CHAPTER 7
COMMUNICATIONS

The basic requirement of combat communications is to provide rapid, reliable, and secure interchange of information.

Section I
FIELD-EXPEDIENT ANTENNAS

Communications are a vital aspect in successful mission accomplishment. The information in this section helps the sniper team maintain effective communications and correct any radio antenna problems.

7-1. REPAIR TECHNIQUES

Antennas are sometimes broken or damaged, causing either a communications failure or poor communications. If a spare antenna is available, the damaged antenna is replaced. When there is no spare, the sniper team may have to construct an emergency antenna. The following paragraphs contain suggestions for repairing antennas and antenna supports and the construction and adjustment of emergency antennas.

DANGER

SERIOUS INJURY OR DEATH CAN RESULT FROM CONTACT WITH THE RADIATING ANTENNA OF A MEDIUM-POWER OR HIGH-POWER TRANSMITTER. TURN THE TRANSMITTER OFF WHILE MAKING ADJUSTMENTS TO THE ANTENNA.

a. **Whip Antennas.** When a whip antenna is broken into two sections, the part of the antenna that is broken off can be connected to the part attached to the base by joining the sections. (Use the method shown in A, Figure 7-1, when both parts of the broken whip are available and usable.) (Use the method in B, Figure 7-1, when the part of the whip that was broken off is lost or when the whip is so badly damaged that it cannot be used.) To restore the antenna to its original length, a piece of wire is added that is nearly the same length as the missing part of the whip. The pole support is then lashed securely to both sections of the antenna. The two antenna sections are cleaned thoroughly to ensure good contact before connecting them to the pole support. If possible, the connections are soldered.

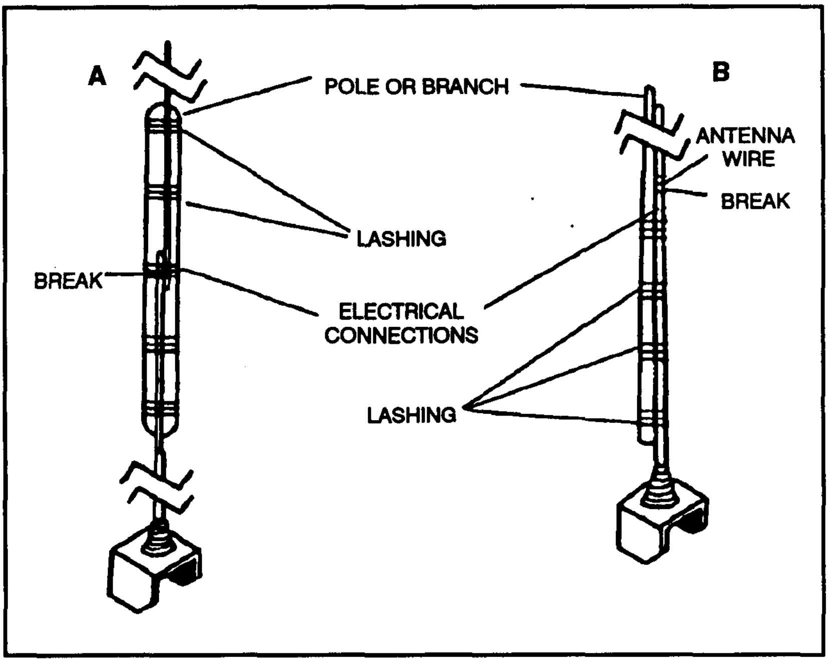

Figure 7-1. Emergency repair of broken whip antenna.

b. **Wire Antennas.** Emergency repair of a wire antenna may involve the repair or replacement of the wire used as the antenna or transmission line; or the repair or replacement of the assembly used to support the antenna.

(1) When one or more wires of an antenna are broken, the antenna can be repaired by reconnecting the broken wires. To do this, lower the antenna to the ground, clean the ends of the wires, and twist the wires together. Whenever possible, solder the connection.

(2) If the antenna is damaged beyond repair, construct a new one. Make sure that the length of the wires of the substitute antenna are the same length as those of the original.

(3) Antenna supports may also require repair or replacement. A substitute item may be used in place of a damaged support and, if properly insulated, can be of any material of adequate strength. If the radiating element is not properly insulated, field antennas may be shorted to ground and be ineffective. Many commonly found items can be used as field-expedient insulators. The best of these items are plastic or glass to include plastic spoons, buttons, bottle necks, and plastic bags. Though less effective than plastic or glass but still better than no insulator at all are wood and rope. The radiating element—the actual antenna wire-should touch only the antenna terminal and should be physically separated from all other objects, other than the supporting insulator. (See Figure 7-2 for various methods of making emergency insulators.)

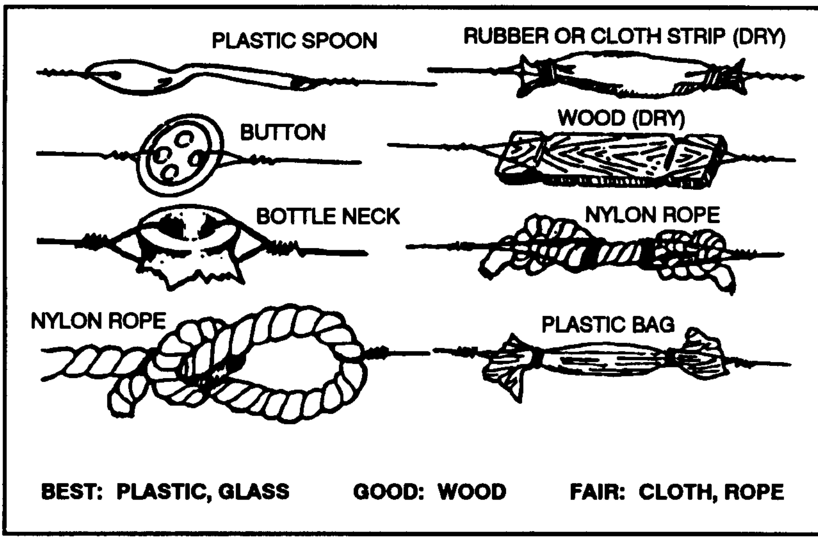

Figure 7-2. Improvised Insulators.

7-2. CONSTRUCTION AND ADJUSTMENT

Sniper teams may use the following methods to construct and adjust antennas.

a. **Construction.** The best kinds of wire for antennas are copper and aluminum. In an emergency, however, snipers use any type of wire that is available.

(1) The exact length of most antennas is critical. The emergency antenna should be the same length as the antenna it replaces.

(2) Antennas supported by trees can usually survive heavy wind storms if the trunk of a tree or a strong branch is used as a support. To keep the antenna taut and to prevent it from breaking or stretching as the trees sway, the sniper attaches a spring or old inner tube to one end of the antenna. Another technique is to pass a rope through a pulley or eyehook. The rope is attached to the end of the antenna and loaded with a heavyweight to keep the antenna tightly drawn.

(3) Guidelines used to hold antenna supports are made of rope or wire. To ensure the guidelines will not affect the operation of the antenna, the sniper cuts the wire into several short lengths and connects the pieces with insulators.

b. **Adjustment.** An improvised antenna may change the performance of a radio set. The following methods can be used to determine if the antenna is operating properly

(1) A distant station may be used to test the antenna. If the signal received from this station is strong, the antenna is operating satisfactorily. If the signal is weak, the sniper adjusts the height and length of the antenna and the transmission line to receive the strongest signal at a given setting on the volume control of the receiver. This is the best method of tuning an antenna when transmission is dangerous or forbidden.

(2) In some radio sets, the sniper uses the transmitter to adjust the antenna. First, he sets the controls of the transmitter to normal; then, he tunes the system by adjusting the antenna height, the antenna length, and the transmission line length to obtain the best transmission output.

7-3. FIELD-EXPEDIENT OMNIDIRECTIONAL ANTENNAS

Vertical antennas are omnidirectional. The omnidirectional antenna transmits and receives equally well in all directions. Most tactical antennas are vertical; for example, the man-pack portable radio uses a vertical whip and so do the vehicular radios in tactical vehicles. A vertical antenna can be made by using a metal pipe or rod of the correct length, held erect by means of guidelines. The lower end of the antenna should be insulated from the ground by placing it on a large block of wood or other insulating material. A vertical antenna may also be a wire supported by a tree or a wooden pole (Figure 7-3). For short vertical antennas, the pole may be used without guidelines (if properly supported at the base). If the length of the vertical mast is not long enough to support the wire upright, it may be necessary to modify the connection at the top of the antenna (Figure 7-4). (See FM 24-18.)

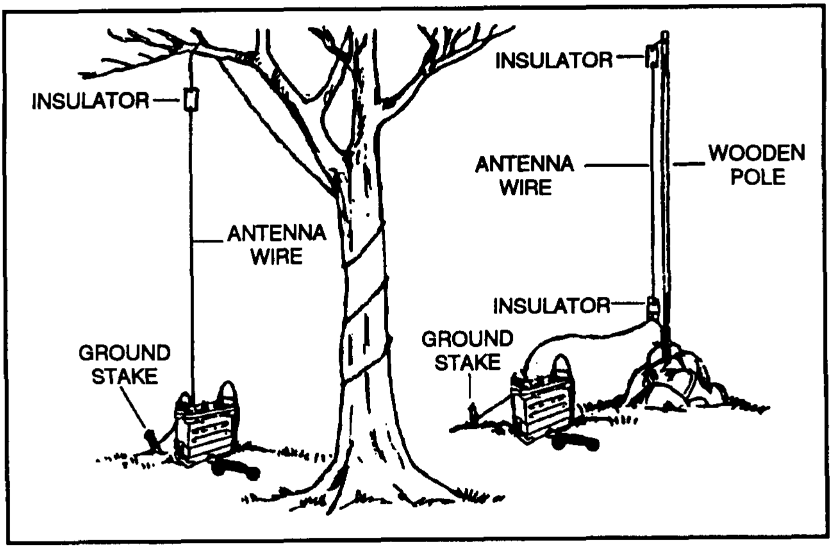

Figure 7-3. Field substitutes for support of vertical wire antennas.

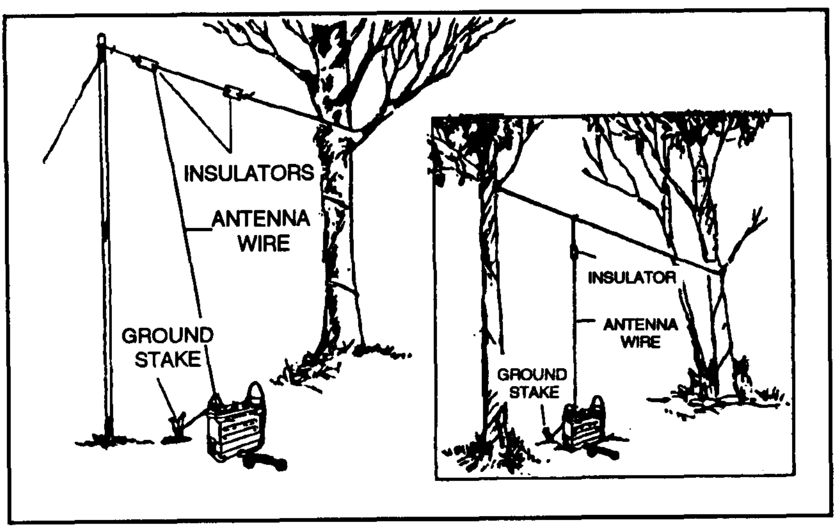

Figure 7-4. Additional means of supporting vertical wire antennas.

a. **End-Fed Half-Wave Antenna.** An emergency, end-fed half-wave antenna (Figure 7-5, page 7-6) can be constructed from available materials such as field wire, rope, and wooden insulators. The electrical length of this antenna is measured from the antenna terminal on the radio set to the far end of the antenna. The best performance can be obtained by constructing the antenna longer than necessary and then shortening it, as required, until the best results are obtained. The ground terminal of the radio set should be connected to a good earth ground for this antenna to function efficiently.

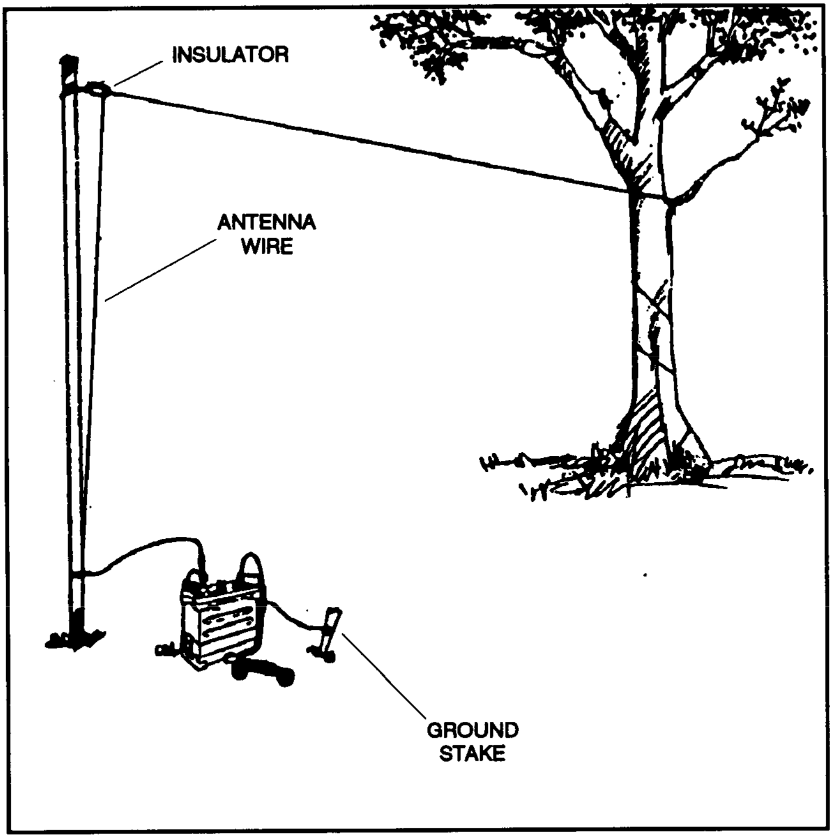

Figure 7-5. End-fed half-wave antenna.

b. **Center-Fed Doublet Antenna.** The center-fed doublet is a half-wave antenna consisting of two quarter wavelength sections on each side of the center (Figure 7-6). Doublet antennas are directional broadside to their length, which makes the vertical doublet antenna omnidirectional This is because the radiation pattern is doughnut-shaped and bidirectional.

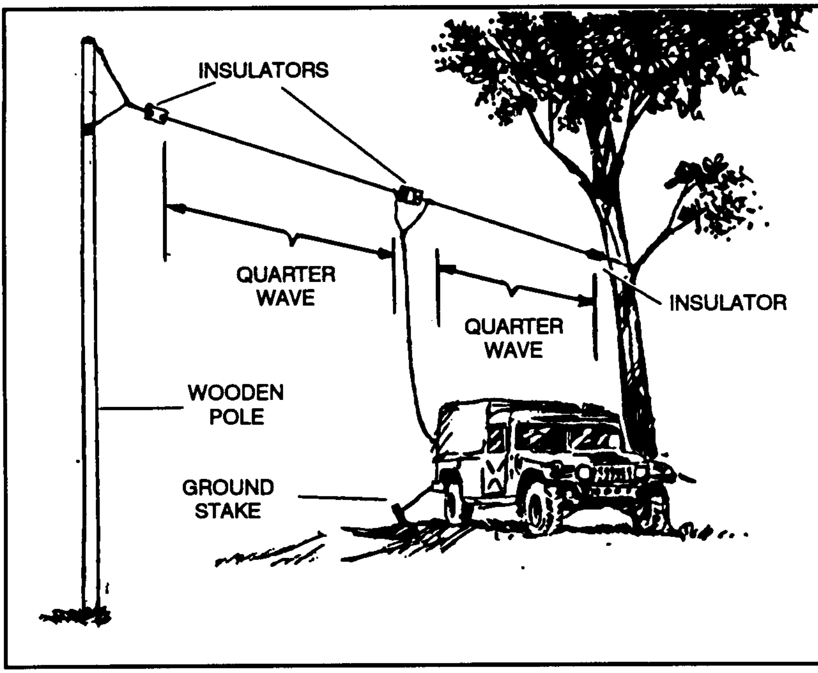

Figure 7-6. Center-fed half-wave doublet antenna.

(1) Compute the length of a half-wave antenna by using the formula in paragraph 7-5. Cut the wires as close as possible to the correct length; this is very important.

(2) Uses transmission line for conducting electrical energy from one point to another and for transferring the output of a transmitter to an antenna. Although it is possible to connect an antenna directly to a transmitter, the antenna is usually located some distance away.

(3) Support center-fed half-wave FM antennas entirely with pieces of wood. (A horizontal antenna of this type is shown in A, Figure 7-7, page 7-8, and a vertical antenna in B, Figure 7-7.) Rotate these antennas to any position to obtain the best performance.

(a) If the antenna is erected vertically, bring out the transmission line horizontally from the antenna for a distance equal to at least one-half of the antenna's length before it is dropped down to the radio set.

(b) The half-wave antenna is used with FM radios (Figure 7-8, page 7-8). It is effective in heavily wooded areas to increase the range of portable radios. Connect the top guidelines to a limb or pass it over the limb and connect it to the tree trunk or a stake.

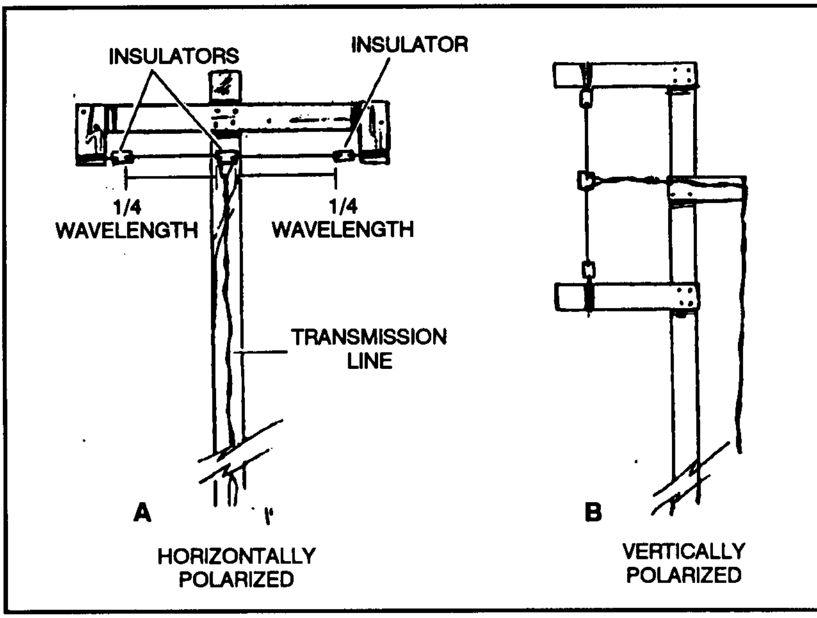

Figure 7-7. Center-fed half-wave antenna, supported.

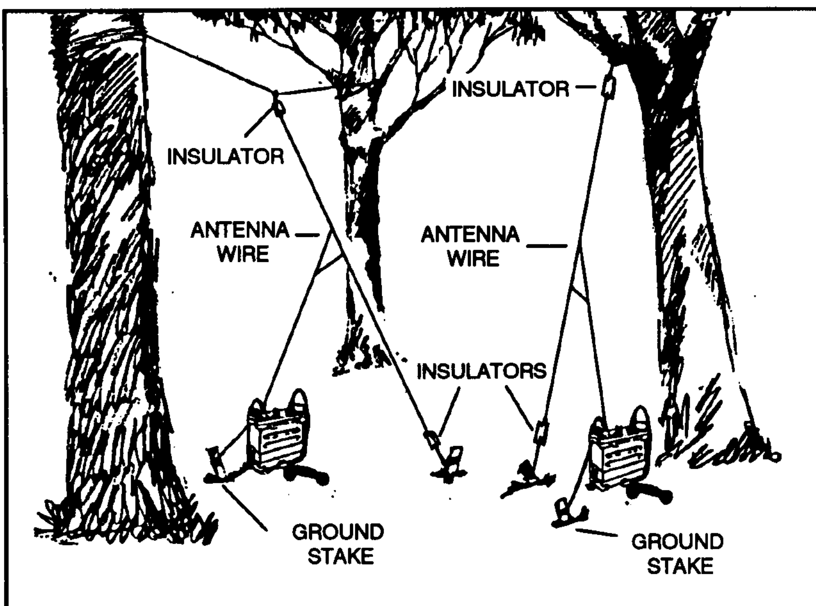

Figure 7-8. Improvised vertical half-wave antenna.

7-4. FIELD-EXPEDIENT DIRECTIONAL ANTENNAS

The vertical half-rhombic antenna (Figure 7-9) and the long-wire antenna (Figure 7-10) are two field-expedient directional antennas. These antennas consist of a single wire, preferably two or more wavelengths long, supported on poles at a height of 3 to 7 meters (10 to 20 feet) above the ground. The antennas will, however, operate satisfactorily as low as 1 meter (about 3 feet) above the ground—the radiation pattern is directional. The antennas are used mainly for either transmitting or receiving high-frequency signals.

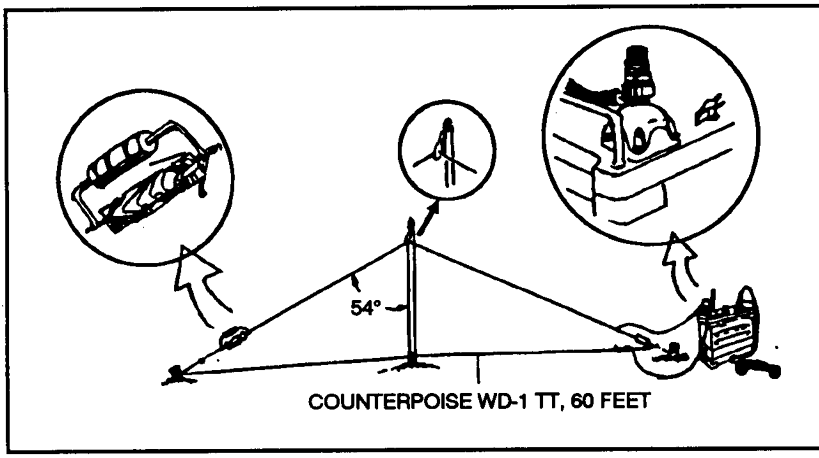

Figure 7-9. Verticle half-rhombic antenna.

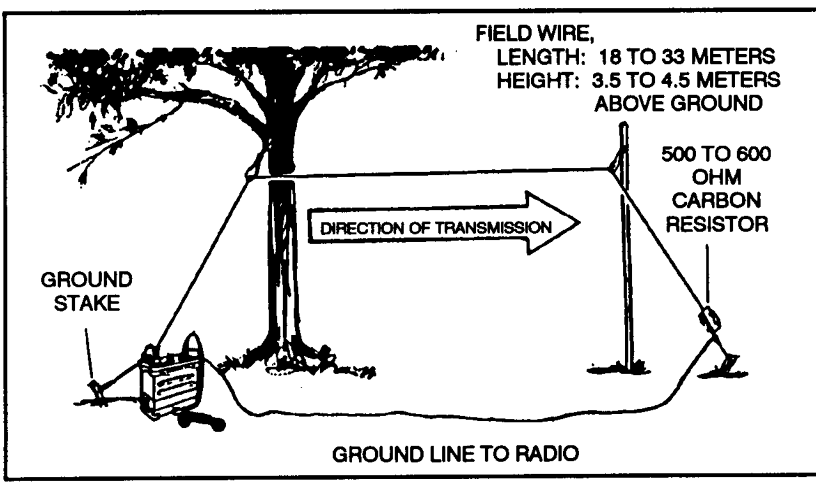

Figure 7-10. Long-wire antenna.

a. The V antenna (Figure 7-11) is another field-expedient directional antenna. It consists of two wires forming a V with the open area of the V pointing toward the desired direction of transmission or reception. To make construction easier, the legs should slope downward from the apex of the V; this is called a *sloping-V antenna* (Figure 7-12). The angle between the legs varies with the length of the legs to achieve maximum performance. (to determine the angle and the length of the legs, use the table in Table 7-l.)

b. When the antenna is used with more than one frequency or wavelength, use an apex angle that is midway between the extreme angles determined by the chart. To make the antenna radiate in only one direction, add noninductive terminating resistors from the end of each leg (not at the apex) to ground. (See TM 11-666.)

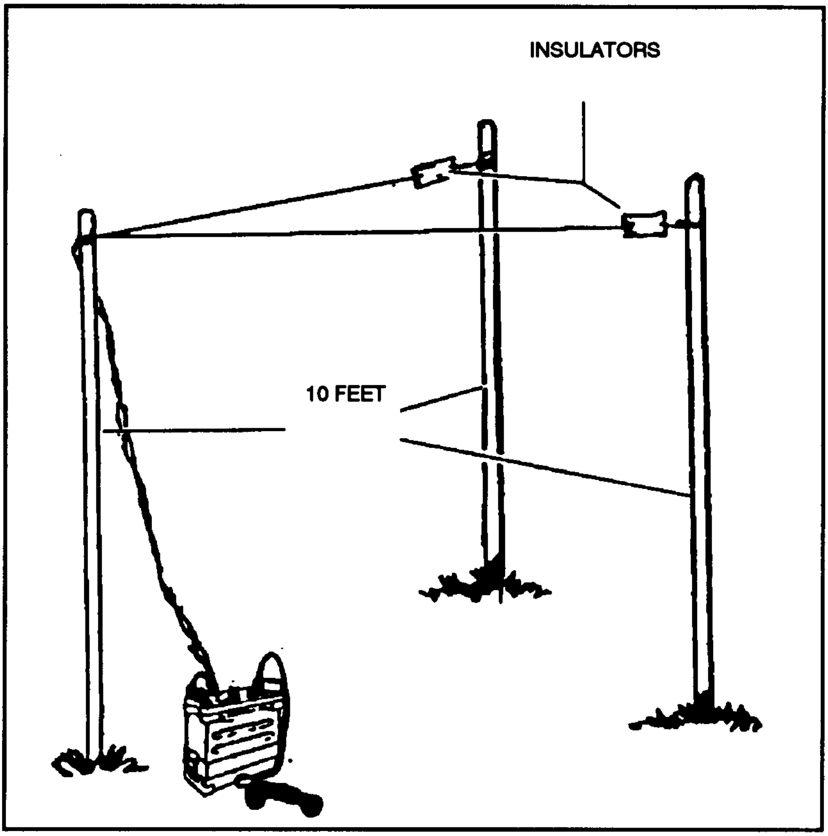

Figure 7-11. V antenna.

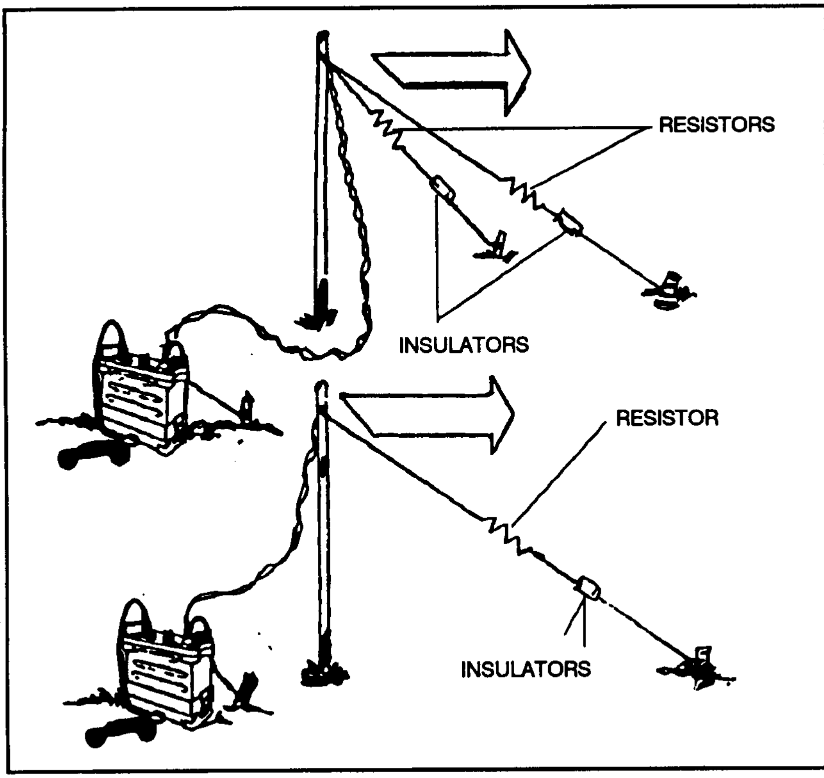

Figure 7-12. Sloping-V antenna.

ANTENNA LENGTH (wavelength)	OPTIMUM APEX ANGLE (degrees)
1	90
2	70
3	58
4	50
6	40
8	35
10	33

Table 7-1. Leg angle for V antennas.

7-5. ANTENNA LENGTH

The length of an antenna must be considered in two ways: both a physical and an electrical length. These two lengths are never the same. The reduced velocity of the wave on the antenna and a capacitive effect (known as end effect) make the antenna seem longer electrically than it is physically. The contributing factors are the ratio of the diameter of the antenna to its length and the capacitive effect of terminal equipment, such as insulators and clamps, used to support the antenna.

a. To calculate the physical length of an antenna, use a correction of 0.95 for frequencies between 3.0 and 50.0 MHz The figures given below are for a half-wave antenna.

$$\text{Length (meters)} = \frac{150 \times 0.95}{\text{Frequency in MHz}} = \frac{142.5}{\text{Frequency in MHz}}$$

$$\text{Length (feet)} = \frac{492 \times 0.95}{\text{Frequency in MHz}} = \frac{468}{\text{Frequency in MHz}}$$

b. Use the following formula to calculate the length of a long-wire antenna (one wavelength or longer) for harmonic operation:

$$\text{Length (meters)} = \frac{150\,(N-0.05)}{\text{Frequency in MHz}}$$

$$\text{Length (feet)} = \frac{492\,(N-0.05)}{\text{Frequency in MHz}}$$

N equals the number of half-wavelengths in the total length of the antenna. For example, if the number of half-wavelengths is 3 and the frequency in MHz is 7, then—

$$\text{Length (meters)} = \frac{150(N-0.05)}{\text{Frequency in MHz}} = \frac{150(3-.05)}{7} =$$

$$\frac{150 \times 2.95}{7} = \frac{442.50}{7} = 63.2 \text{ meters}$$

7-6. ANTENNA ORIENTATION

If the azimuth of the radio path is not provided, the azimuth should be determined by the best available means. The accuracy required in determining the azimuth of the path depends on the radiation pattern of the directional antenna. In transportable operation, the rhombic and V antennas may have such a narrow beam as to require great accuracy in azimuth determination. The antenna should be erected for the correct azimuth. Great accuracy is not required in erecting broad-beam antennas. Unless a line of known azimuth is available at the site, the direction of the path is best determined by a magnetic compass.

7-7. IMPROVEMENT OF MARGINAL COMMUNICATIONS

Under certain situations, it may not be feasible to orient directional antennas to the correct azimuth of the desired radio path. As a result, marginal communications may suffer. To improve marginal communications, the following procedure can be used:

a. Check, tighten, and tape cable couplings and connections.

b. Return all transmitters and receivers in the circuit.

c. Ensure antennas are adjusted for the proper operating frequency.

d. Change the heights of antennas.

e. Move the antenna a short distance away and in different locations from its original location.

Section II
RADIO OPERATIONS UNDER UNUSUAL CONDITIONS

The possibility of being deployed to different parts of the world presents many problems for the sniper team due to extremes in climate and terrain. This section informs the sniper team of these common problems and possible solutions to eliminate or reduce adverse effects.

7-8. ARCTIC AREAS

Single-channel radio equipment has certain capabilities and limitations that must be carefully considered when operating in cold areas. However, in spite of limitations, radio is the normal means of communications in such areas. One of the most important capabilities of the radio in Arctic-like areas is its versatility. Man-packed radios can be carried to any point accessible by foot or aircraft. A limitation on radio communications that radio operators must expect in extremely cold areas is interference by ionospheric disturbances. These disturbances, known as ionospheric storms, have a definite degrading effect on skywave propagation. Moreover, either the storms or the auroral (such as northern lights) activity can cause complete failure of radio communications. Some frequencies may be blocked completely by static for extended periods during storm activity. Fading, caused by changes in the density and height of the ionosphere, can also occur and may last from minutes to weeks. The occurrence of these disturbances is difficult to predict. When they occur, the use of alternate frequencies and a greater reliance on FM or other means of communications are required.

a. **Antenna Installation.** Antenna installation in Arctic-like areas presents no serious problems. However, installing some antennas may take longer because of adverse working conditions. Some suggestions for installing antennas in extremely cold areas areas follows:

(1) Antenna cables must be handled carefully since they become brittle in low temperatures.

(2) Whenever possible, antenna cables should be constructed overhead to prevent damage from heavy snow and frost. Nylon rope guidelines, if available, should be used in preference to cotton or hemp because nylon ropes do not readily absorb moisture and are less likely to freeze and break.

(3) An antenna should have extra guidelines, supports, and anchor stakes to strengthen it to withstand heavy ice and wind.

(4) Some radios (usually older generation radios) adjusted to a specific frequency in a relatively warm place may drift off frequency when exposed to extreme cold. Low battery voltage can also cause frequency drift. When possible, a radio should warmup several minutes before placing it into operation. Since extreme cold tends to lower output voltage of a dry battery, warming the battery with body heat before operating the radio set can reduce frequency drift.

(5) Flakes or pellets of highly electrically charged snow is sometimes experienced in northern regions. When these particles strike the antenna, the resulting electrical discharge causes a high-pitched static roar that can blanket all frequencies. To overcome this static, antenna elements can be covered with polystyrene tape and shellac.

b. **Maintenance Improvement in Arctic Areas.** The maintenance of radio equipment in extreme cold presents many problems. Radio sets must be protected from blowing snow since snow will freeze to dials and knobs and blow into the wiring to cause shorts and grounds. Cords must be handled carefully as they may lose their flexibility in extreme cold. All radio equipment must be properly winterized. The appropriate technical manual should be checked for winterization procedures. Some suggestions for maintenance in Arctic areas include:

(1) ***Batteries.*** The effect of cold weather conditions on wet and dry cell batteries depends on the following factors: the type and kind of

battery, the load on the battery, the specific use of the battery, and the degree of exposure to cold temperatures.

(2) ***Winterization.*** The radio set technical manual should rechecked for special precautions for operation in extremely cold climates. For example, normal lubricants may solidify and cause damage or malfunctions. They must be replaced with the recommended Arctic lubricants.

(3) ***Microphone.*** Moisture from the sniper's breath may freeze on the perforated cover plate of his microphone. Standard microphone covers can be used to prevent this. If standard covers are not available, a suitable cover can be improvised from rubber or cellophane membranes or from rayon or nylon cloth.

(4) ***Breathing and sweating.*** A radio set generates heat when it is operated. When turned off, the air inside the radio set cools and contracts, and draws cold air into the set from the outside. This is called *breathing*. When a radio breathes and the still-hot parts come in contact with subzero air, the glass, plastic, and ceramic parts of the set may cool too rapidly and break. When cold equipment is brought suddenly into contact with warm air, moisture condenses on the equipment parts. This is called *sweating.* Before cold equipment is brought into a heated area, it should be wrapped in a blanket or parka to ensure that it warms gradually to reduce sweating. Equipment must be thoroughly dry before it is taken into the cold air or the moisture will freeze.

7-9. JUNGLE AREAS

Radio communications in jungle areas must be carefully planned, because the dense jungle growth reduces the range of radio transmission. However, since single-channel radio can be deployed in many configurations, especially man-packed, it is a valuable communications asset. The capabilities and limitations of single-channel radio must be carefully considered when used by forces in a jungle environment. The mobility and various configurations in which a single-channel radio can be deployed are its main advantages in jungle areas. Limitations on radio communications in jungle areas are due to the climate and the density of jungle growth. The hot and humid climate increases maintenance problems of keeping the equipment operable. Thick jungle growth acts as a vertically polarized absorbing screen for radio frequency energy that, in effect, reduces transmission range. Therefore, increased emphasis on maintenance and antenna siting is a must when operating in jungle areas.

a. **Jungle Operational Techniques.** The main problem in establishing radio communications in jungle areas is the siting of the antenna.

The following techniques can be applied to improve communications in the jungle:

(1) Locate antennas in clearings on the edge farthest from the distant station and as high as possible.

(2) Keep antenna cables and connectors off the ground to lessen the effects of moisture, fungus, and insects. This also applies to all power and telephone cables.

(3) Use complete antenna systems, such as ground planes and dipoles, for more effect than fractional wavelength whip antennas.

(4) Clear vegetation from antenna sites. If an antenna touches any foliage, especially wet foliage, the signal will be grounded.

(5) When wet, vegetation acts like a vertically polarized screen and absorbs much of a vertically polarized signal. Use horizontally polarized antennas in preference to vertically polarized antennas.

b. **Maintenance Improvement in the Jungle.** Due to moisture and fungus, the maintenance of radio sets in tropical climates is more difficult than intemperate climates The high relative humidity causes condensation to form on the equipment and encourages the growth of fungus. Operators and maintenance personnel should check appropriate technical manuals for special maintenance requirements. Some techniques for improving maintenance in jungle areas follow:

(1) Keep the equipment as dry as possible and in lighted areas to retard fungus growth.

(2) Clear all air vents of obstructions so air can circulate to cool and dry the equipment.

(3) Keep connectors, cables, and bare metal parts as free of fungus growth as possible.

(4) Use moisture and fungus-proofing paint to protect equipment after repairs are made or when equipment is damaged or scratched.

c. **Expedient Antennas.** Sniper teams can improve their ability to communicate in the jungle by using expedient antennas. While moving, the team is usually restricted to using the short and long antennas that come with the radios. However, when not moving, snipers can use these expedient antennas to broadcast farther and to receive more clearly. However, an antenna that is not “tuned” or “cut” to the operating frequency is not as effective as the whips that are supplied with the radio. Circuits inside the radio “load” the whips properly so that they are “tuned” to give the greatest output. Whips are not as effective as a tuned doublet or tuned ground plane (namely RC 292-type), but the doublet or ground plane must be tuned to the operating frequency. This is especially critical with low-power radios such as the AN/PRC-77.

(1) ***Expedient 292-type antenna.*** The expedient 292-type antenna was developed for use in the jungle and, if used properly, can increase the team's ability to communicate. In its entirety, the antenna is bulky, heavy, and not acceptable for sniper team operations. The team can, however, carry only the mast head and antenna sections, mounting these on wood poles or hanging them from trees; or, the team can make a complete expedient 292-type antenna (Figure 7-13, page 7-18), using WD-1, wire, and other readily available material. The team can also use almost any plastic, glass, or rubber objects for insulators. Dry wood is acceptable when nothing else is available. (See Figure 7-2 for types of insulators that may be used.) The following describes how to make this antenna:

(a) Use the quick-reference table (Table 7-2, page 7-19) to determine the length of the elements (one radiating and three ground planes) for the frequency that will be used. Cut these elements (A, Figure 7-13, page 7-18) from WD-1 field wire (or similar wire). Cut spacing sticks (B, Figure 7-13) the same length. Place the ends of the sticks together to form a triangle and tie the ends with wire, tape, or rope. Attach an insulator to each corner. Attach a ground-plane wire to each insulator. Bring the other ends of the ground-plane wires together, attach them to an insulator (C, Figure 7-13, page 7-18), and tie securely. Strip about 3 inches of insulation from each wire and twist them together.

(b) Tie one end of the radiating element wire to the other side of insulator C and the other end to another insulator (D, Figure 7-13). Strip about 3 inches of insulation from the radiating element at insulator C.

(c) Cut enough WD-1 field wire to reach from the proposed location of the antenna to the radio set. Keep this line as short as possible, because excess length reduces the efficiency of the system. Tie a knot at each end to identify it as the "hot" lead. Remove insulation from the "hot" wire and tie it to the radiating element wire at insulator C. Remove insulation from the other wire and attach it to the bare ground-plane element wires at insulator C. Tape all connections and do not allow the radiating element wire to touch the ground-plane wires.

(d) Attach a rope to the insulator on the free end of the radiating element and toss the rope over the branches of a tree. Pull the antenna as high as possible, keeping the lead-in routed down through the triangle. Secure the rope to hold the antenna in place.

(e) At the radio set, remove about 1 inch of insulation from the "hot" lead and about 3 inches of insulation from the other wire. Attach the "hot" line to the antenna terminal (doublet connector, if so labeled). Attach the other wire to the metal case-the handle, for example. Be sure both connections are tight or secure.

(f) Set up correct frequency, turn on the set, and proceed with communications.

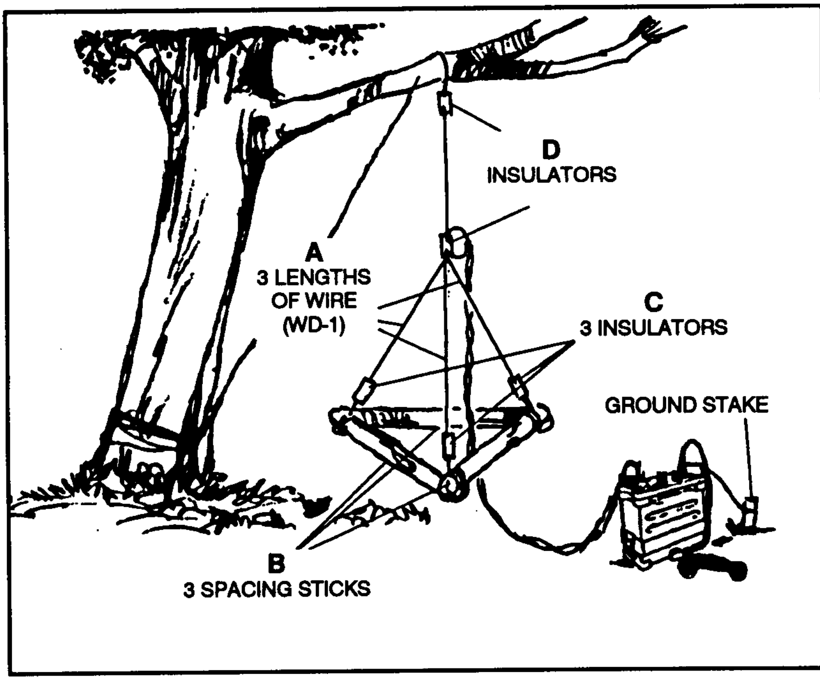

Figure 7-13. Expedient 292-type antenna.

(2) ***Expedient patrol antenna.*** *This* is another antenna that is easy to carry and quick to set up (Figure 7-14, page 7-20). The two radiating wires are cut to the length shown in Table 7-2 for the operating frequency. For the best results, the lead-in should extend at least 1.8 meters (6 feet) at right angles (plus or minus 30 degrees) to the antenna section before dropping to the radio set. The easiest way to set up this antenna is to measure the length of the radiating elements from one end of the lead-in (WD-1) and tie a knot at that point. The two wires are separated: one is lifted vertically by a rope and insulator;

the other is held down by a rock or other weight and a rope and insulator. The antenna should be as high as possible. The other end of the lead-in is attached to the radio set as described in paragraph 7-9c(l), expedient 292-type antenna.

OPERATING FREQUENCY IN MHz	ELEMENT LENGTH (radiating element and ground-plane elements)
30	2.38m (7 ft 10 in)
32	2.23m (7 ft 4 in)
34	2.1m (6 ft 11 in)
36	1.98m (6 ft 6 in)
38	1.87m (6 ft 2 in)
40	1.78m (5 ft 10 in)
43	1.66m (5 ft 5 in)
46	1.55m (5 ft 1 in)
49	1.46m (4 ft 9 in)
52	1.37m (4 ft 6 in)
55	1.3m (4 ft 3 in)
58	1.23m (4 ft 0 in)
61	1.17m (3 ft 10 in)
64	1.12m (3 ft 8 in)
68	1.05m (3 ft 5 in)
72	.99m (3 ft 3 in)
76	.94m (3 ft 1 in)

Table 7-2. Quick-reference chart.

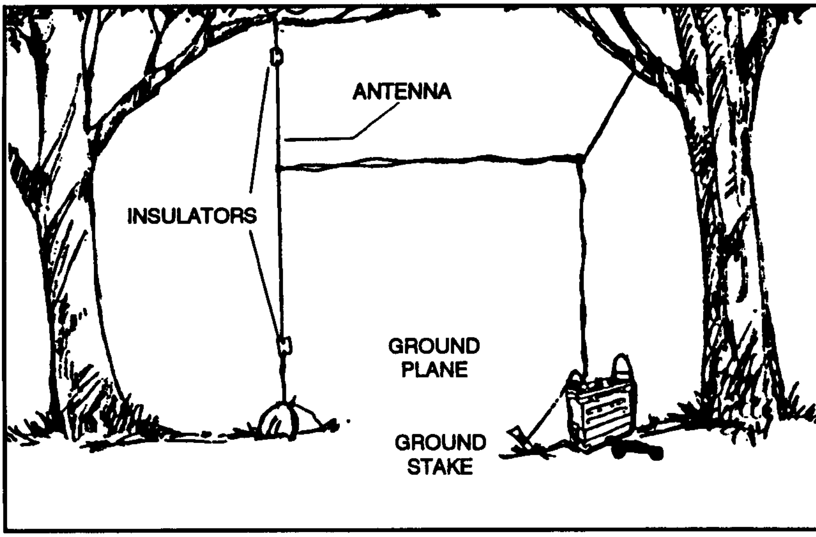

Figure 7-14. Expedient patrol antenna.

7-10. DESERT AREAS

Radio is usually the primary means of communications in the desert. It can be employed effectively in desert climate and terrain to provide a highly mobile means of communications demanded by widely dispersed forces.

a. **Techniques for Better Operations.** For the best operation in the desert, radio antennas should be located on the highest terrain available. In the desert, transmitters using whip antennas lose one-fifth to one-third of their normal range due to the poor electrical grounding common to desert terrain. For this reason, complete antenna systems must be used such as horizontal dipoles and vertical antennas with adequate counterpoises.

b. **Equipment Considerations.** Some radios automatically switch on their second blower fan if their internal temperature rises too high. Normally, this happens only in temperate climates when the radios are transmitting. This may disturb soldiers unaccustomed to radio operation in the desert environment. Operation of the second fan, however, is quite normal. Radio frequency power amplifiers used in AM and single sideband sets may overheat and burn out. Such equipment should be turned on only when necessary (signal reception is not affected). Since the RF power amplifiers take about 90 seconds to reach the operating mode, the SOP of units using the equipment allows for delays in replying. Dust affects communications equipment such as SSB/AMRF power amplifiers and radio teletypewriter sets. Radio teletypewriter sets are prone to damage due to the vulnerability of the oil lubrication system, which attracts and holds dust particles. Dust covers, therefore, should be used when possible. Some receiver-transmitter units have ventilating ports and channels that can get clogged with dust. These must be checked regularly and kept clean to prevent overheating.

c. **Batteries.** Dry battery supplies must be increased, since hot weather causes batteries to fail more rapidly.

d. **Electrical Insulation.** Wind-blown sand and grit damage electrical wire insulation over time. All cables that are likely to be damaged should be protected with tape before insulation becomes worn. Sand also finds its way into parts of items, such as “spaghetti cord” plugs, either preventing electrical contact or making it impossible to join the plugs together. A brush, such as an old toothbrush, should be carried and used to clean such items before they are joined.

e. **Condensation.** In deserts with relatively high dew levels and high humidity, overnight condensation can occur wherever surfaces are cooler than the air temperature, such as metals exposed to air. This condensation can affect electrical plugs, jacks, and connectors. All connectors likely to be affected by condensation should be taped to prevent moisture from contaminating the contacts. Plugs should be dried before inserting them into equipment jacks. Excessive moisture or dew should be dried from antenna connectors to prevent arcing.

f. **Static Electricity.** Static electricity is prevalent in the desert. It is caused by many factors, one of which is wind-blown dust particles. Extremely low humidity contributes to static discharges between charged particles. Poor grounding conditions aggravate the problem. All sharp edges (tips) of antennas should be taped to reduce wind-caused static discharges and the accompanying noise. If operating from a fixed position, teams ensure that equipment is properly grounded. Since static-caused noise lessens with an increase infrequency, the highest frequencies that are available and authorized should be used.

g. **Maintenance Improvement.** In desert areas, the maintenance of radio sets becomes more difficult due to the large amounts of sand, dust, or dirt that enter the equipment. Sets equipped with servomechanisms are especially affected. To reduce maintenance downtime, the team must keep sets in dustproof containers as much as possible. Air vent filters should also be kept clean to allow cool air to circulate to prevent overheating. Preventive maintenance checks should be made often. Also, the team should closely check the lubricated parts of the equipment. If dust and dirt mix with the lubricants, moving parts may be damaged.

7-11. MOUNTAINOUS AREAS

Operation of radios in mountainous areas have many of the same problems as in northern or cold weather areas. The mountainous terrain makes the selection of transmission sites a critical task In addition, terrain restrictions often require radio relay stations for good communications. Due to terrain obstacles, radio transmissions often have to be by line of sight. Also, the ground in mountainous areas is often a poor electrical conductor. Thus, a complete antenna system, such as a dipole or ground-plane antenna with a counterpoise, should be used. The maintenance procedures required in mountainous areas are the same as for northern or cold weather areas. The varied or seasonal temperature and climatic conditions in mountainous areas make flexible maintenance planning a necessity.

7-12. URBANIZED TERRAIN

Radio communications in urbanized terrain pose special problems. Some problems are similar to those encountered in mountainous areas. Some problems include obstacles blocking transmission paths, poor electrical conductivity due to pavement surfaces, and commercial power line interference.

a. Very high frequency radios are not as effective in urbanized terrain as they are in other areas. The power output and operating frequencies of these sets require a line of sight between antennas. Line of sight at street level is not always possible in built-up areas.

b. High frequency radios do not require or rely on line of sight as much as VHF radios. This is due to operating frequencies being lower and power output being greater. The problem is that HF radio sets are not organic to small units. To overcome this, the VHF signals must be retransmitted.

c. Retransmission stations in aerial platforms can provide the most effective means if available. Organic retransmission is more likely to be used. The antenna should be hidden or blended in with surroundings. This helps prevent the enemy from using it as a landmark to “home in” his artillery bombardment. Antennas can be concealed by water towers, existing civilian antennas, or steeples.

7-13. NUCLEAR BIOLOGICAL AND CHEMICAL ENVIRONMENT

One of the realities of fighting on today’s battlefield is the presence of nuclear weapons. Most soldiers are aware of the effects of nuclear blast, heat, and radiation. The ionization of the atmosphere by a nuclear explosion will have degrading effects on communications due to static and the disruption of the ionosphere.

a. Electromagnetic pulse results from a nuclear explosion and presents a great danger to our radio communications. An EMP is a strong pulse of electromagnetic radiation, many times stronger than the static pulse generated by lightning. This pulse can enter the radio through the antenna system, power connections, and signal input connections. In the equipment, the pulse can break down circuit components such as transistors, diodes, and integrated circuits. It can melt capacitors, inductors, and transformers, destroying a radio.

b. Defensive measures against EMP call for proper maintenance, especially the shielding of equipment. When the equipment is not in use, all antennas and cables should be removed to decrease the effect of EMP on the equipment.

Section III
COMMUNICATIONS FORMATS

Timely, accurate information reporting reduces the unknown aspects of the enemy and the area of operations, contributing to the commander's risk assessment and successful application of combat power. This section provides the sniper team with a means of organized and rapid information delivery through reporting formats.

7-14. SPOT REPORT

This paragraph complies with STANAG 2022.

The sniper team uses the SPOTREP to report intelligence information. Each report normally describe a single observed event. When reporting groups of enemy vehicles, personnel report the location of the center of mass or indicate "from—to" coordinates. Higher headquarters sets the SPOTREP format, but the report usually follows the SALUTE format.

LINE 1 The size of the enemy force observed.

LINE 2 What the enemy was doing.

LINE 3 Where the enemy was located.

LINE 4 The unit to which the enemy belongs specified by markings on vehicles, distinctive features on uniforms, or special equipment that may identify the type enemy unit.

LINE 5 Time the enemy was observed.

LINE 6 Equipment the enemy carried, wore, or used.

Example: "C12, THIS IS STRIKER 1, SPOTREP, OVER."
"STRIKER 1, THIS IS Cl2 SEND MESSAGE, OVER."
"C12, THIS IS STRIKER 1. LINE 1: 3. LINE 2 MOVING IN A WESTERLY DIRECTION. LINE 3: GL024396. LINE 4: UNKNOWN. LINE 5: 2709911437. LINE 6: 1 SVD WITH PSO-1 TELESCOPE. CAMOUFLAGED OVERGARMENT AND RUCKSACK TWO INDIVIDUALS CARRYING AKM-74 RIFLES. 9-MM MAKAROV PISTOLS WITH SHOULDER HOLSTERS AND RUCKSACKS."

7-15. SITUATION REPORT

This paragraph complies with STANAG 2020.

The sniper team submits the SITREP to higher headquarters to report tactical situations and status. The team submits the report daily by 0600 hours after significant events or as otherwise required by the SEO or commander. The sender says, "SITREP," to alert the receiver of the type of report being sent. The following explains the reporting format according to line number:

LINE 1 Report as of date-time group.

LINE 2 Brief summary of enemy activity, casualties inflicted, prisoners captured.

LINE 3 Your location (encrypted—if not using secure communications).

LINE 4 Combat vehicles, operational.

a. Improved TOW vehicle.

b. M3 Bradley / Ml13Al.

c. Ml.

d. M60A3 tanks.

e. M106A1 mortar carriers.

f. Armored vehicle launched bridges (AVLB).

LINE 5 Defensive obstacles encoded.

a. Coordinates of mine fields.

b. Coordinates of demolitions executed.

c. Coordinates of reserve demolition targets.

LINE 6 Personnel strength.

a. Green (full strength, 90 percent or better on hand).

b. Amber (reduced strength, 80 to 89 percent on hand).

c. Red (reduced strength, 60 to 79 percent on hand, mission-capable).

d. Black (reduced strength, 59 percent or lesson hand).

LINE 7 Class III and V for combat vehicles.

a. Ammunition—green, amber, red, or black.

b. Fuel—green, amber, red, or black.

LINE 8 Summary of tactical intentions.

Example: "RED 1, THIS IS RED 5; BLUE 2. LINE 1: 062230. LINE 2: NEGATIVE CONTACT. LINE 3: I SET ES, STA NEL. LINE 4B: 1. LINE 5: ABATIS, 1 SET XB, RDJ ALT. LINE 6: GREEN. LINE 7A: GREEN. LINE 7B: AMBER. LINE 8: CONTINUING MISSION."

7-16. RECONNAISSANCE REPORT

This paragraph complies with STANAG 2096.

Due to the length and detail of a reconnaissance report, it should be sent by messenger rather than transmitted by radio. Graphic overlays and sketches are normally included with the report. The following explains the reporting format according to line number:

LINE 1 OR HEADING (collection data).

a. DTG information collected.

b. DTG information received.

c. Reporting unit.

LINE 2 OR 3 CAPITAL ROUTE CLASSIFICATION (data for a route classification).

a. Start point.

b. Checkpoint/release point.

c. Classification (code).

d. Trafficability (code).

e. Movement (code).

f. Location of critical points.

LINE 3 OR BRIDGE CLASSIFICATION (data for a bridge classification).

a. Location.

b. One-way class.

c. Two-way class.

d. Overhead clearance.

e. Bypass location.

f. Bypass (code).

g. Slope of entry bank.

h. Slope of exit bank.

LINE 4 OR FORDING/SWIM SITE (data for a ford or swim site).

a. Location.

b. Velocity (water speed).

c. Depth.

d. Type bottom (code).

e. Width.

f. Length.

g. Slope of entry bank.

h. Slope of exit bank.

LINE 5 OR TUNNEL CLASSIFICATION (data for a tunnel classification).

a. Location.

b. Usable width.

c. Overhead clearance.

d. Length.

e. Bypass location.

LINE 6 OR OBSTACLES (obstacle information).

a. Location.

b. Slope (code).

c. Type (code).

d. Length.

e. Bypass location.

f. Dimensions.

(1) From:

(2) To:

(3) To:

CODES: Classification

GREEN - all vehicles.
AMBER - no AVLBs.
RED - armed personnel carriers/BFVs.
BLACK -1 l/4-ton wheels or less.

Trafficability

X - all weather.
Y - limited weather.
Z - fair weather.

Movement

F - fast.
S - slow.

Bypass

E - easy.
D - difficult.

Type bottom

M - mud.
C - clay.
S - sand.
G - gravel.
R - rock.
P - paving.

Slope

A - less than 7 percent.
B - 7 or 10 percent.
C - 10 to 14 percent.
D - Over 14 percent.

Type obstacle

MF - mine field.

TD - tank ditch.

RF - rockfall or slide.

CH - chemical.

NBC - radiological.

RB - roadblock.

AB - abatis.

O - other.

NOTES: 1. During reconnaissance., report items as they occur, since they are time-sensitive.

2. If time permits, submit overlays to the S2 during briefing. The S2 routinely consolidates details of terrain features and passes them to higher headquarters at the end of the debriefing.

Example: "C12, THIS IS STRIKER 1, RECONREP OVER." "STRIKER 1, THIS IS Cl2; SEND MESSAGE, OVER." "C12, THIS IS STRIKER 1. LINE 1A: 2609910800. LINE lC: ST 1. LINE 2A: I SET DL, JAR CMN. LINE 2B: SIL MNC. LINE 2C: GREEN. LINE 2D: X. LINE 2E: F."

7-17. MEACONING, INTRUSION, JAMMING, AND INTERFERENCE REPORT.

This paragraph complies with STANAG 6004.

When the sniper team knows or suspects that the enemy is jamming, or knows or suspects that the enemy is intruding on the net, the incident is reported immediately by secure means to higher headquarter. Such information is vital for the protection and defense of friendly radio communications. The sniper who is experiencing the MIJI incident forwards this report through the chain of command to the unit OP. He also submits a separate report for each MIJI incident. An example of a MIJI 1 report follows:

ITEM 1-022 (encrypted) or MIJI 1.

ITEM 2-3 (encrypted) or JAMMING.

ITEM 3 - 1 (encypted) or RADIO.

ITEM 4 - 46.45 (encyypted if being transmitted over a nonsecure communications means).

ITEM 5 - N6B85S.

ITEM 6 - FA86345964 (encrypted if being transmitted over a nonsecure communications means).

a. Item 1 - Type of Report. When transmitted over nonsecure communications means, the numerals 022 are encrypted as Item 1 of the MIJI report. When transmitted over secure communications means, the term MIJI 1 is used as Item 1 of the MIJI 1 report.

b. Item 2 - Type of MIJI Incident. When transmitted over nonsecure communications means, the appropriate numeral preceding one of the items below is encrypted as Item 2 of the MIJI report. When transmitted over secure communications means, the appropriate term below is used as Item 2 of the MIJI 1 report.

- Meaconing.
- Intrusion.
- Jamming.
- Interference.

c. Item 3 - Type of Equipment Affected. When transmitted over nonsecure communications means, the appropriate numeral preceding one of the terms below is encrypted as Item 3 of the MIJI 1 report. When transmitted over secure communications means, the appropriate term below is used as Item 3 of the MIJI report.

- Radio.
- Radar.
- Navigational aid.
- Satellite.
- Electro-optics.

d. Item 4 - Frequency or Channel Affected. When transmitted over nonsecure communications means, the frequency or channel affected by the MIJI incident is encrypted as Item 4 of the MIJI 1 report. When transmitted over secure communications means, the frequency or channel affected by the MIJI incident is Item 4 of the MIJI 1 report.

e. Item 5 - Victim Designation and Call Sign of Affected Station Operator. The complete call sign of the affected station operator is Item 5 of the MIJI 1 report over both secure and nonsecure communications means.

f. Item 6 - Coordinates of the Affected Station. When transmitted over nonsecure communications means, the complete grid coordinates of the affected station are encrypted as Item 6 of the MIJI 1 report. When transmitted over secure communications means, the complete grid coordinates of the affected station are Item 6 of the MIJI 1 report.

7-18. SHELLING REPORTS

This paragraph complies with STANAG 2934.

The sniper team prepares and submits a SHELREP when it receives incoming rockets, mortars, or artillery rounds (FM 6-121). The team also uses this format for bombing attacks and mortars. The SHELREP format is as follows:

- ALPHA: Unit call sign.
- BRAVO: Location of observer.
- CHARLIE: Azimuth to flash or sound.
- DELTA: Time shelling started.
- ECHO: Time shelling ended.
- FOXTROT: Location of shelled area.
- GOLF: Number, type, and caliber (fire support team personnel only).
- HOTEL: Nature of fire (barrage, harassment, or registration).
- INDIA: Number of rounds.
- JULIET: Time of flash to bang.
- KILO: Damage.

7-19. ENEMY PRISONER OF WAR/CAPTURED MATERIEL REPORT

This paragraph complies with STANAG 2084.

The sniper team immediately tags EPWs and captured materiel. This ensures that information of intelligence value (place, time, and circumstances of capture) is not lost during evacuation. Only EPWs or materiel of immediate tactical importance are reported to the troop or battalion TOG Snipers use the following formats to report EPWs and captured materiel:

a. Enemy Prisoners of War.

LINE 1 - Type of report.

LINE 2 - Item captured.

LINE 3 - Date/time of capture.

LINE 4 - Place of capture-grid coordinates.

LINE 5 - Capturing unit-all sign.

LINE 6 - Circumstances of capture (be brief).

b. Captured Materiel.

LINE 1 - Type of report.

LINE 2 - Item captured.

LINE 3 - Type document/equipment.

LINE 4 - Date/time captured.

LINE 5 - Place of capture-call sign.

LINE 6 - Capturing unit—call sign.

LINE 7 - Circumstances of capture (be brief).

After the report is given to the company/team/commander, disposition instructions will be provided if needed.

7-20. NBC 1 REPORT

This paragraph complies with STANAG 2103.

The sniper team uses the NBC 1 report to submit initial and subsequent information on an NBC attack, transmitting over the command or operation and intelligence net immediately after an NBC attack.

LINE 1 OR EVENT - Type of attack-nuclear, chemical, or biological.

LINE 2 OR BRAVO - Grid location of observer.

LINE 3 OR CHARLIE - Direction from observer to attack—mils or degree—true, grid, or magnetic.

LINE 4 OR DELTA - Date-time group of detonation or star of attack.

LINE 5 OR ECHO - Illumination time in seconds for nuclear attack.

LINE 6 OR ECHO BRAVO - End time for biological/chemical attack

LINE 7 OR FOXTROT - Actual or estimated (state which) grid coordinates for location of attack.

LINE 8 OR GOLF - Means of delivery.

LINE 9 OR HOTEL - Height of nuclear burst in feet or meters and or type of burst.

LINE 10 OR HOTEL BRAVO - Type of biological/chemical attack and height of burst.

LINE 11 OR INDIA BRAVO - Number of munitions or aircraft.

LINE 12 OR EFFECTS - Effects of burst/agent on personnel.

LINE 13 OR JULIETT - Flash-to-bang time in seconds for nuclear attack.

LINE 14 OR KILO - Crater (yes or no) and width in meters.

LINE 15 OR KILO BRAVO - Vegetation chemical/biological.

LINE 16 OR LIMA - Nuclear burst angular cloud width, measured at five minutes after detonation in mils or degrees.

LINE 17 OR MIKE - Stabilized cloud top height, in feet or meters, or angular cloud top angle, in degrees or mils, measured at H+10 minutes after detonation and stabilized cloud height, in feet or meters, or angular cloud bottom angle, in degrees or mils, measured at H+10.

LINE 18 OR PAPA ALPHA- Grid of predicted outline of external contours of hazardous cloud or area.

LINE 19 OR PAPA BRAVO - Downwind direction of nuclear cloud or duration of hazard in days.

LINE 20 OR SIERRA - Date-time group of reading for nuclear or detection time for biological/chemical.

LINE 21 OR YANKEE BRAVO - Effective downwind direction and wind speed.

LINE 22 OR ZULU ALPHA STABILITY - Air stability indicator.

LINE 23 OR ZULU ALPHA TEMPERATURE - Surface air temperature.

LINE 24 OR ZULU ALPHA HUMIDITY - Relative humidity range.

LINE 25 OR ZULU ALPHA WEATHER - Significant weather phenomena.

LINE 26 OR ZULU ALPHA COVER - Cloud cover.

LINE 27 OR NARRATIVE - Other significant observation.

LINE 28 - Not used.

LINE 29 OR AUTHENTICATION - Self-authentication, if required.

7-21. MEDICAL EVACUATION REQUEST

This paragraph complies with STANAG 3204.

The sniper team sends a MEDEVAC request to the medical team on the company command net.

a. When air assets are not available, the sniper team uses the ground evacuation format.

LINE 1 - Evacuation.

LINE 2 - Location for pickup (encode).

LINE 3 - Number of casualties.

LINE 4 - Category of patient(s).

A Urgent.
B Priority.
C Routine.

Use the letter of the appropriate subparagraph from Line 4 with the number of casualties in Line 3—for example, a2 means there are two urgent patients for evacuation.

b. When air assets are available, the sniper team uses the air evacuation format.

LINE 1 - Location.

LINE 2 - Radio frequency, call sign, and suffix.

LINE 3 - Precedence:

URGENT__ PRIORITY__ ROUTINE__ TACTICAL IMMEDIATE__

LINE 4 - Special equipment.

LINE 5 - Number of patients by type:

Little__ Ambulator__

LINE 6 - Security of pickup site.

LINE 7 - Method of marking pickup size.

LINE 8 - Patient's nationality and status.

LINE 9 - NBC contamination.

c. The definitions of the categories of precedence follow:

(1) ***Urgent.*** Used for emergency cases for evacuation as soon as possible and no more than two hours to save life, limb, and eyesight.

(2) ***Priority.*** Used when the patient should be evacuated within four hours or his medical condition will deteriorate to an URGENT precedence.

(3) ***Routine.*** Requires evacuation, but the patient's condition is not expected to deteriorate within the next 24 hours.

(4) ***Tactical immediate.*** Used when the patient's condition is not urgent or priority, but evacuation is required as soon as possible so as not to endanger the requesting unit's tactical mission.