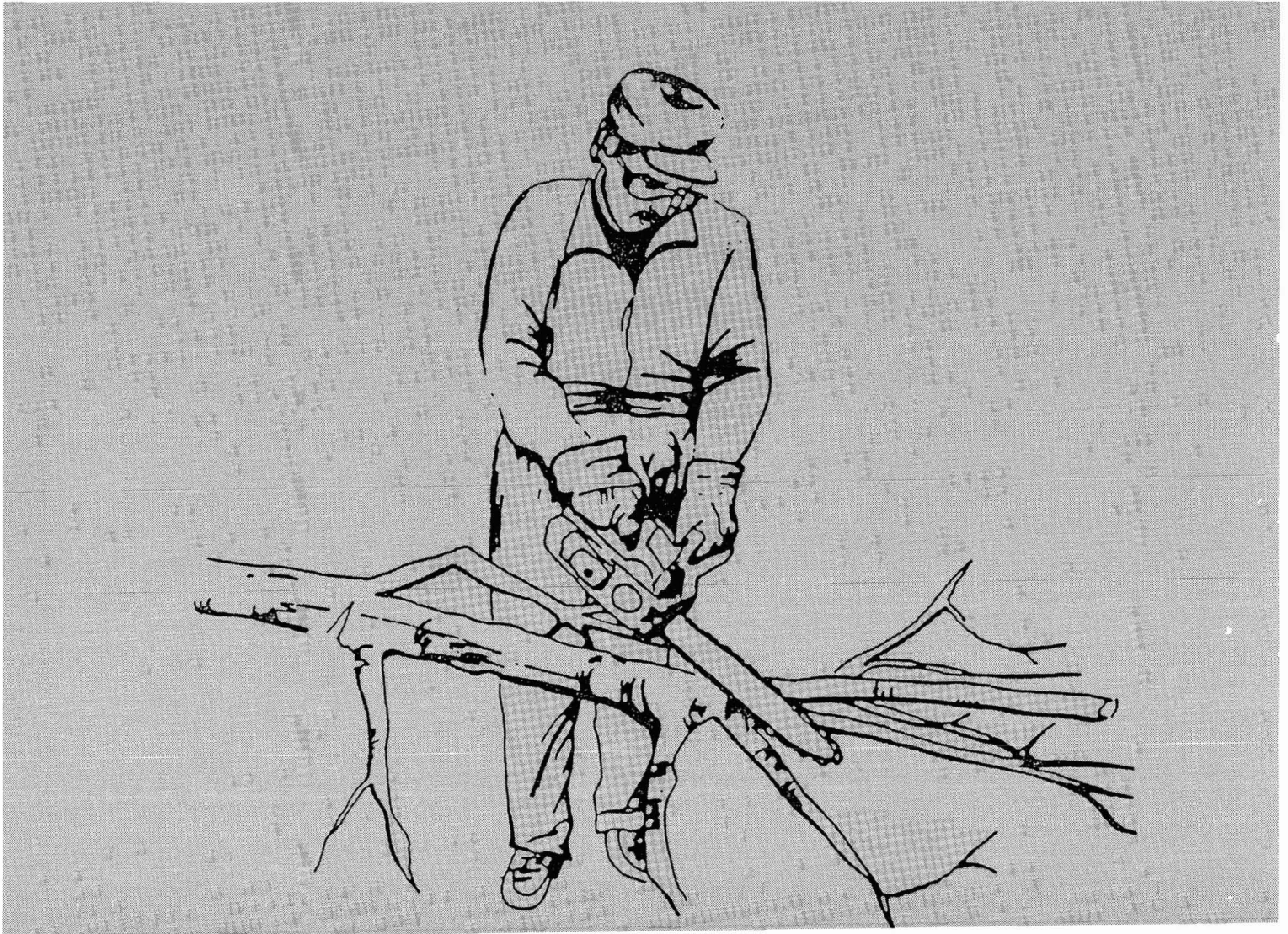


CHAIN SAW OPERATION AND MAINTENANCE

Darrell L. Roberts

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INTRODUCTION

The chain saw is one of the most useful and time-saving power tools ever made. It is also one of the most dangerous. Chain saws serve a broad range of cutting needs, from small trimming jobs to felling very large trees. Worldwide, there are more than 100 manufacturers. A chain saw should be picked for the main cutting jobs it is to do. Since the bar saw is the type best suited for general use, this publication

is written for bar-type chain saws.

Considerations in the selection, operation, and maintenance of bar saws are included. Since there is considerable variation among saws and their use, the reader is advised to study details about a specific brand and model in the owner's manual. Follow the manual's suggested operating instructions. Remember, each year thousands of chain saw injuries occur in the United States, some serious enough to kill and others to produce permanent injury.

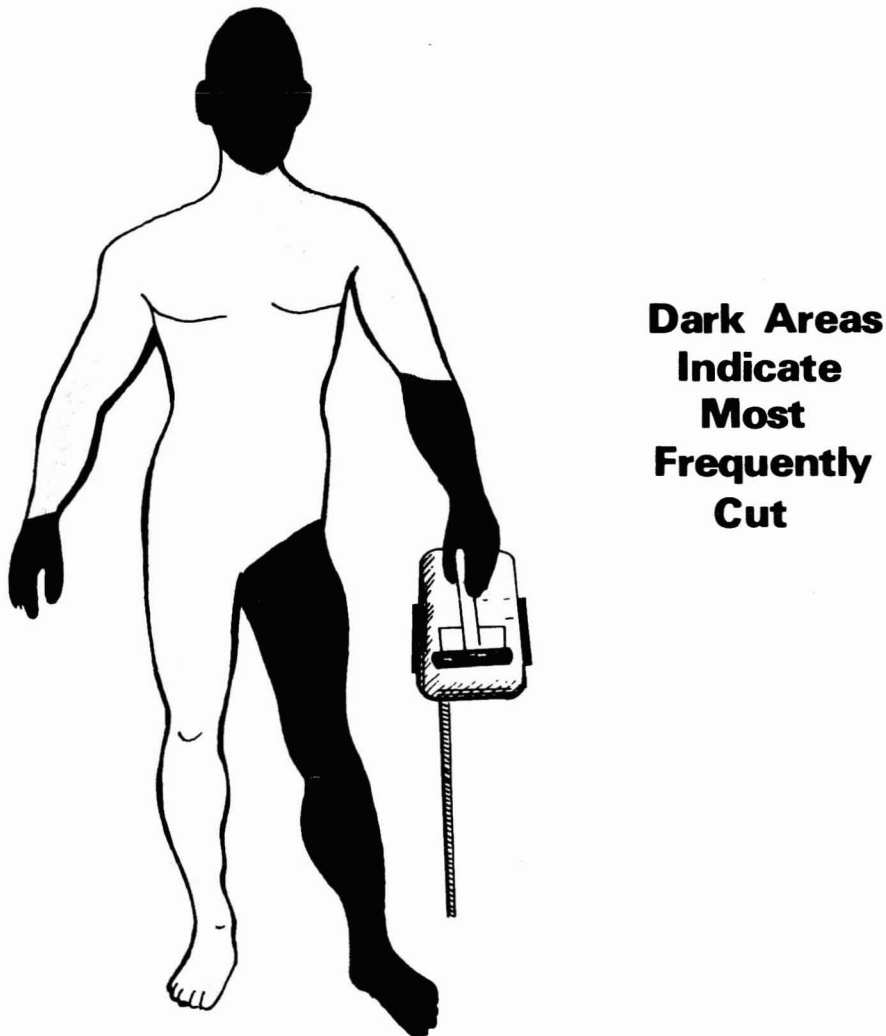


Figure 1. Chain saw injury locations.

Use of illustrations is by courtesy of Clemson University; illustrations are from South Carolina Cooperative Extension Service Circular 637.

THE CHAIN SAW

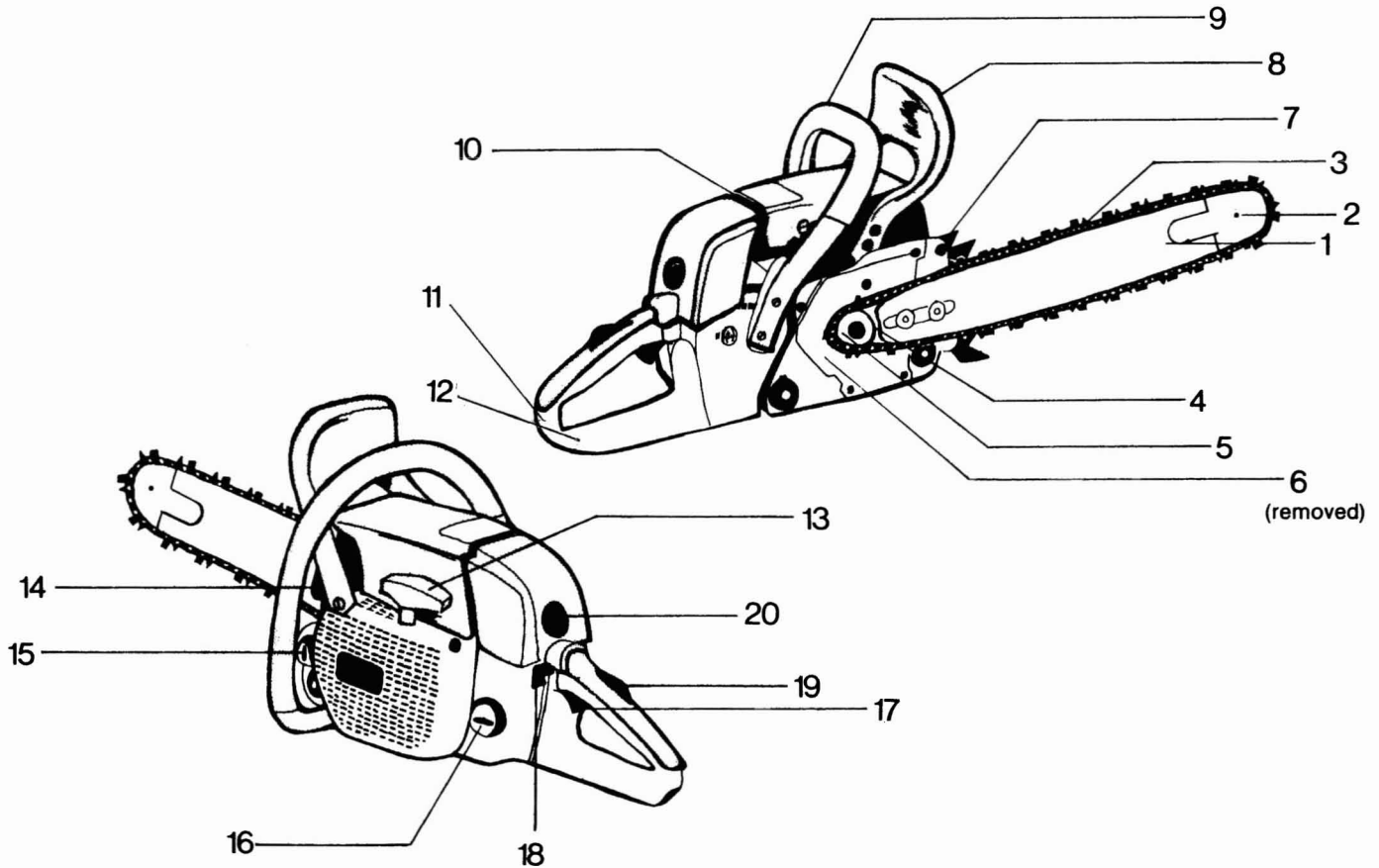
Potential Injuries

Every chain saw user should understand the hazards and potential injuries so there will be more desire to observe proper operating procedures. The most common injuries resulting from improper use are:

- * Cuts by the chain on the underside of the guide bar when the chain is in motion; usually caused by sawing through materials into the legs, feet, or trunk of one's body.
- * Cuts by the moving chain on the top side of the

guide bar as a result of kickback or a hand slipping off the front handle.

- * Injuries from overhead by wood or branches shaken loose by tree vibrations when cutting.
- * Injuries from falling trees or rolling logs.
- * Possible hearing impairment if ears are not protected against excessive noise.
- * Others, such as falls, sprains, strains while carrying, operating, or starting saws, and burns due to the hot muffler or accidents with improper fueling.



- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Guide Bar—Supports and provides track for saw chain. 2. Guide Bar Nose—Exposed end of bar with a sprocket. 3. Saw Chain—A loop consisting of cutters with depth gauges (rakers), connecting links, and drive links. 4. Chain Brake—Stops chain if hand guard (8) is tripped. 5. Chain Sprocket—The powered toothed wheel that drives the chain. 6. Sprocket Cover—Exterior cover over sprocket and rear end of bar. 7. Bumper Spikes—Toothed part to hold saw against wood when cutting. 8. Hand Guard—Protects front hand and activates chain brake. 9. Front Handle—Handle bar for hand control of saw front. | <ol style="list-style-type: none"> 10. Spark Plug Terminal—Plug-to-terminal connection below cover. 11. Rear Handle—Support for hand at rear of saw. 12. Hand Guard—Gives some rear hand protection and adds to saw's structural unity. 13. Starter Grip—Grip for manual pull starter for engine. 14. Muffler—Used to reduce sound level and sparks at exhaust port. 15. Oil Filler Cap—Closure for oil tank. 16. Fuel Filler Cap—Closure for fuel tank. 17. Throttle Trigger—Speed control for engine. 18. Ignition Switch—Switch for engine start/stop. 19. Throttle Lock—Must be depressed to use throttle trigger. 20. Air Filter Cover—Cover over carburetor and air filter. |
|---|---|

Figure 2. Chain saw parts and descriptions.

Chain Saw Parts

Figure 2 shows the parts of a bar-type chain saw and gives brief descriptions. One part not shown, but available on some saws, is the safety tip. This is a removable guard that attaches to the front of the bar. It keeps the front tip of the chain from contacting objects and reduces kickback.

Selection

Seek a reputable and experienced dealer when you buy a saw, for it is most helpful to have a good dealer for parts and service. Many dealers will let the prospective buyer test the saw by cutting some wood. If you have questions about a saw's capabilities, ask the dealer if you can test it or if he will demonstrate it. Do some test cutting to see if the saw is well balanced and does not vibrate excessively. The saw should feel good in the hands of the intended user.

Most nonprofessional users buy medium-sized saws with 14- to 20-inch bars and weighing 10 to 16 pounds. This weight is reasonably easy to handle. Heavier saws, when used for long periods, can fatigue the nonprofessional user and increase the likelihood of accidents.

Most users prefer gasoline-powered saws, as they are portable and less cumbersome than electric-powered ones, even though they are heavier. Seek the advice of a knowledgeable person for the power needed for the saw use intended, but do not be underpowered.

When the saw is running, the chain and bar must be oiled. An automatic oiler is desirable. Since the oiling requirements vary with the type of cutting, many people prefer to have both automatic and manual oiling capability. Too little oiling causes premature part wear or failure.

Manufacturers have done well in improving chain saws' safety features, from lowering noise and vibration to reducing kickback. The principal features to evaluate for reducing kickback are chain type (low-kickback vs. standard chain), chain brake, low-kickback bars, and safety tip. The throttle interlock has been a good addition to aid starting and to make the throttle and chain return to idle when the rear handle is released.

Be sure to evaluate the saw's design with respect to basic maintenance and service. People doing chain saw repair work can tell you which saws are easiest to maintain and repair.

Situations causing saw blade to kick back toward the operator

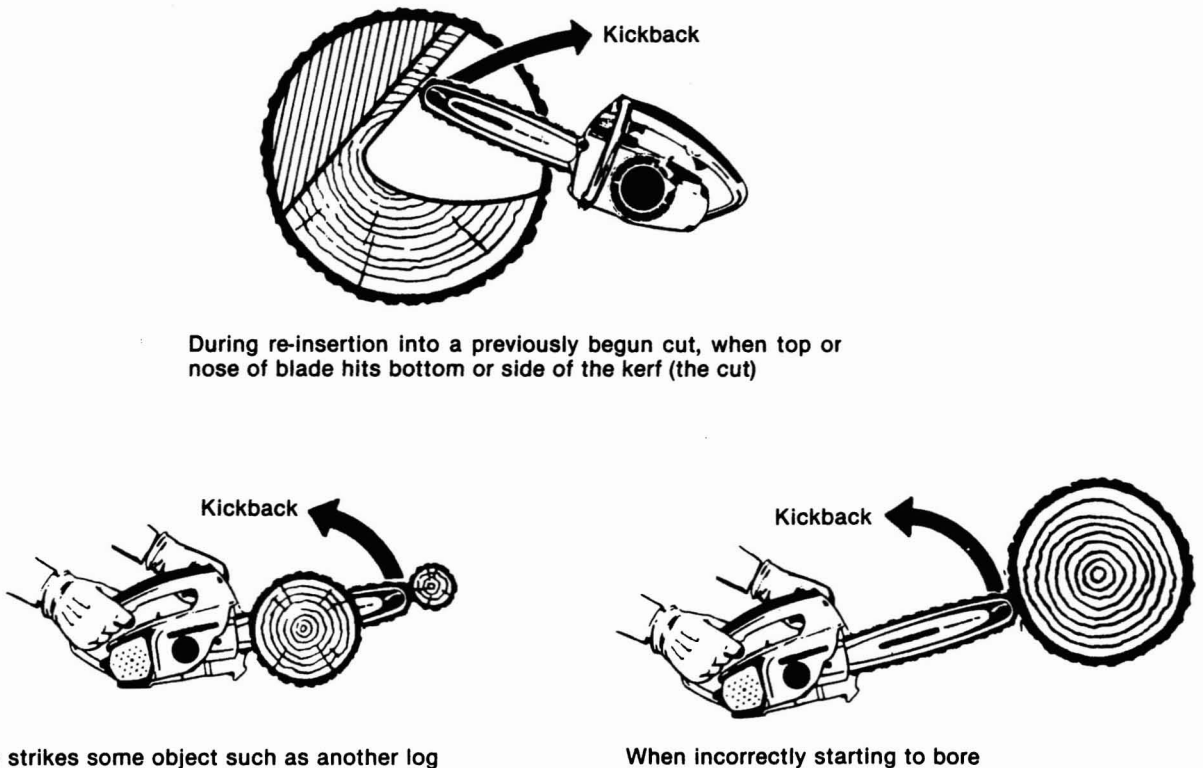


Figure 3. Avoiding kickback.

CUTTING

The chain saw is dangerous when misused. It is involved in about 30 percent of all woods accidents among professionals and poses the single greatest hazard in woods work for professionals or nonprofessionals.

The three principal cutting operations are felling, limbing, and bucking. Pruning is a complete removal (limbing) or partial removal of tree branches.

Kickback

The most common form of kickback occurs when the saw bar makes "grabbing" contact at the tip. The bar is thrown rapidly backward in an arc, pivoting about the operator's hand at the saw handle. This often causes serious injury, loss of balance, or loss of control of the saw. Grabbing can occur when the chain encounters an abrupt change in wood characteristics, such as hitting a knot, or when the chain is run too slowly or the saw is twisted so the chain grabs. Figure 3 shows three examples.

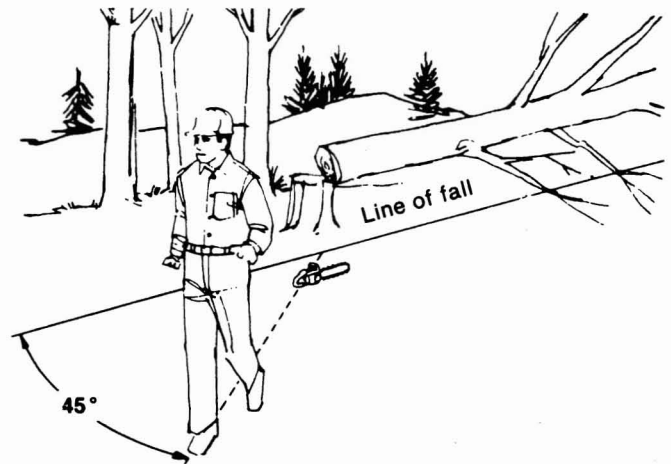
Felling

The ability to control the fall of a tree comes with experience. Inspect the tree to be felled and surrounding trees for hazards such as broken limbs, vines, and so forth. Such hazards should be removed, if possible, before felling the tree. A tree may be unbalanced by uneven top growth or breakage, even though the trunk does not lean. Keep the felling direction as simple as possible, and avoid felling trees on a windy day. Plan a safe path of retreat before cutting (Figure 4).

An inexperienced operator should fell trees only when conditions indicate a high degree of certainty for the direction of tree fall. Check the fuel supply before starting a cut that will require a long running period.

Figure 5 illustrates the notching and felling cuts to control direction of tree fall. The steps include:

- * Make a notch on the side of the tree in the direction in which it is expected to fall. Make the lower horizontal notch cut first, to a depth of about one-third the diameter of the tree. Then make an angular notch cut at about 45 degrees downward to the horizontal notch cut.
- * From the other side of the tree, make the felling cut about 2 inches higher than the horizontal notch cut, and keep these cuts parallel. Guide the saw into the tree, and do not force it.



Plan a safe, unobstructed path of retreat before making felling cut. When tree begins to fall, remove saw, stop motor, set it on ground, and retreat rapidly at 45-degree angle from line of fall.

Figure 4. Path of retreat.

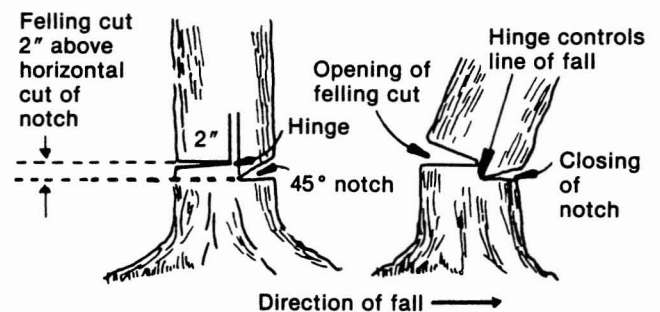
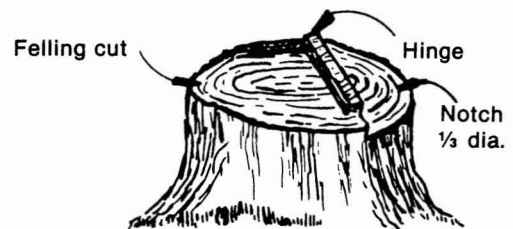


Figure 5. Controlling tree fall.

* **DO NOT CUT THROUGH THE HINGE FIBERS.** Stop the cut to leave wood fibers to act as a hinge. The tree begins to fall as the felling cut approaches the hinge fibers. Retreat from the tree as indicated in Figure 4.

A well-balanced tree may need to be wedged, pulled, or pushed in the desired fall direction. Using two wedges, rather than one, is the most dependable way to help direct a tree fall. Wooden, aluminum, or plastic wedges should be used. Strike the wedges with firm but not excessive blows, using a sledge or mallet having a face broader than the wedge.

Limbing

Cutting accidents frequently occur during limbing. Quite often the operator cuts too close to his feet or legs. When possible, cuts should be made on the opposite side of the trunk from where the operator stands, using the trunk as a barrier (Figure 6). When necessary to cut with the saw on the same side as your body, keep the saw comfortably spaced from the body so it will not swing into the legs or feet. Always limb from the ground. Avoid reaching with the saw, and maintain good footing for balance.



Cut on opposite side of the tree trunk whenever possible.

Figure 6. Limbing.

Cut the limbs on the top side of the trunk before removing those resting on the ground. Remove smaller branches as the work progresses up the trunk, since they impair vision, present obstacles, and may

cause kickback when twigs lodge in the blade. Many times an axe is the best way to remove small limbs. Cut longer branches to desired length before cutting them from the trunk.

As the work progresses, branches resting on the ground need to be cut to improve working conditions underfoot. Leave key branches to stabilize the tree until last. While cutting, keep the engine speed up; a slow-moving chain is more likely to lock and cause kickback than one cutting freely at higher speed.

Bucking

Cutting the tree into desired lengths is usually less hazardous than other sawing tasks. Bucking hazards include kickback and unexpected roll of logs. Maintain sure footing when working on hillsides, and always work on the uphill side of the log. Do all manual lifting with back- and strain-saving techniques. Work from the ground, not the log. Avoid operating a saw above waist level. Use both hands to hold the saw, placing the bumper spikes against the log during cutting. A tree lying on the ground that is too big to lift can usually be cut partly through from the top, then rolled over and cut from the opposite side until free. If the tree is partially supported, make the type of cut dictated by the obstructions, support points, and general lay of the tree.

MAINTENANCE

Chain saws require frequent care and maintenance, as they are often operated in dirty environments and abused by many operators. Routine service is necessary so the saw will perform satisfactorily and unnecessary repairs are avoided. Many operators disregard trouble symptoms for hours after they appear, since "it still cuts," though improperly or inadequately. Follow the owner's manual for routine service and troubleshooting.

It is best to leave major repair work or service work you do not understand to professionals who repair small engines. With some practice and interest, however, most people can perform the following jobs. Refer to the owner's manual for specific details.

Chain Oiler

Before and during cutting, check for adequate chain-bar lubrication. **DO NOT CUT WITHOUT CHAIN-BAR LUBRICATION.** Make sure the oil tank is full. To check oil flow before cutting, first rev up the engine. Hold the nose of the bar a few inches away from a sheet of paper or section of cut wood to inspect for a fine oil spray deposit. If oil is not depos-

ited, shut the engine off and adjust the oil-discharge regulating screw to increase flow for an automatic oiler.

Repeat the procedure, and if oil does not flow, use the manual oiler if the saw has one. Refer to the owner's manual for suggestions or take the saw to a dealer, if oil flow is still inadequate.

Fuel Quality

It is important to mix the recommended amount of two-cycle engine oil with fresh gasoline for satisfactory engine lubrication and fuel performance. Fresh fuel minimizes gumming, and clean fuel reduces fuel-filtering problems. Mix chain saw fuel in a separate container rather than in the saw's tank.

Chain Tightening

Check chain tension frequently. When adjustment is needed, slightly loosen the sprocket cover nuts. While lifting the nose of the guide bar with the saw stationary, pull the chain away from the top of the bar and release it. The chain is properly tensioned if it does not sag and can be moved freely along the guide bar by a gloved hand. Adjust the chain-tensioning screw while holding the bar upward. Tighten the cover nuts. Make a few cuts with the saw and recheck tension, readjusting if necessary. Remember: as the chain heats up, it stretches; as it cools, it shortens.

Chain Sharpening and Care

Keeping the chain sharp reduces several cutting and maintenance problems. The signs of a dull chain are fine sawdust being produced rather than chips, chain chatter, overheated bar, curved cuts, and the operator having to apply too much force. To prolong chain life when operating the saw, avoid hitting rocks, dirt, or other abrasive material. Similarly, forcing a dull chain to cut can damage the chain, bar, sprocket, and clutch. Using good-quality chain oil also helps extend the life of these parts.

Sharpening is best done by filing a little each time and filing often. Cutters and depth gauges for each chain are designed to be filed at specific angles with round, flat, or triangular files, depending on the chain. Properly tension the chain on the guide bar, then hand-sharpen the cutters and depth gauges. Correct file sizes and angles are given in the owner's manual.

Air Filter Cleaning

If the engine cannot get adequate air for combustion, it cannot develop full power. Clean the air filter by brushing with a soft brush, blowing with

compressed air, or washing with a liquid recommended for that filter. Replace the filter when it is damaged or cannot be adequately cleaned.

Guide Bar Inspection and Cleaning

The sprocket on guide bars having a bearing sprocket-nose should be lubricated as recommended. Conditions causing bar wear include running the chain too tight or too loose, insufficient lubrication, cutting in abrasive conditions, and prying with the bar or getting it pinched. If the bar is symmetrical, turn it over periodically to help keep wear more uniform.

After removing the bar, clean the groove by using a wire or narrow stick to remove sawdust and other material. Clean the oil inlet holes at the rear of the bar. Nicks in the bar can be filed to renew the flat surface. Bars that have slight bends can often be straightened to allow the chain to run acceptably.

Cleaning Cooling Fins

Periodically remove the housing about the cylinder cooling areas so sawdust and grime can be removed with a brush or compressed air. Daily cleaning of cylinder ribs and flywheel vanes may be needed in dirty conditions.

Spark Plug and Ignition

The plug should be checked every 30 to 40 working hours. If you are having trouble starting a saw, first check the plug condition and replace or service as needed. Ignition systems (magneto or solid-state types) believed to be defective are best left to service dealers.

Carburetor Adjustment

If the engine is overheating, misfiring, stopping while accelerating, or giving off dense smoke, carburetor adjustment is likely needed. Such adjustments are best made by starting with the manufacturer's basic carburetor settings and deviating slightly from these to account for the effects of atmospheric pressure, fuel quality, and other variables. The best advice for most people is to take the saw to a service dealer for repair or adjustment.

Drive Sprocket Inspection

Check the teeth of the drive sprocket for damage or uneven wear. Replace the sprocket if damaged. Also, with the sprocket cover off and the engine not running, manually test the chain brake to be sure its components work correctly. Test its action to be sure it will stop the clutch drum and sprocket when engaged.

Exhaust System Cleaning

Periodically remove any carbon or dirt deposits, since a clogged muffler or buildup on the exhaust port can cause considerable power loss. Remove the muffler. Slowly pull the starter rope to position the piston at the top of its stroke. Then clean the exhaust port with a wooden scraper. Replace the spark screen or entire muffler as needed.

SAFETY SUGGESTIONS

- * Never cut alone.
 - * Know the saw; study the owner's manual.
 - * Respect the saw for its potential to produce serious injury.
 - * Never operate a saw when fatigued or when taking strong medication or alcohol.
 - * Prepare yourself by wearing suitable work clothing and personal protective equipment.
 - * Hold the saw firmly on a solid surface when you start it.
 - * Keep the saw's handles clean and dry; use both hands to saw.
 - * Operate the saw at full speed before starting a cut.
 - * Keep other people out of your working area when operating the saw.
 - * Avoid conditions that contribute to kickback.
 - * Keep antikickback devices (e. g., chain brake) in working order.
 - * Avoid contact with the muffler, to prevent burns.
 - * Let the saw cool before fueling, and do so in a safe area.
 - * Avoid chain saw operation when the chain is too loose.
 - * Avoid cutting trees on windy days. Plan the path of tree-fall and a safe line of retreat.
 - * Always stay alert and in a balanced position when cutting.
- * Keep the line of the saw and bar to your side when cutting.
 - * Cut on the uphill side of a downed tree, to prevent rollover.
 - * Avoid springback when cutting limbs that are bent.
 - * Carry the saw with the engine stopped, guide bar to the rear, and the muffler away from your body.

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