The Care and Feeding of an Amateur's Favorite Antenna Support—the Tree

If your tree-supported antenna fell down, you'd care. Did you ever think about caring for the tree that holds up your antenna?

By Doug Brede, W3AS
116 Ridgewood Dr
Post Falls, ID 83854

For most hams, trees are favorite antenna supports. Many radio amateurs begin their operating careers by hanging the far end of a wire up in the family's shade tree. On Field Day, resourceful hams find a hundred and one ways to get an aerial into the air; many (if not most) of these methods involve using trees as supports or aids.

During my 20 years as a radio amateur, I've used tree-supported wire antennas almost exclusively. Some of those antennas lasted several years; most didn't. Over the years, by trial and error—and because of my trade association with arborists and horticulturists—I've gained an understanding of what can (and can't) be expected of trees as antenna supports.

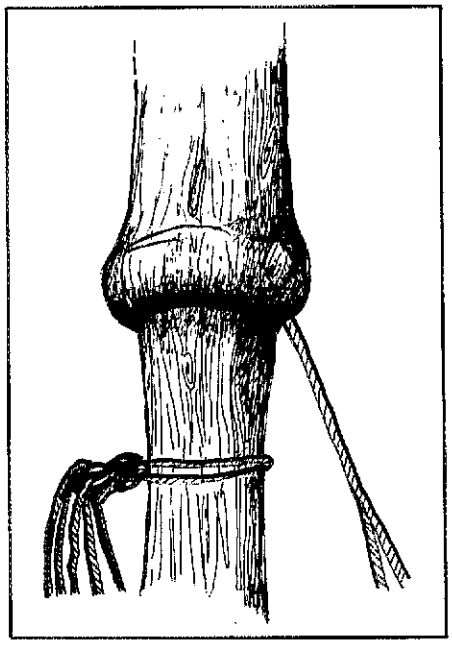

Fig 1—Attaching ropes or wires to trees can sometimes lead to major problems for the tree. Wrapping a rope around a limb or trunk and leaving it unattended will suffocate the tree and cause a distortion of growth or the death of the limb.

There are right and wrong ways to attach and maintain your tree-mounted skyhooks over the long haul. In this article, I'll share with you some pointers from two noted horticulturists who talk about attaching wires to trees. Safety is also discussed—your safety during antenna installation, and the safety of the tree.

Trees Are Alive

Few antenna supports can be classified as life forms. Trees are an exception. Tree experts usually cringe when someone brings up the idea of attaching a wire to a tree—especially when connecting a chunk of wire to its midriff (see Figs 1 and 2). The experts know that trees are made up of three basic layers: the bark, the living sapwood, and the nonliving heartwood. The bark protects the sapwood from injury. The sapwood contains the "skin and blood vessels" of the tree. If the sterile barrier between the bark and the sapwood is broken, infection can set in. Infection, if unchecked, can kill even a mighty oak within a year.

Trees have the same basic problems with infection as we humans do. If a tree gets a cut or gash, infection from bacteria and fungi is bound to set in. But there's one important difference between trees and humans: "Tree wounds don't heal," says noted tree expert Dr Alex L. Shigo. "People heal; when you are wounded, you have forces that fight off the infection. Trees don't have these forces to fight off infection, and *every wound* will become infected."

Shigo, author of the book, *Tree Biology and Tree Care*[1] notes that trees lack an immune system that fights off infection from wounds that occur from the actions of a careless climber or the attachment of an antenna-support eyebolt. Trees treat their wounds by walling off the infected area and isolating it from the living part of the tree. "If you cut open a tree that's 2000 years old, you'll see every injury in that tree that occurred over its lifetime," says Shigo.

Whenever you wound a tree, you weaken the tree in that spot. The walled-off wood around the wound lacks the strength of healthy wood. When attaching an antenna to a tree, it's important to traumatize the tree as little as possible. This will ensure a strong, enduring connection.

Most people believe that tree paint or shellac is the best way to treat a tree wound. "Not so," says Shigo. "Wound dressing paints just protect the microorganisms." Scientific research with tree-wound preparations have failed to show *any* benefit to the tree.

Making the Attachment

Although it's relatively easy to get a wire up into a tree, it's certainly more difficult to keep it there for the long term. Usually,

Fig 2—Over the years, this tree has grown around the cable of a roadside barrier. Dave Newkirk, AK7M, spotted this tree in Glastonbury, Connecticut. *(photo KC1MP)*

[1] A. Shigo, *Tree Biology and Tree Care*, (Shigo and Trees, Assoc, 2nd ed. 1989) 4 Denbow Rd, Durham, NH 03824; $52 plus shipping and handling. A companion to this book, an expanded glossary of 239 tree terms, is priced at $13. The shipping and handling charge for any single book is $3. For any combination of books ordered, the shipping and handling charge is $3 for the first book and $1 for each additional book.

Some Questions and Answers about Tree Antennas

Q: *A CBer in my neighborhood cut the top out of his pine tree and stuck a ground plane antenna up in it. Is this an acceptable way to mount an antenna?*

A: Definitely not. Not only is this a hazardous way to mount an antenna, it essentially ends the useful life of the tree. Topping of trees is strongly discouraged by professional arborists. Because topping removes the growing point of the tree, the tree recovers from the damage by sprouting numerous lateral buds around the top, which soon overrun the antenna.

Q: *I've heard that if you fertilize a tree, your antenna will grow higher each year. True?*

A: False. Although fertilizing is a desirable way to keep your tree healthy, it does not raise the height of your attached antenna one inch. Trees grow by extension of the apex. A wire attached to the trunk at 30 feet will still be at 30 feet 10 years later. By the way, when you fertilize your tree, use regular garden fertilizer distributed around the drip line of the tree. The fancy tree spikes you see advertised are unnecessary because most tree feeder roots are near the surface.

Q: *Is there any way to slow down the growth of a tree, so that it doesn't interfere with my antenna?*

A: Some home-and-garden stores now stock growth regulators for trees. These products can be injected into the tree, dropped on the soil surrounding the tree, or sprayed on the leaves (follow label directions). Tree professionals can also perform this service. These growth regulators are used by some utility companies to reduce the need for tree trimming near power lines.

Q: *Are certain types of trees better wire-antenna supports than others? What about hardwoods versus softwoods?*

A: There's little difference between hard- and softwoods in their ability to hold up antennas. Conifers, because of their shape, are nearly ideal antenna supports. Avoid the use of red oaks and silver maples if possible, because they tend to rot easily if wounded. Avoid using poplars, too. In spite of their height and rapid growth, their branches are brittle and break easily.

Q: *If I damage a tree during antenna installation, what should I do? Is tree replacement expensive?*

A: If the damage is minor, your best bet is to do nothing. If it's a broken limb, saw the limb off cleanly, perpendicular to the axis of the branch. Never saw off a branch flush with the surface of the trunk, as this allows decay to set into the trunk. Using tree paint for injury repair is unnecessary (see text). In case of major tree damage, consult a trained arborist.

The answer to the second question is: Yes, tree replacement is expensive. The International Society of Arboriculture publishes a formula for calculating replacement cost of shade trees of various sizes. This pamphlet can be obtained from many tree services and libraries. Here's one point to ponder: A large, stately shade tree can add several thousand dollars in value to the property on which it sits.

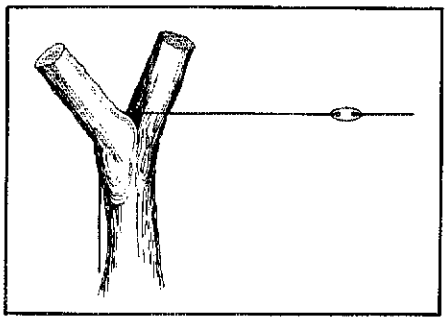

Fig 3—Most hams install tree-mounted antennas by throwing a line over a branch crotch. This should be used only as a temporary installation, because abrasion of the rope and tree results. Over time, girdling may occur leading to the loss of one or more of the branches.

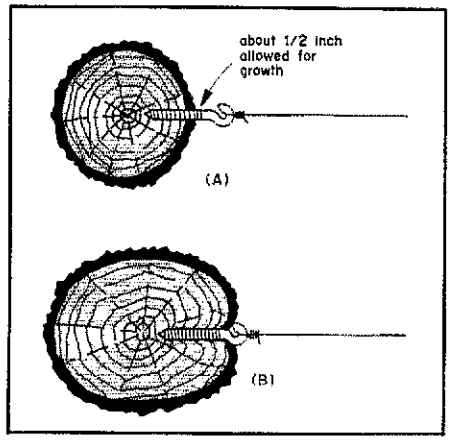

Fig 4—The best way to secure a wire to a tree is with an eyescrew mounted into the wood (A). As the tree grows and expands, however, the eyescrew will become embedded (B) and must be removed and replaced.

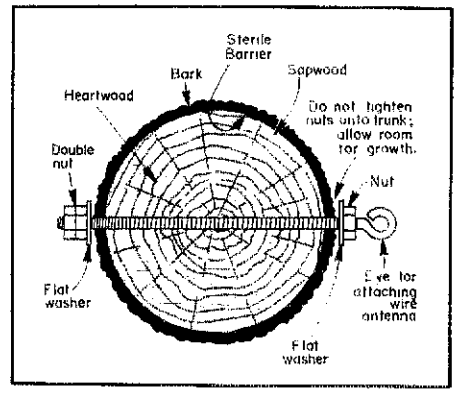

Fig 5—For heavy antenna loads, an eyebolt passed through the trunk or limb will support more weight than an eyescrew. Allow about ½ inch of play between the bolt and trunk or limb. Don't tighten the bolt completely; this allows for tree growth.

annual (sometimes weekly) restringing is needed. It seems that trees "instinctively know" just when to drop a wire to the ground: during midwinter when the snow is high and the skip is long, or in the middle of a heated contest!

The bow-and-arrow method has become a standard of the wire-in-the-tree crew. But many other methods, slingshots, for example—even attaching a string to a golf ball and whacking it with a sand wedge—are common.

One of the easiest and most common ways to connect a wire to a tree is to throw a rope over a branch crotch (see Fig 3) and tie off the loose end. This is the main method used in temporary (such as Field Day) installations.

"Doing this probably won't hurt the tree if it's done as a temporary thing," says Washington State University horticulturist Ray Maleike. But with any of these simple antenna-stringing methods, some problems for the tree (and the antenna) may develop later.

"First of all, you're not stabilizing the antenna very well with this type of setup. The other thing is that people have a tendency to forget the antenna's there. As the tree grows—as it increases in diameter—you can girdle the tree. If you've got this girdling rope or wire up there, you can actually kill that portion of the tree above the wire."

Another no-no when attaching an antenna to a tree is wrapping a wire around the trunk. This strangles the veins in the sapwood the same way a noose around your neck would strangle you. "It's important not to wrap anything around the trunk," says Maleike.

Many commercial nurserymen wrap stabilizing ropes around newly transplanted saplings to keep them from falling over. Recently, however, this practice has been questioned because of the restrictions these ropes place on the growth of the tree. People forget about these ropes; some remain on

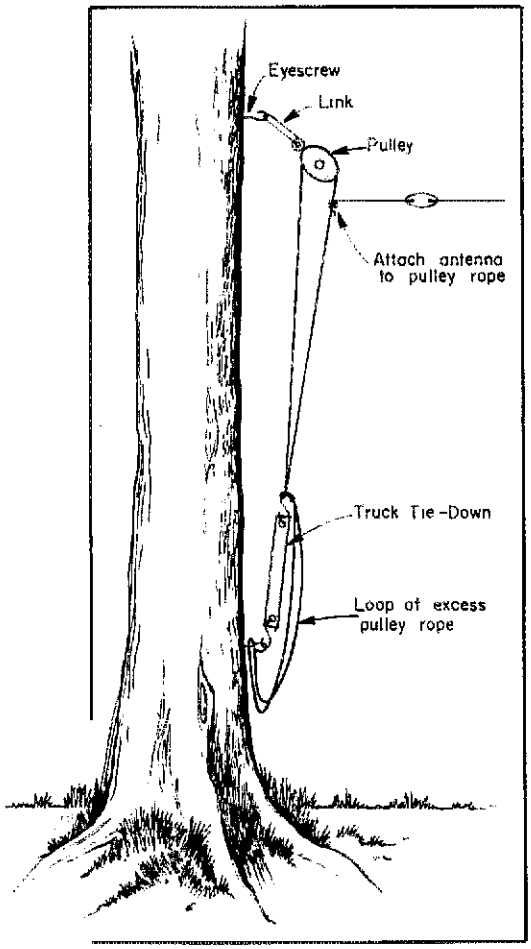

Fig 6—By using a pulley, raising and lowering the antenna for repairs can be done without the need to climb the tree. Flexible truck tie-downs can be used to apply tension to the antenna. (Early editions of *The ARRL Antenna Book* show a weight used to provide the required tension. A weight swinging from a tree can be hazardous.) Loop the excess pulley rope to a second eyescrew, in case the tie-down fails.

Practical Tree Biology Tips

Excerpted from *A New Tree Biology*,† by Alex Shigo, PhD

- Tree wood is not dead. There are more living cells than dead cells in sapwood.
- Tree wounds will become infected. Trees cannot restore, regenerate, or repair injured wood.
- Branches are attached to trunks by a series of collars; branch collars over trunk collars.
- Branch removal that injures or removes the collar will destroy a tree's defense system.
- Trees have five major growth periods during each growing season: (1) onset of growth, (2) leaf formation, (3) wood and inner bark formation, (4) storage, and (5) dormancy.
- Fertilize injured or stressed trees during growth periods (3) and (4).
- Trees get food (sugar) by trapping the energy of the sun.
- Trees get water and elements essential for growth from the soil.
- Substances for tree defense come mostly from stored energy reserves.
- Healthy trees have living cells with high amounts of energy reserves.
- When defense is low, opportunistic diseases attack.
- Because it grows big and fast does not always mean that a tree is healthy.
- If possible, cut tree limbs only when they're dormant or after leaf formation.
- There is no data to show that wound dressings stop rot.
- Tree topping is a crime against nature!
- Read and learn about trees.

†A. Shigo, *A New Tree Biology* (Shigo and Trees, Assoc, 1989), 4 Denbow Rd, Durham, NH 03824; $21 plus $3 shipping and handling (see note 1).

trees for years after transplanting.

Encasing the stabilizing (or antenna) wire in rubber or plastic hose is not the answer either. "Wire wrapped in hose is just as injurious to the tree as the bare wire itself," says Shigo. "If you remember your basic physics, you're applying the same number of pounds of force to the tree with or without the hose." Shigo recommends that if you must wrap something around the trunk of a tree, use a wide fabric strap to do the job.

Two methods have emerged among leading horticulturists as the preferred way to attach a wire to a tree. For light antenna loads (eg, the end of a dipole), a threaded eyescrew (Fig 4) is the method of choice. Simply drill a hole into the tree about 1/16 inch smaller than the screw diameter, then twist in the eyescrew. Be sure to select a cadmium-plated eyescrew threaded for use in wood. A thread length of 2 or 3 inches should secure most antennas. Allow about ½ inch of space between the trunk and the eye; this allows for outward growth of the tree with time.

For stouter antennas, such as multielement wire beams, another method for securing wires to trees is recommended. This procedure involves using an eyebolt longer than the tree diameter, drilling clear through the tree and securing the eyebolt on either side of the tree with round washers and nuts (see Fig 5).

Fig 7—A professional arborist uses a safety belt and rope when climbing trees. Hams should take similar safety precautions. *(A. Douglas Brede, W3AS photo)*

Drilling a hole through a tree causes much less trauma to the tree than wrapping something around it. Much of the core of a tree is dead tissue, used mainly for physical support. Although there will be some wounding of the tree at the site of the bolt or screw, such wounding will be far less than that which occurs from wrapping a wire around the trunk.

Over time, either type of eyescrew connection will have to be replaced. "If these fasteners are left on the tree for a long time, the fastener will eventually become embedded in the tree," says Maleike. "You're going to have to pull these fasteners out and replace them every now and then." Maleike recommends replacement of tree eyescrews every 5 to 8 years as the tree matures. Commercial arborists use *drive fasteners* for securing wires to trees; drive fasteners are similar to eyescrews. "These fasteners keep the wire away from the tree, allowing the tree to grow out to it," says Maleike. Drive fasteners are used for securing lightning rods and their accompanying wires to trees. The use of drive fasteners is common in the Midwest, where lightning strikes to trees are common. You may have to shop around to find drive fasteners—try calling tree-care services in your area.

It's easier to periodically service a tree-supported antenna if a pulley is used (see Fig 6). Raising and lowering the antenna for repairs can be done without the need to climb

(continued on page 40)

Table 1

C64 Memory Transplant Program

```
1 OPEN 2, 2, 3, CHR$(3 + 32) + CHR$(32 + 128) : PRINT CHR$(147)
2 GET #2, A$ : IF VAL(A$) = Ø THEN 2
3 PRINT A$;
4 GET #2, A$ : PRINT A$; : A$ = A$ + CHR$(Ø) : IF ASC(A$) < > 13 THEN 3
5 PRINT : PRINT "POKE 152,1 : GOTO 7"
6 POKE 631, 19 : POKE 632, 13 : POKE 633, 13 : POKE 634, 13:
  POKE 635, 13 : POKE 198, 5 : END
7 PRINT CHR$(147) : GOTO 4
```

a manner similar to that of the transmit modem. CHR$(147) removes nonpertinent characters from the screen.

2) GET #2 fetches the first character from memory. If that character is part of the program preamble, its value is zero. Execution of the program is thereby reinitiated immediately.

3) The first valid character is PRINTed to the screen without a carriage return.

4) As program execution is well under way at this point, there is no further need to test for zeros. With the C64, the CHR$(Ø) is a necessary formality when performing this sort of operation. If the character is *not* ASCII code 13 (a carriage return), action loops back to line 3. Each character is PRINTed to the screen as it is received.

5) When a carriage return is detected, POKE 152,1 : GOTO 7, to be executed in line 6, is PRINTed to the screen.

6) The POKE commands place the cursor at the proper screen location, place four carriage returns in the keyboard buffer, then indicate that information is being held in the buffer as a total of five keystrokes (POKE 198, 5). It is the END statement that implements the POKE 152,1 : GOTO 7 statement that was printed to the screen earlier (in line 5). In this instance, END does not constitute the end of the program. The latter part of line 5 directs final action to line 7.

7) The screen is once again cleared and the program returns to line 4 to begin processing the next line.

The beauty of this approach lies in its simplicity. There is no need for ancillary programs, intermediate transformations, storage to disk, buffers, etc. Yet the program as received is wholly in memory and can be manipulated in customary fashion. All the other techniques I've seen substitute cumbersome hard-, firm- and software for something the C64 is inherently equipped to do.

Although I worked this out on 2-meter FM, the same procedure can be followed on HF. (However, I highly recommend the use of an audio band-pass filter on HF.) My modem is about as simple as one can get—I designed and built it myself. The modem plugs directly into the C64 USER PORT and requires no external power source. Details of the modem are available from me; please provide a business-size SASE.

Initial inspiration for this project was provided by Virgil Yarbrough, W5YGX (not Virgil Yarbrough, K4IEK[3]). The technique might never have been mastered had it not been for continuing encouragement and invaluable suggestions by Kenneth Bates, KF5WD. After a search of more than two years for a method of getting received data into memory, I am indebted to my son, Bill, for having discovered the final missing link—the POKE instructions in lines 5 and 6 of the receive program.—*Don Goshay, W6MMU, Emerald Beach Village, Golden, MO 65658*

[3]C. Pratt and V. Yarbrough, "Pictures by Packet," *QST*, May 1988, pp 15-17.

Note: All correspondence addressed to this column should bear the name, call sign and complete address of the sender. Please include a daytime telephone number at which you may be reached if necessary.

Feedback

☐ A couple of errors crept into Howard Lester's July 1989 *QST* article, "Interference Standards Revisited." In both photo captions, the US National Institute of Standards and Technology is incorrectly identified as the National Institute of Science and Technology. Also, both photographs were provided courtesy of M. L. "Mike" Crawford of the National Institute of Standards and Technology.

☐ A crystal-frequency typo found its way into "A Four-Stage 75-Meter SSB Superhet," May 1989 *QST*. On page 25, the sentence in the middle of the second paragraph of the third column should read: I found that I could shift a surplus 9.500-MHz HC-6/U crystal to 9.50013 MHz with C14 in place of W1, as shown. *(tnx Charles M. Schwab, Jr)*

The Care and Feeding of Trees

(continued from page 28)

the tree each time. I use a flexible truck tiedown to provide tension to the antenna.

Your Safety in Trees

A fall from a 40-foot tree is just as dangerous as a fall from a 40-foot tower. Yet, many times you see hams scaling trees with no safety equipment! Wear a tower-climbing safety belt for all tree climbs (see Fig 7). Commercial arborists take the matter of safety one step further: They lob a rope over a tree crotch just above the height at which they'll be working. Then they tie the rope to their safety belt. The loose end of the rope can be held by a helper on the ground.

Be sure to use a good quality rope that is heavy enough to support your weight. Before use, inspect the rope for wear. Arborists prefer to use hemp rope rather than nylon, because hemp rope stretches less.

When you're climbing a tree to attach a wire, always have a buddy on the ground available to fetch tools or summon help in an emergency. Be sure your buddy wears a hard hat; tools or branches dropped from even a moderate height can be dangerous.

As an alternative to doing it yourself, consider procuring the assistance of a professional to install your tree antenna. A professional can clear away interfering branches and secure an eyescrew in short order. Professional tree trimmers generally work in pairs. They use a ladder or bucket truck to get up into the tree, and then they free-climb throughout the tree. A safety rope, saddle, and safety belt are worn. "A figure that I heard about how much this runs is about $50 an hour," says Maleike. Most antenna tasks can be done by professionals in about an hour.

Summary

Keeping your station in good operating condition is—or should be—a fundamental practice of every radio amateur. Part of that practice includes annual inspection of your antenna system. If trees are a part of your antenna system, take a good look at them. Are you keeping them healthy?

Doug Brede is a former Associate Professor of Horticulture at Oklahoma State University and is now research director for a major west-coast seed company. In addition to having written for QST before ("The Electronic Voice-Saver," QST, Jun 1980, pp 18-20), Doug has written over 100 technical articles on landscape topics for magazines in the landscaping industry.

Doug holds an Extra Class license, and operates mostly HF CW. For an antenna, he uses a dipole suspended between two 90-foot-tall Ponderosa pines.