt around the tree, above the limb, and then snap it into the V-ring on the harness.
- d. Unsnap your flip line.
- e. Continue up the tree, utilizing the limb-over belt in lieu of the flip line to reduce the overall number of limb-over procedures.
- f. Throw the snap end of the flip line around the tree above limbs and snap into the main large D-ring.
 1. This procedure can take some skill and timing to perform. Try throwing the snap as far out, slightly above your head and with as much force as possible, then catch the snap as it comes around the tree trunk. Often, multiple tries are required.
- g. Then, when the flip line snap is secured to the large D-ring, unsnap the limb-over belt and continue.
- h. If the tree is too large to get the limb-over belt around.
 1. Climb as high as possible.

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2. Place a double wrap around the limb with the limb-over belt and snap it into the V-ring.
3. Take up all the slack.
4. Unsnap the flip line and then reattach before continuing on.
5. Release the limb-over belt and continue.

i. Reverse these procedures when descending.

E. Free Climbing

1. Free climbing potentially may be hazardous as the flip line or limb-over belt is not used as a safety line while ascending.
 - a. Do not free climb on **ANY** dead limbs.
 - b. Do not free climb if the limbs are spaced too far apart to maintain good hand and feet positions.
 - c. Always take species and condition of the tree into considerations before free climbing.
 1. Cedar and Western Larch (Tamarack) trees are brittle and limbs break easily.
 - d. When free climbing, keep feet and hands close to the bole of the tree.
 - e. Maintain three sure points of contact at all times.
 1. Two feet and one hand or two hands and one foot at **ALL** times.
 - f. If spurs are removed during free climb, be certain that they are secured in the tree before continuing on.
 1. Lash with parachute cord or binding straps.
 2. Take care in leaving spurs behind...some areas above may require the use of spurs to ascend safely.
 3. If free climbing with spurs on, the stirrup area of the sole

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of the foot is extremely unstable due to the metal on limb connection. Take great care!

4. Free climbing can save time, effort, energy, and should be used whenever possible. It take more time for some climbers to become comfortable with free climbing, but the alternative of numerous limb-overs and tedious sawing is time consuming and ultimately dangerous as it leaves the climber in a vulnerable state of exhaustion.

F. Tree climbing let-down and rappel systems

1. There are occasions, because of safety, time, and effort, that making a letdown out of the tree being climbed is practical. The following procedures are different from the standard letdown training because of the situations and equipment being used.

a. Equipment needs.

1. Regular tree climbing equipment.
2. ¾” tubular letdown tape (standard smokejumper issue).

b. Climbing and letdown procedure.

1. Inspect all equipment before climbing.
2. Secure birdnested or bagged letdown tape to climbing harness before climbing.
3. After climbing to work area, secure letdown tape to a limb until ready for use.
4. Letdown distance is limited to ½ the length of the letdown tape.
5. Uses a solid green limb greater than 4” diameter with **NO** downward slope.
6. Using the limb-over belt. Attach the limb-over belt to the climbing harness as **BOTH** attachment points. Adjust the belt so that the sliding V-ring is about mid-sternum height.

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7. Tie one end of the letdown tape to sliding V-ring using a bowline knot.
- c. Pass the letdown tape over the limb and around the trunk of the tree.
- d. Drop the birdnested or bagged letdown tape to the jumper on the ground.
- e. The ground person routes the tape around another tree at the base. Take up all slack.
- f. On a signal from the climber, the ground person puts tension on the tape. The climber puts weight on the tape, releases the flip line, removes the spurs out of the tree and pushes away from the trunk slightly with the hands and toes. The climber then signals the ground person to allow them to descend.
- g. The ground person will hold the tape behind their lower back and puts tension on the tape while lower. Use leather gloves.

2. Tree climbing rappel system

- a. There are occasions, particularly in large trees in which multiple limb-overs are necessary, when it may be desirable to rappel rather than climb down the tree. The following rappel system will enable a climber to rappel from a height $1/2$ the length of the letdown tape.
- b. Equipment
 1. Standard tree climbing equipment.
 2. Two locking “D” carabiners.
 3. Folding knife.
 4. $3/4$ ” tubular letdown tape. (Standard smokejumper issue).
- c. Rappel procedures
 1. The climber should secure themselves to the tree using the flip line with slack adjusted to arm’s length.
 2. Snap each end of the limb-over belt to the opposite side V-rings on either side of the climbing harness.

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Form an inverted “V” with the limb-over belt, placing the sliding V-ring at the apex. When taut, the apex of the inverted V should reach the bottom of the sternum.

3. Attach the locking “D” carabiner to the sliding “V” ring on the limb-over belt. The gate should be facing up and to the left. A second locking carabiner should be placed through the right hand side V-ring on the climbing harness.
4. Thread the letdown tape around the bole of the tree or over a large non-sloping green limb, at least 4” in diameter. Continue to thread the tape around or over until the end being threaded reaches the ground. Then drop the coiled end to the ground. When threading is completed, the tape should be around the tree and over a limb at its highest point and both ends should be on the ground. Both ends should be parallel, free and clear all the way to the ground. The jumper on the ground should confirm this.
5. Take up both ends of the tape with the right hand and snap them through the gate of the carabiner located at the apex of the limb-over belt. Snap both strands through the carabiner three times so that both strands running parallel make a total of 2 1/2 wraps around the carabiner.
6. Being careful to avoid excess slack, snap both strands through the gate of the carabiner on the right hand side of the climbing harness.
7. Check the entire system before continuing.
 - a. Letdown tape clear, parallel and both ends on the ground.
 - b. Routing of the tape through the carabiners is correct.
 - c. Limb-over belt is attached properly with both ends attached to either side of the climbing harness.
8. Begin transferring weight to the rappelling system by taking the flip line out of the hook on the metal rope adjuster. Feed the rope through the adjuster until all

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weight has been transferred to the rappel system.

9. While holding **BOTH** strands of the letdown tape firmly in the right hand, release the slap flip line by unhooking the main snap on the left side of the climbing harness. Use caution to avoid being struck by the trailing flip line snap during descent.
10. Begin the descent by allowing the letdown tape to run through the right hand. Make sure the right hand is kept well away from the carabiner to avoid getting a glove caught in the carabiner.
11. Continue the descent using the feet to maintain a comfortable angle and distance from the bole of the tree. Avoid excessive speed as this could result in damage to the tape from overheating.
12. Once on the ground, retrieve the letdown tape by pulling on one end of the parallel strands until the tape unthreads from around the limb and bole of the tree.

Note: This rappel system is approved only for climbing in support of smokejumper fire operations. It is imperative the letdown tape be thoroughly inspected after each use and be discarded if excessive wear or heat damage is detected.

G. Evaluation parameters for Tree Climbing

At the completion of this unit, the trainee will demonstrate the following smokejumper tree climbing skills:

1. Ascend a tree or pole (preferably 30+ dbh) to a height of 45 feet and perform a limb over. Safely descend back down the tree in a time not to exceed 5 minutes. This is a minimum. Most bases will exceed this parameter by having the trainee climb to the top of a 100-150' tall tree, using limb over techniques, and free climbing techniques following all correct procedures.
2. Describe the components of the smokejumper tree climbing equipment and the care and maintenance of each part, including:
 - a. Flip line
 - b. Limb over belt

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- c. Spurs
- d. Fanno saw
- e. Climbing harness

TREE CLIMBING is an important smokejumping skill that must be mastered so that smokejumper can be efficient and safe in performing their duties. All smokejumpers should take whatever opportunities to practice tree climbing whenever possible go develop and master this skill. Confidence and muscular coordination are keys to safe climbing.