Improvised antennas

by Capt. Melvin W. Mitchell

Working antennas are essential tools for providing the command, control and communications that ensure combat success. Every soldier should be prepared to overcome jamming interference and artillery engagement damage or loss, both of which can be expected in modern combat. However, human ingenuity and improvisation can maintain functional antennas despite their susceptability to these hazards.

When communications with either AN/PRC-77s, AN/VRC-12 series or RATT systems are ineffective, the usual troubleshooting techniques should be followed. These include checking the mike, power connections and antenna connections. If those checks don't help, try improving the efficiency of transmission and reception by moving to higher ground, being careful not to exceed the military crest. At frequencies above 30 megahertz (MHz), line of sight from antenna to antenna will greatly increase the quality of transmission and reception. Since the vast majority of radio systems in the division operate above 30 MHz, greater attention should be given to locating antennas.

When all these troubleshooting techniques have been tried and communications still cannot be established, try this field expediency: If your radio is vehicle-mounted, point the vehicle toward the unit you want to contact. Use the nylon tie down rope to bend the antenna from the vertical position some 45 to 60 degrees away from the station you wish to contact. This technique, which applies the theory of wave propagation, will improve communications. The sketches below will help.

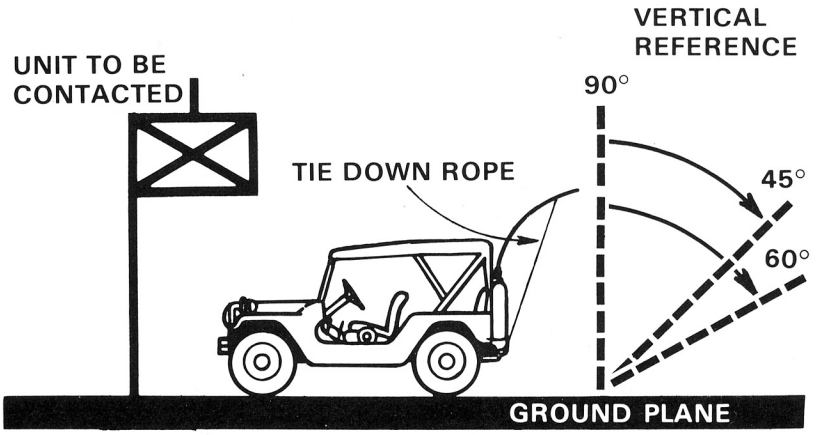
If you have no antenna at all, there are two workable field expedient antennas which will get the job done: the vertical antenna, which is looped over a tree limb or some high object and the horizontal antenna, which is extended from the radio to a vertical support about 15 ft. high. Either type of antenna can be easily built with WD-1/TT (field wire). Antennas made of copper or aluminum

are best. The strands in WD-1 are made of No. 23 (each) wire. Four strands are tinned copper and three are galvanized-steel. Barbed wire, electrical wire or coaxial cable also can be used as improvised antennas for portable and vehicle mounted radios. Antennas can either be ¼ or ½ wavelength. The 3 ft. antenna used on portable radios is ¼ wavelength antenna. The mathematical formula for making a field expedient ¼ wavelength antenna is: 234 (constant) divided by the frequency in MHz. (For example: 234 divided by 44.8 MHz = 5.22 or 5 ft. 3 inches; therefore, the proper length of a ¼ wavelength antenna is 5 ft. 3 inches). 10 ft. and 15 ft. antennas are ½ wavelength antennas. The formula for making a ½ wavelength antenna is to divide 468 (constant) by the frequency in MHz. (For example: 468 dividied by 56 MHz = 8.36 or 8 ft. 4 inches in length.)

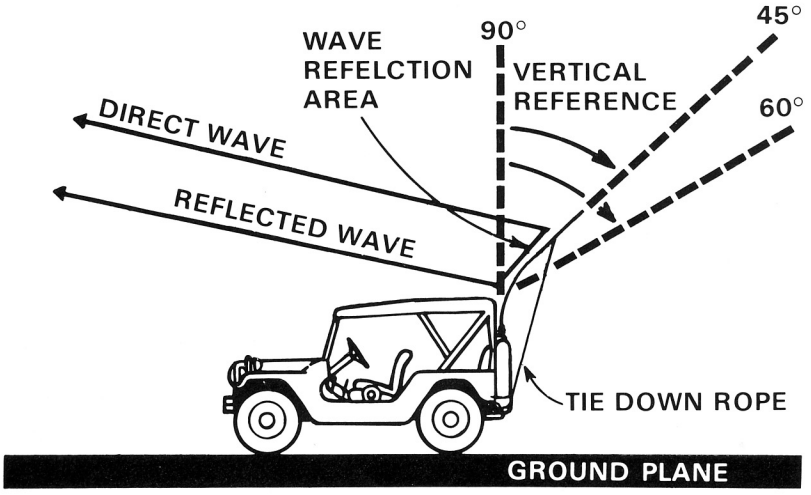
To make a vertical ¼ wavelength antenna for a portable radio, cut a piece of WD-1 to the appropriate length, using the same formula plus an extra 12 inches. Using one of the free ends of WD-1 (there are two twisted and individually insulated strands to a line of WD-1), a good electrical connection to the radio is made by removing 1 to 2 inches of insulation from the wires. Separate the three steel strands off at the insulation. Twist the four strands of each line together. Thread the stripped end around the handle, or to the broken whip base. This will keep the antenna wire from pulling out of the antenna connector on the radio before inserting the stripped end(s) into the antenna connector. Tie the free end around an insulator. An improvised insulator can be made from a C-ration spoon or piece of wood. Tie a length of rope or another piece of WD-1 to the opposite end of the insulator. Throw the free end of rope or wire over a limb or other high object, pulling the improvised antenna up until it is vertical. The same principle applies to vehicle mounted radios.

The second type of improvised antenna is a horizontal antenna. The first method is to use the formula for a ½ wavelength antenna as previously described, (468 divided by the frequency in MHz). The second method is field expedient. Measure a 100 ft. length of WD-1, which is sufficient to operate between 30 MHz to 80 MHz. Select a vertical support at least 15 ft. high, move your radio, so that the support is in line with the station you need to reach. Attach an insulator to the top of WD-1. Pull the slack out of the expedient antenna, wrap the stripped end (if the radio is mounted on a vehicle) around the lower part of the broken whip to secure it and connect it to the "ANT" (connector) on the radio. Make sure you remove the control cable and antenna cable connected between the matching unit and radio.

There are distinct advantages and disadvantages to each of the antennas. The vertical whip is omnidirectional and enables one to communicate without being concerned about the location of the receiving stations. The principle involved, however, makes it highly susceptible to



enemy radio direction finding since the waves are emitted in a 360 degree circumference. Bending the whip antenna away from the station one wants to contact brings the propagation theory into play. The emitted radio waves are then reflected upon the earth's atmosphere. This will help to extend the range and clarity of transmission.



The disadvantage of horizontal antennas is that they allow transmission and reception best in only one direction. The main advantage is that they are least susceptible to enemy interception.

When there is a need to communicate and the situation is critical, every soldier can be prepared to overcome jamming and damage from enemy artillery fire by applying these techniques. This mission can be accomplished by maintaining command and control and communicating.