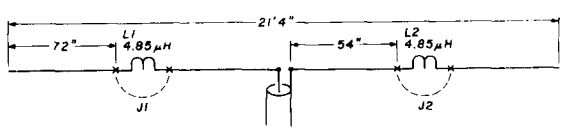
compact travel antenna

Complete the installation — add this antenna to your compact rig

Traveling with a portable rig* is fun, but raising a temporary antenna can be difficult. For one thing, few resort managers are willing to lend their flagpoles and trees to unsightly wires that could garrote paying customers. And, of course, there's always the possibility of a mishap — a poorly thrown beanbag dimpling the roof of a vintage Mercedes, for example. These liabilities are *real*, and all too often I've settled for makeshift alternatives to avoid an unpleasant confrontation.

Thinking there must be a better way, I set out to build an antenna that would provide solid on-the-road performance without scaring the spirit of cooperation out of resort owners. I started by writing down my needs: it must be self-supporting, easy to mount, and collapsible; it must cover 14-30 MHz, perform with high efficiency in either vertical or horizontal polarization, be made from available materials, and require no external matching devices.

Remembering my old Cushcraft "Trick-Stick" VHF dipole, and how easy it was to set up and use, I reasoned that a loaded hf dipole of similar size might be the answer.



Loading coils:
L1,L2 24 turns 3/4-inch x 16 TPI coil stock (B&W No. 3011 or Air Dux 616T) or 14 turns 1-1/2 inch x 8 TPI coil stock (B&W No. 3018 or Air Dux No. 1008).
J1,J2 8-inch clip leads.

fig. 1. Overall length of antenna is 21 feet, 4 inches, about 66 percent of a full-sized dipole. Two 4.85 μH inductors are required to resonate it at 14.05 MHz. Jumpers bypass inductors for 21-30 MHz operation.

design

Since I didn't want a high-budget project, my first step was to raid my junk pile, where I found several 4-1/2 foot lengths of 3/8-inch diameter thick-wall aluminum tubing. I decided that these would make sturdy center sections.

Six-foot collapsible replacement antennas from Radio Shack would be perfect for the ends. This would give me a 21-foot element in four pieces (**fig. 1**). Since 21 feet is a healthy 66 percent of full size, I concluded that my antenna would be efficient, and provide a good match without need for special matching devices.

loading coils

Power handling wasn't a concern, since my portable rig runs 15 watts. But efficiency was very important. With QRP and marginal locations, every watt counts! A friend who designs antennas for a living cautioned me against close-winding loading coils with enameled wire. His experience indicated that high-*Q* air-wound stock is less lossy, and well worth the extra investment. He said I might get away with using 3/4-inch 16 TPI (turns per inch) miniductor for low power, but strongly recommended larger diameter stock with 8 or 10 TPI spacing.

construction (see table 1)

Since this antenna is intended for temporary use,

Rick Littlefield, K1BQT, Box 114, Barrington, New Hampshire 03825

*See K1BQT's "A Compact 20-meter CW Transceiver" on page 8 of this issue.

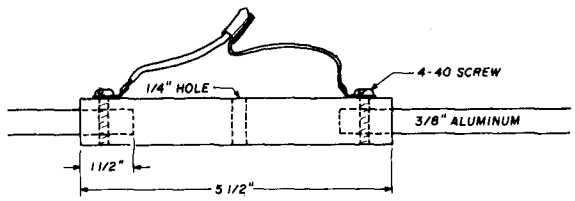


fig. 2. The 3/8-inch elements slip into the center block, and lock in place with No. 4-40 screws. Only one element need be removed to break down and transport the antenna.

electrical half wavelength (22 feet) of RG-58U directly to the center block. This accommodates most out-the-window and off-the-balcony setups. Since this antenna is certain to be installed in imperfect locations, it may be especially beneficial to decouple the feedline from the antenna. While a balun can be installed for this purpose, looping five or six tight turns in the feedline or slipping a few large ferrite beads over the cable jacket will prove just as effective.

Feel free to modify the design to suit your own particular needs. I've constructed a second version of the antenna that breaks down into 2-1/2 foot sections — just for air travel. A friend of mine built a ruggedized

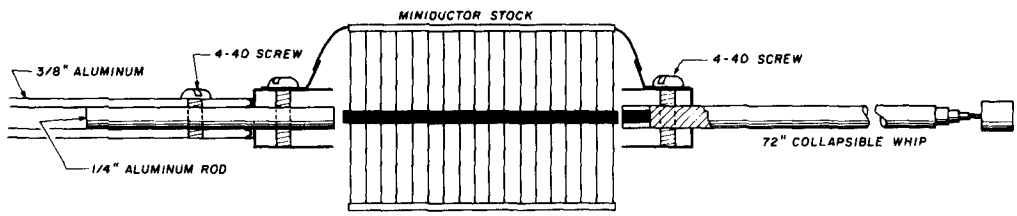


fig. 3. End sections slip into 3/8-inch elements and are locked in place with a No. 4-40 screw. Solder lugs provide electrical connections for loading coils.

I concentrated on making it lightweight and easy to assemble in the field. The center block was made from a piece of 5-1/2 inch x 3/4-inch plastic rod stock (see **fig. 2**). This material is fairly inexpensive, easy to machine, and available from most plastic supply houses. Each end was drilled to a depth of about 1-1/2 inches to accept the 3/8-inch tubing. The block and tubing sections were drilled and tapped to accept a No. 4-40 screw, which locks each element in place. This screw also provides electrical connection for the feedline. The center of the block can then be drilled to accept any kind of mounting scheme, including the one shown here or a standard TV mast U-bolt.

The loading coil and collapsible whip are constructed as a single assembly (see **fig. 3**). The coil support is a 3-inch length of 1/2-inch diameter plastic rod. A 1/4-inch solid aluminum stub is installed in one end to mate with the 3/8-inch element tubing. The whip is inserted in the other end. Note the location of the solid insert at the base of the whip. The locking hole must be drilled through this insert to ensure a secure mount and good electrical contact. Install solder lugs on mounting hardware; these will be needed for connecting the loading coils. If you plan to operate in foul weather, protect the coils with a plastic sleeve. Without them, rain and snow may detune the antenna and make it temporarily unusable.

To simplify feedline attachment, I hard-wired an

Table 1. List of materials for compact antenna.

2	3/8-inch OD x 53-inch aluminum tubing
2	1/4 x 3-inch aluminum rod
1	3/4 x 3-1/2 inch aluminum channel stock
1	3/4 x 5-1/2 inch plastic rod
2	1/2 x 3-inch plastic rod
2	Radio Shack 72-inch collapsible antenna (No. 270-1408).

model for permanent installation on his TV mast. In reality, moving loading coils closer to the ends, adjusting element lengths, and using different tubing schemes will probably do little to change performance. The most critical factors are keeping the length greater than 20 feet and using high-*Q* loading coils to achieve resonance. A grid dip meter works fine for making initial adjustments.

supports

To support my antenna, I cut a 6-foot strip of 3/4 x 1-inch poplar. Wood is preferable to metal in this application because it's strong, light, and less likely to damage or discolor woodwork. A short piece of 3/4-inch aluminum channel stock was used to square the center block so it would lock securely into a square notch cut into the mast. A single 1/4-inch bolt holds the antenna in place (see **fig. 4**).

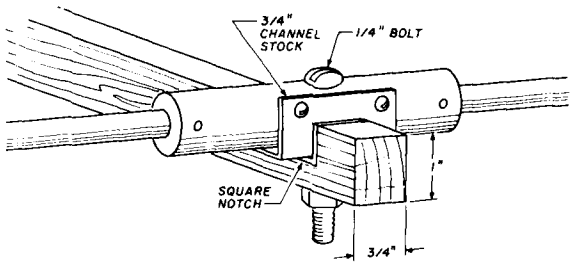


fig. 4. A short piece of square channel stock locks center block firmly in place on support mast. A 1/4-inch bolt holds the antenna in place.

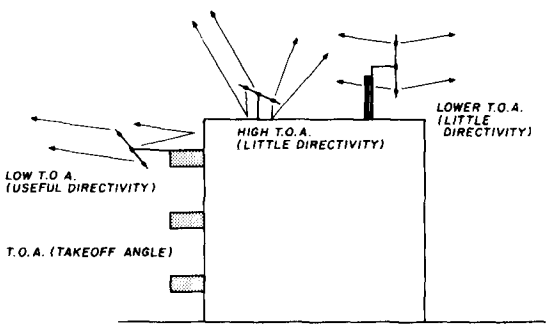


fig. 5. Conductive surfaces on buildings may be an advantage or disadvantage, depending on how you use them. On 20 meters, placing a horizontal dipole near the surface of a conductive roof may produce poorer results than mounting vertically, or mounting off to one side of the building!

When setting up the antenna, almost anything can be a potential supporting structure (window sills, balcony rails, fire escapes, standpipes, and existing TV masts are all favorites). Attaching antenna and mast to one of these supports can be a real exercise in "jerry-rig" engineering. Having the right tools helps! Gaffer's tape, lightweight ratcheting C-clamps (Stanley 83-157 or equivalent) and motorcycle bungie cords are essential tools of the trade for the imaginative field-installer!

performance

For initial testing, I mounted the antenna out a second story window, about 5-1/2 feet from the side of the building. Sections went together without difficulty, and the completed assembly seemed well balanced and easy to handle. The support mast was clamped to the window casement with a C-clamp.

After pruning the loading coils for resonance at

14.05 MHz, I measured a minimum SWR of 1.4:1. My noise bridge read the impedence as 38 ohms — an acceptable load for broadbanded solid-state rigs. Listening across the band, I was encouraged to hear several 599+ signals. Running 15 watts, I called two lengthy CQs, both yielding no reply. Beginning to think the worst, I tried again. This time, a much-welcomed CT3 came back with a 569 report. Several more DX and stateside contacts followed, with signal ranging from 559 to 589. Flipping the antenna to vertical polarization brought similar results.

other bands

Although untested on the other bands, this antenna should do very well on 18, 21, 24, and 30 MHz. For 18-MHz operation, simply readjust the collapsible end sections for minimum SWR. For 21 MHz and up, place 8-inch jumper wires across each loading coil (the extra jumper length is needed to make the antenna resonate at 21.0 MHz). Collapsing the length of the end sections (with jumpers in place) will provide continuous coverage through 10 meters.

site suggestions

Here are some tips to help you achieve maximum performance:

- **Look for a high, open location**. Get above the roofline if you can, but keep directivity and takeoff angle in mind (**fig. 5**).
- **Keep the antenna at least 5 or 6 feet from the building surface**. Proximity to electrical wiring, foil insulation, and structural metal can detune it. Bending elements outward may help to decouple the ends from a metal structure.
- **When you side-mount to a building, try to locate the antenna on the side facing the desired direction of transmission**. Better to use the structure as a reflector than as a shield!
- **If there are horizontal wires close by, vertical polarization may work better**. When using vertical polarization, make sure the bottom leg is at least 6 feet above ground. Also, make sure the antenna is clear of people and pets. Even QRP rigs can develop enough rf potential at element tips to cause painful burns and injury.

conclusion

Whether you're jet-setting to VP2-land, driving cross-country, or working tabletop DX from the local flea market, a good portable antenna will help you get on the air with a minimum of hassle and frustration. I am continually pleased with how well this one has worked for me. On occasion, it has even been spotted emerging from my office window . . . at lunchtime, of course!

ham radio