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# Portable Antennas for Out-of-the-Ordinary QTHs

*Some ideas for antenna alternatives in unusual situations.*

Some time ago at a convention I met a doctor, a medical missionary working at a relief station in the Sudan. Because of his unique QTH, we had an interesting discussion about mobile and portable antennas for communication from the boondocks. His bona fides include the fact that he is licensed to operate on both amateur radio bands and as a land-mobile or point-to-point station in the 6.2 MHz band.

The desert where he travels in one of the worst in the world. Because of the harsh conditions, the doctor's organization requires him to check in twice daily on either 6.2 MHz or 3.885 MHz (that some missionary hams in Africa use as an official calling frequency). If he misses two check-ins in a row, search and rescue planes are sent up. Because of his unique *housecalls*, he does a lot of mobile and portable operating in the lower HF region. His problem? How do you reliably get through the QRM and tropical QRN with only 200 Watts PEP and a standard loaded mobile antenna?

A KL7 government forester I met, who works in Alaska, faces many of the same problems as the doctor in the Sudan (but at temperatures 100 degrees colder). He frequently takes his 100-Watt mobile rig into the back country of Alaska. With only 100 Watts into an inefficiently loaded mobile antenna, how does he reliably cut through QRM to talk to the base station?

An earthquake or hurricane strikes your community, antenna towers collapse, tribanders are tangled masses of aluminum tubing, dipoles are snarled globs of Copperweld, and rig and linear amplifiers are smashed. All that's left is the 100-Watt HF rig in the car. Communications now are not for fun—they're deadly serious! How do *you* establish reliable communications with only a 100-Watt mobile driving a 75-meter loaded whip? Suddenly, the problems of a Sudanese doctor and an Alaskan forester aren't so remote.

### Some Problems with Mobile Configurations

Because quarter wavelength antennas on low-HF band frequencies are 30–70 feet high, full-size vertical whip antennas are not practical (in fact, at frequencies below 10 meters full-size whips are rare). A typical short, mobile antenna (Figure 1) exhibits capacitive resistance, so a loading coil is added (L in Figure 1) to the radiator and its inductive reactance cancels the capacitive reactance of the antenna. The inductor can be placed almost anywhere along the radiator, although base, center, and top-loaded designs predominate. The actual inductance needed varies somewhat with coil placement as does antenna performance. (The resonators used on commercial low-HF mobile antennas are loading coils encapsulated in weather-tight housings.)

Mobile configuration is inefficient by nature and little can be done to improve matters. An antenna matching device or tuner helps optimize power transfer and should always be used (especially with solid-state final amplifiers that don't tolerate vswr as easily as do tube finals). With portable configurations, we can improve performance and look into options not available to mobile operators. A basic assumption is that operators needing emergency communication are located in remote areas with no access to the usual VHF bands which would allow them to make contact with emergency services through a repeater autopatch. Here we are dealing with HF rigs operating at the lower end of the HF spectrum in situations where a temporary antenna must be erected.

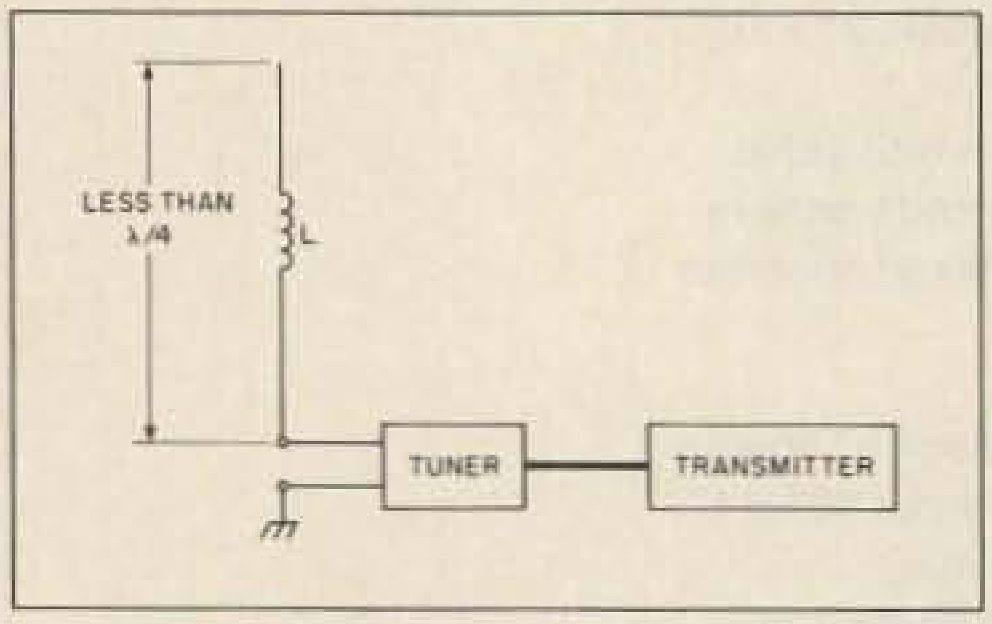


*Figure 1. A typical mobile antenna for a low-HF band.*

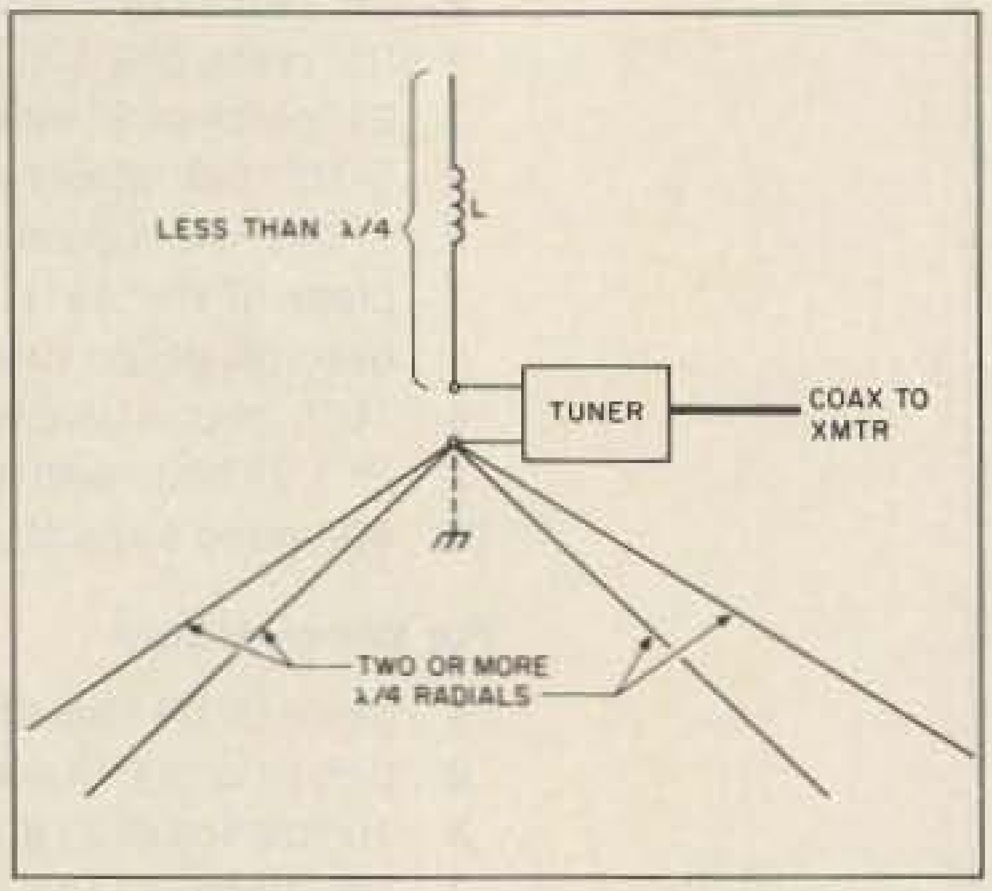


*Figure 2A. The electrical system of a counterpoise ground plane.*

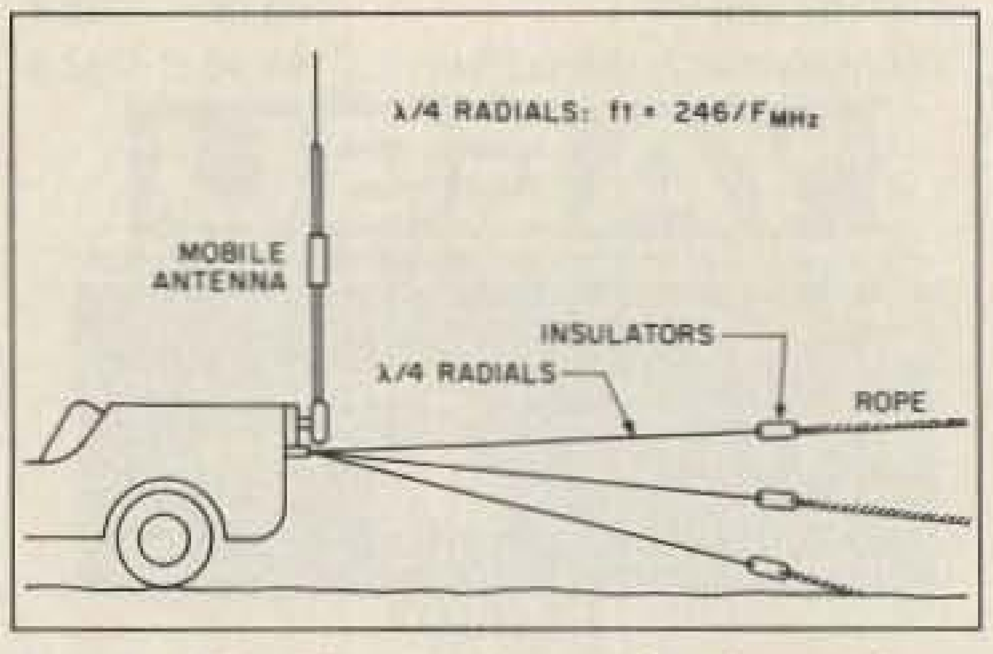


*Figure 2B. The mechanical scheme for a counterpoise ground plane.*

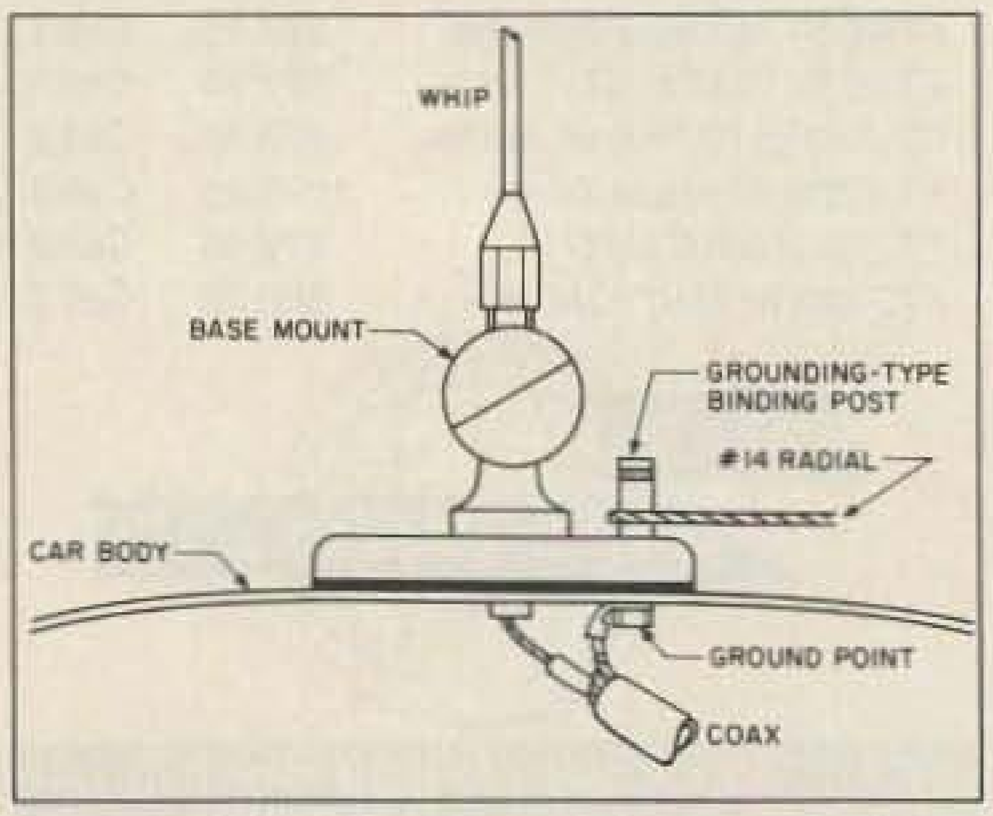


*Figure 2C. An improved mobile antenna system, with two #14 radials.*

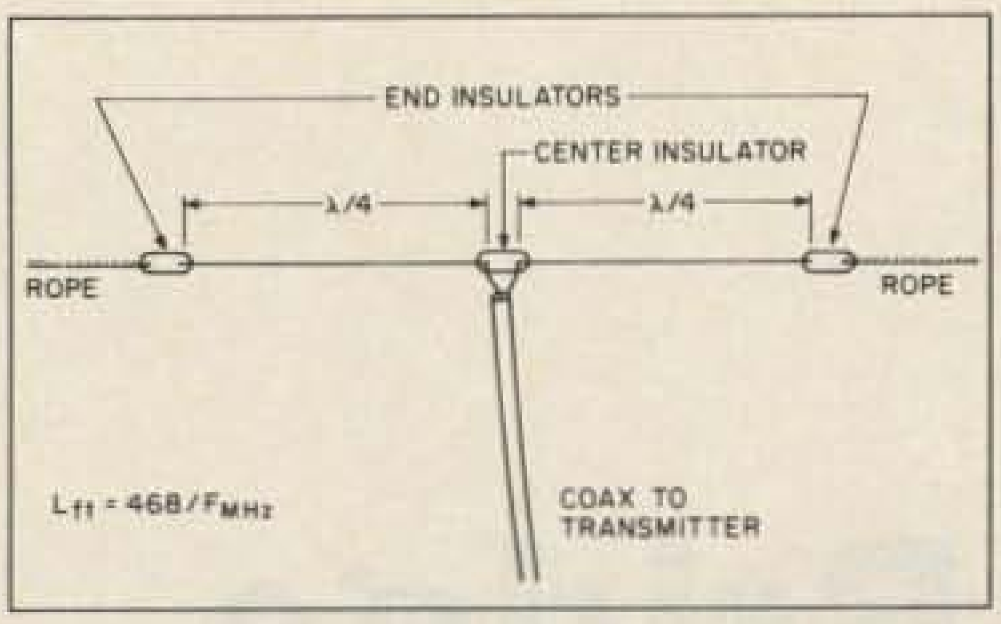


*Figure 3. The common dipole and the equation for determining approximate length.*

### Some Solutions

One solution to these problems is to provide a counterpoise ground plane. The ground plane consists of two or more (even *one* helps) quarter wavelength radials connected to the antenna ground point (i.e., the coaxial cable shield connects to the vehicle body). (See Figures 2A and 2B.) The radials, made of #14 wire, are relatively easy to stow.

A mobile antenna system that shows considerable improvement over the unaided loaded whip, uses the normal basemount attached to the rear quarter panel adjacent to the trunk lid (Figure 2C). An all-metal, grounding binding post is installed through an extra hole drilled in the base insulator. The binding post, though small, easily accomodates two #14 radials.

Another solution is to replace the mobile antenna with a more efficient, stowable antenna that can be erected when needed. A military surplus HF whip antenna intended for jeeps and communication trucks is collapsible and efficient.

The common dipole is also capable of some impressive results. The dipole is made by connecting two quarter wavelength pieces of wire to a coaxial cable transmission line; one length to the center conductor, the other to the shield of the coax. [In an emergency zip (lamp) cord and twisted pairs of hookup wire will do for a transmission line.] Figure 3 illustrates the common dipole and the normal equation for determining approximate length. Actual length is found by trimming length until the vswr drops to its lowest point.

Mounting points for the ends of the dipole aren't always easy to find. Figure 4 shows an alternative antenna that works well for portable operation. This inverted-vee dipole does not need end supports but uses a single center support. Each leg is 6 percent longer than that of a nominal dipole. Since the applications is both temporary and emergency in nature, construction methods unthinkable in a permanent installation are acceptable.

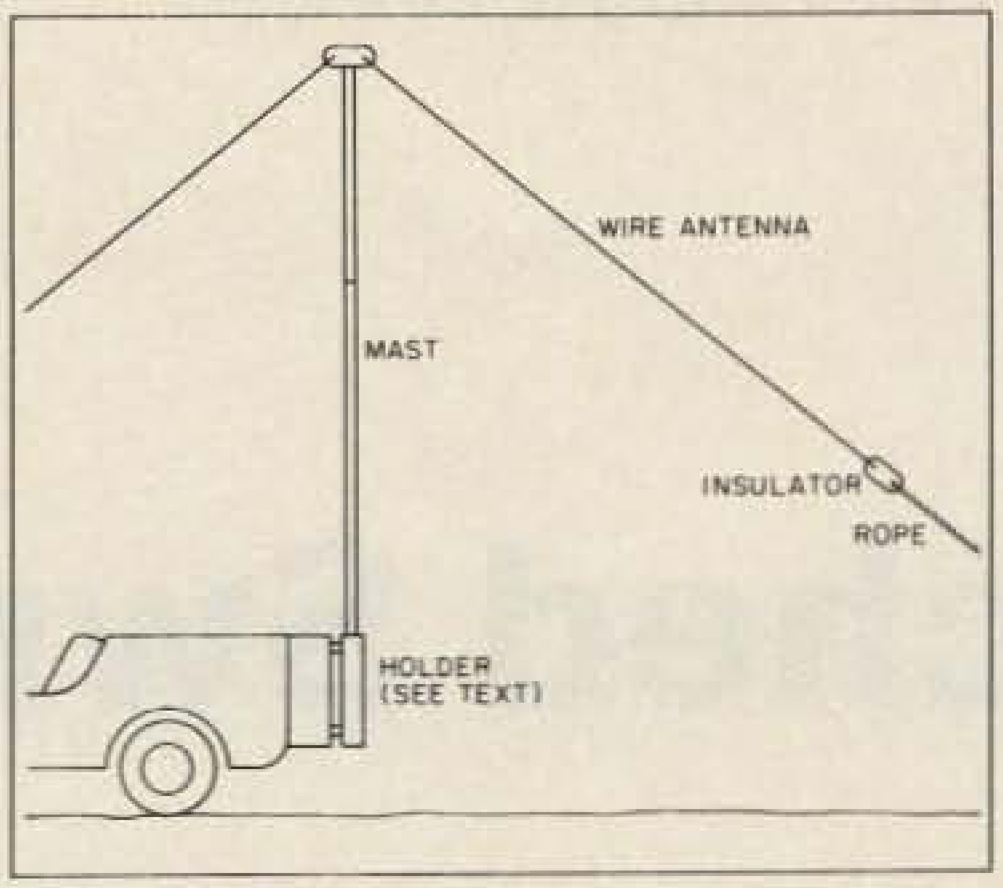


*Figure 4. An inverted-vee antenna.*

There are three problems: 1) the antenna must be portable for backpackers or stowable for vehicles; 2) what are the materials and means of construction for the mast; and, 3) how is the mast supported?

### The Mast

One solution is using a telescoping TV antenna mast to support your antenna. A mobile whip and its associated radials can be mounted at the top, or an inverted vee installed (Figure 4). These masts collapse to 6–8 feet, but can be slipped up to 18, 25, 30, 40, or even 50 feet. Keep in mind that the larger models are heavier and require more than one person to install. Even a 30-foot model can be a bit hairy to install alone.

PVC plastic plumbing pipe can also be used for the inverted-vee antenna. If you're using a vehicle lengths of up to 10 feet are available. Longer lengths can be put together on site by joining one or more sections together with couplings (also available at plumbing supply outlets). However, PVC pipe is flexible and any diameter below 1.5-inch diameter will not stand alone without guying. While a single 10-foot section will stand alone, two or more sections will not support both itself and the weight of the antenna. Guying can be done with ropes, or on a temporary basis, heavy twine.

Another alternative is to carry steel TV antenna masts. These masts, available in 5- and 10-foot lengths, are flared on one end and crimped on the other so they can be joined to form longer lengths. Guy wire rings for additional support are also available from suppliers of these masts. Also available are a variety of roof-top mountings that will also aid in ground mounting.

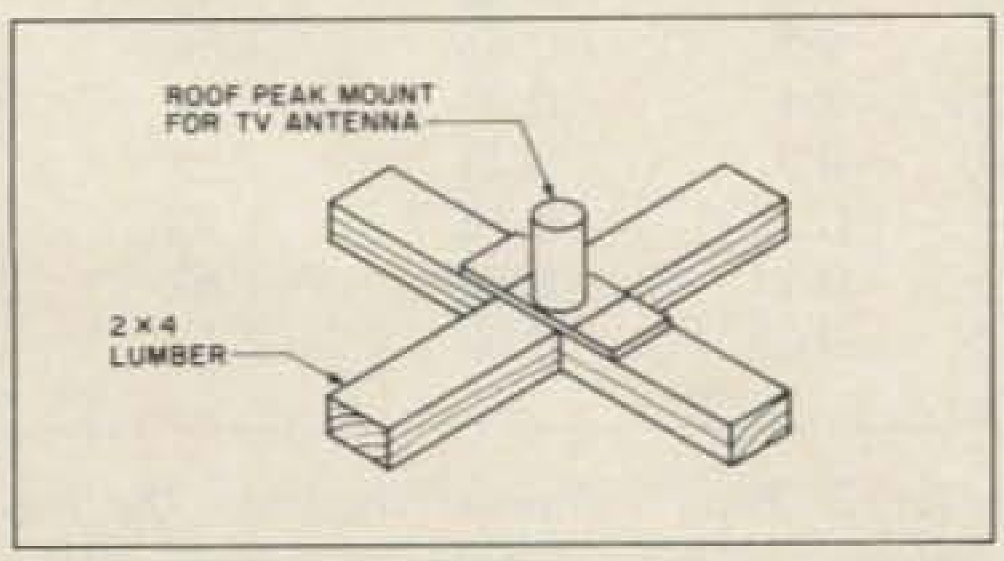


*Figure 5A. Base support of 2x4's.*

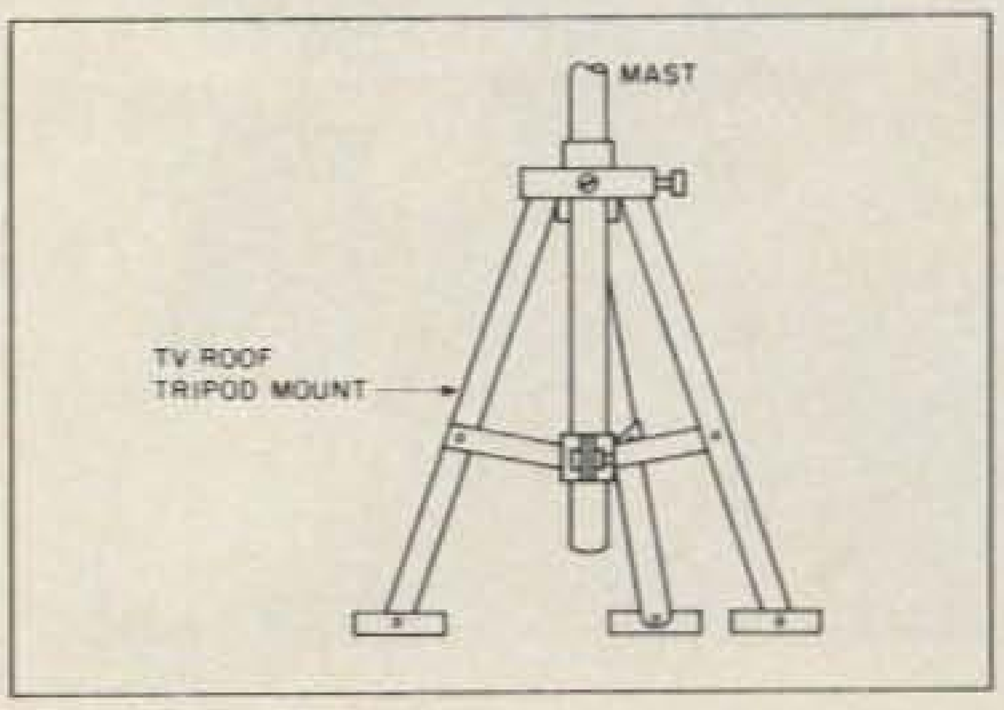


*Figure 5B. TV roof tripod mount.*

### Base Mountings

An unusual solution I saw on the Outer Banks in North Carolina was one used by a CB operator/bass fisherman. Steel tubes welded to either the front or back bumper and usually used for mounting surf casting rods were used by this CB operator to mount two 10-foot TV mast sections. The upper end of the mast was his 11-meter ground plane antenna (Figure 4). This same mounting method could be used for similar amateur antennas, inverted-vee dipoles, or VHF/UHF antennas.

If the antenna installation is short-term and temporary, long-term integrity is not a problem. So, if you plan to camp or are stranded for a few days, mounting the mast to the back of the vehicle with a pair of U-bolts works nicely.

For lightweight masts (up to about 25 feet) an X-shaped base of 2x4's (Figure 5A) or even a Christmas-tree holder will work. A TV antenna tripod (Figure 5B) is also easily adapted for ground use. Of course, none of these three alternatives can be depended on to be self-supporting, but must be guyed even if used for only short periods. Because of the temporary nature of the installation, aluminum or wooden tent pegs work fine in the short run to anchor guy wires.

### Another Problem—Electricity

Simple tools are a must for building and repairing simple antennas in the field (for example, a 12-VDC soldering iron that runs off the vehicle battery). There are two alternatives that can be used in providing power—one, the 12-VDC from the vehicle electrical system; or second, operate from 110-VAC generated by a light plant generator.

When boondocking in a four-wheeler or other vehicle, it is wise to use a dual battery system. Two separate 12-VDC auto batteries (with high amp-hour capacity) are connected in parallel with the alternator. Diodes are rated at 100-amps, 50-volt piv, and are used to isolate the two batteries. Such assemblies are available from van conversion and recreational vehicle shops. It's definitely not to anyone's advantage to run down the vehicle battery operating the rig—not only can't you start the truck, but you can't even call for help.

### Conclusion

Operating radio communication equipment under primitive conditions depends on two factors: the available electrical power and an effective and efficient antenna system. Without going into detail about getting power in remote locations, I have provided some suggestions that will help you begin planning your own *survival* radio system. ■