CHAPTER 10

COMMUNICATIONS

Section I. GENERAL

10-1. General

The communication systems and techniques employed by Special Forces in unconventional warfare vary from conventional signal operations in support of activities located within friendly territory to clandestine systems and techniques between the SFOB and the deployed detachments in the UWOA.

10-2. Extent and Type of Communications

a. Communications Within Friendly Territory. Communications between the SFOB and other headquarters or activities in friendly territory generally are the same as those required by any headquarters of comparable size. Normally, facilities of the theater army area signal system are used to the maximum extent possible; however, when backup or special circuits are necessary, they are provided by radio or radio-teletype operated by the Special Forces group. Communications in this area present no unique operational or technical signal problems.

b. Communications to and from the UWOA. When a detachment is committed, the primary, and often the only, means, of communications with the SFOB is by radio. Clandestine communication techniques are employed. Other methods may be used, when practical, such as infiltration of couriers, exchange of messages during resupply, or through use of existing communication facilities.

c. Communications Within the UWOA. As a general rule, communications within the UWOA progress from clandestine to conventional systems as the guerrilla movement gains strength. The extent and type of system depends on factors such as size of the area, the size of the guerrilla force, activities of the enemy and the guerrillas, the technical proficiency of both the enemy and the guerrilla communication organization, and the required speed of response to the orders of the area command. Any and all means which satisfy the requirement for communications and provide the required security are used. Certain clandestine communication systems may be used, but these should be tightly controlled by the commander (see FM 31-20A). All the following are considered:

(1) Messenger.

(2) Radio.

(3) Telephone.

(4) Audible signals.

(5) Visual signals.

(6) Local communication systems.

(7) Pigeons or trained animals.

d. See FM 31-21.

10-3. Communication Media

a. Messenger. In the early developmental stages of a UWOA, messengers may be the only secure means of communication. In the UWCA, messenger (courier) service is organized using clandestine, nontechnical communication techniques described in FM 31-20A. During the organization and development of the UWOA, security remains a paramount consideration; therefore, communication means will be dictated by the status of training and capability of the resistance force.

b. Radio. Radio can provide instantaneous, generally reliable communications; however, any radio transmission is vulnerable to interception and jamming by an enemy. The advantage of its speed must be balanced against the probable loss of security. Low-powered, frequency-modulated radios operating in the VHF or UHF band can be used under some conditions, with little risk. Generally, when considering the use of radio, the deciding factors are the nature of the message text and the probable enemy reaction time if the message is intercepted. For example, enemy reaction to last-minute control instructions during a raid or ambush

Figure 10–1. Expedient Ground return circuit.

would not be rapid enough to affect the operation. On the other hand, the interception of plans or instructions involving future actions could result in disastrous compromise. Within a UWOA the availability of radio equipment may be the governing factor. Maintenance, spare parts, and resupply of batteries are important considerations. The use of even the simplest radio requires training of operators and maintenance personnel.

c. Telephone. In the early stages of development of a UWOA, telephones may be used extensively, possibly between a security outpost and a base camp, or during an ambush to warn of the approach of a convoy or train. When using a telephone under these conditions, it is often advantageous to use a ground-return circuit, allowing the telephones to be operated with a single metallic conductor connecting them. A section of barbed wire fence, unused power line, unused telephone line, or one side of a railroad track already inplace can be used as the conductor. The conductor must be insulated from the ground and the other terminal of the telephone must be connected to a good ground connection (fig 10-1).

d. Audible Signals. Audible signals are useful for short distances. Church bells, vehicle horns, musical instruments, sirens, dogs barking, or voices may be used as audible signals. Quite often, audible signals can be planned in such a way that the sound is routine and recognizable as a signal only to someone trained in the system.

e. Visual Signals. Visual signals are limited only by the imagination of the person planning the signals and by the equipment available. Visual signals include

(1) Flashlight signals at night or by using sunlight reflected from a mirror. The use of any flashing light requires some prearranged code.

(2) A housewife hanging laundry on a clothesline in a predesignated pattern to serve as a

warning; light, smoke, a fire, or a person walking over a given road at a specified time. Normal actions are the guide for developing visual signals.

(3) Flags used to transmit messages either by means of semaphore or wigwag. In semaphore two flags are used. The position of the flags designate a certain letter. Wigwags can be used to send a message by Morse code. The flag on one side of the body indicates a dash, on the other side a dot (see FM 21-60).

f. Local Communication Systems. Many areas of the world have extensive, local communication systems. Without any special equipment, part or all of these systems may be used. When considering the use of the local communication systems, security must be paramount. The local language or dialect must be used in apparently innocent conversation.

g. Pigeons or Trained Animals.

(1) Homing pigeons, obtained locally or from the SFOB, may be used for the rapid, secure transmission of messages within the operational area. Since they require a few days to acquaint themselves with the home loft area, homing pigeons should be used when the guerrilla base is relatively static. Extremely cold weather limits the use of pigeons.

(2) Locally-procured, trained animals (usually dogs) may also be used as a means of communication; however, dogs are usually more susceptible to interception or diversion than homing pigeons.

Section II. COMMUNICATION TRAINING

10-4. Communication Training

a. General. Radio personnel assigned to Special Forces operational detachments are confronted with problems different from those faced by radio operators assigned to a conventional military unit. When committed to a UWOA, operators must be able to communicate over long distances, up to 2,500 miles, using low-powered equipment. They must do this in a manner that will result in minimum loss of security. Technical assistance and maintenance support are not readily available. Messages are encrypted using paper and pencil cryptographic systems. On progressing from clandestine to overt operations within the UWOA, machine crypto systems may be employed. The radio operators must also be prepared to assist and advise the detachment commander on any communication problem with the area to include the communication training of the resistance force.

b. Code Speed and Procedures. A Special Forces radio operator must be able to transmit and receive Morse code at the rate of 18 words per minute. He must be thoroughly familiar with radio-telegraph procedure as described in ACP-124B. Once these standards have been achieved, they must be maintained by constant practice. Before infiltration, the SOP is established for the actual radio-telegraph procedure to be used in the operational area. Sufficient time must be allocated for radio operators to become familiar with this specific procedure. Other members of the detachment must be familiar with these procedures as well.

c. Maintenance and Use of Equipment. Normal maintenance support is not available within a UWOA. In the detachment deployed in a UWOA, any repair of signal equipment is done by the operator, assigned signal maintenance man, or when feasible, by friendly members of the local populace or resistance elements. Radio operator training includes sufficient theory and practice so that the operator can perform direct support maintenance on the primary detachment radio set. He is sufficiently schooled in theory so that he can make sound recommendations on the use of enemy equipment captured within the operational area.

d. Radio Propagation. The radio frequencies to be used between the UWOA and SFOB are contained in the detachment's Signal Operation Instructions (SOI). These radio frequencies are determined before infiltration on the basis of published radio frequency prediction charts and tables. Detailed information on selecting frequencies for long-range communications can be found in TM 11-666 and radio propagation charts which are procured from the U.S. Army Strategic Communications Command, Communications Engineering Department, Fort Huachuca, Arizona 85613. These charts are published monthly and must be requested for the particular area of operations.

10-5. Message Writing

a. The writer of a message must express his thoughts clearly and concisely. Additional transmission time caused by unnecessary message length gives the

enemy a better opportunity for interception and radio direction-finding, and furnishes more traffic for analysis.

b. The following basic rules are applied to all messages:

(1) *Preparation*. All outgoing messages to the SFOB are prepared or reviewed by the detachment commander or his executive officer before transmission.

(2) *Content.* Write the message and then read it back. First consider any portion that can be eliminated. Many times the bulk of a message is used to say something that is obvious by the very fact that the message is being sent. Consider each portion. Does each portion tell the addressee something or could that whole sentence or thought be eliminated? Once this has been done, consider whether the thought of the message is expressed as clearly and concisely as possible.

(3) *Writing.* Print carefully to avoid any confusion about the meaning of the message. An encrypted message may be made completely useless by one misunderstood letter.

(4) *Abbreviations*. Use authorized abbreviations and only when they will not be misunderstood (see AR 310-25).

(5) *Punctuation*. Do not punctuate unless necessary for clarity. Do not use the expression STOP in a message. If punctuation is necessary, use authorized abbreviations such as QUES, CLN, PAREN, PD, CMM, PARA, and QUOTE-UNQUOTE.

(6) *Repetition.* Repeat only to avoid errors, not for emphasis. For example,' repeat unusual names to ensure correct spelling.

(7) *Numbers.* Numbers may be written as digits or spelled out. When spelled out, they are expressed in words for each digit except in exact hundreds or thousands, when the word hundred or thousand is used. Some cryptographic systems require the numbers to be encoded without spelling. As a general rule, numbers should be spelled out before encrypting. If the message is completely understood the first time it is transmitted, the result will be less time on the air. Example: 1234 is written as ONE TWO THREE POINT FOUR; 500 is written FIVE HUNDRED and 20,000 as TWO ZERO THOUSAND.

(8) *Isolated letters.* If necessary to use isolated letters, use the phonetic alphabet for each isolated letter.

c. Codes Are Normally Used for Brevity. Extensive brevity codes can be developed by proper planning which can greatly enhance message brevity and clarity. Codes that may be employed by Special Forces detachments in their operations are (see sample, app F)

(1) The Catalog Supply System (CSS) which provides an operational detachment with a brevity code in which single or several associated logistical items may be requested on resupply operations (see sample Catalog Supply System, app F):

(2) The Q and Z signals used by radio operators (ACP 131).

(3) Operation codes (SOI).

Section III. ANTENNAS AND COMMUNICATION SECURITY

10-6. Antennas

Special Forces radio operators use field expedients to ensure reliable communications. Because of rigid limitations on size and weight of equipment, the radio used by Special Forces is not issued with a prefabricated antenna. Only antenna wire is issued. Although there is little the radio operator can do to increase the designed power output of his transmitter, he can maximize the propagation of his signal by use of an efficient antenna system. Antenna theory and construction are presented in FM 24-18 and TM 11-666. The Special Forces radio operator must understand the material covered in the manuals in order to provide longrange communications. Various types of antennas which can be used with Special Forces-issued radio equipment are shown in figures 10-3 through 10-10.

a. Field Expedient Insulators. When constructing an antenna, it is important to insulate the antenna from its supports or from the ground. It is often necessary for the radio operator to make use of whatever materials are available. Almost any kind of wire can be used when constructing an antenna. Although glass and porcelain may be the best materials for insulators, it is better to use a second best (such as wood) rather than none at all. The antenna diagrams shown in this manual cannot be understood without a basic knowledge of antenna theory. These diagrams picture antenna configurations which can be used with issued radio equipment in limited space (see fig 10-2).

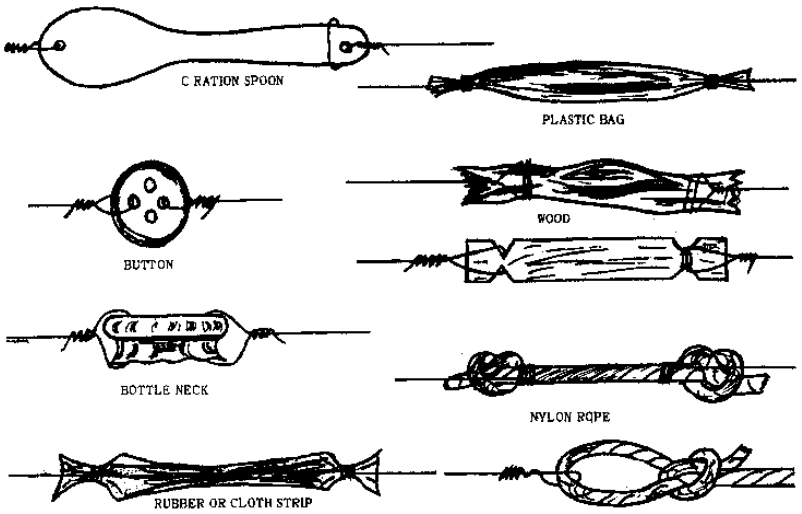

Figure 10–2. Expedient insulators.

b. Quarter-Wave Antenna. The quarter-wavelength antenna is normally erected vertically. Its length (in feet) is computed by dividing 234 by the operating frequency in megahertz. It is omnidirectional, making it an ideal antenna for a net control station (NCS) when operating with different teams and the exact team locations are not known. It can be used with any type of radio and is normally used when a groundwave is desired. In the case of standard FM radios it makes use of space waves (line-of-sight). When a quarter-wave antenna is used, a good ground system is essential (fig 10-3).

c. Half-Wave Doublet Antenna. A typical halfwave antenna is the doublet, or dipole antenna. It is constructed by using one-quarter wavelength wire for each side and fed in the center by coaxial cable or, as a field expedient, a twisted pair of field wire. It can be used with any type of radio and can be constructed in a horizontal or vertical plane. When in a horizontal position (fig 10-4), it radiates broadside

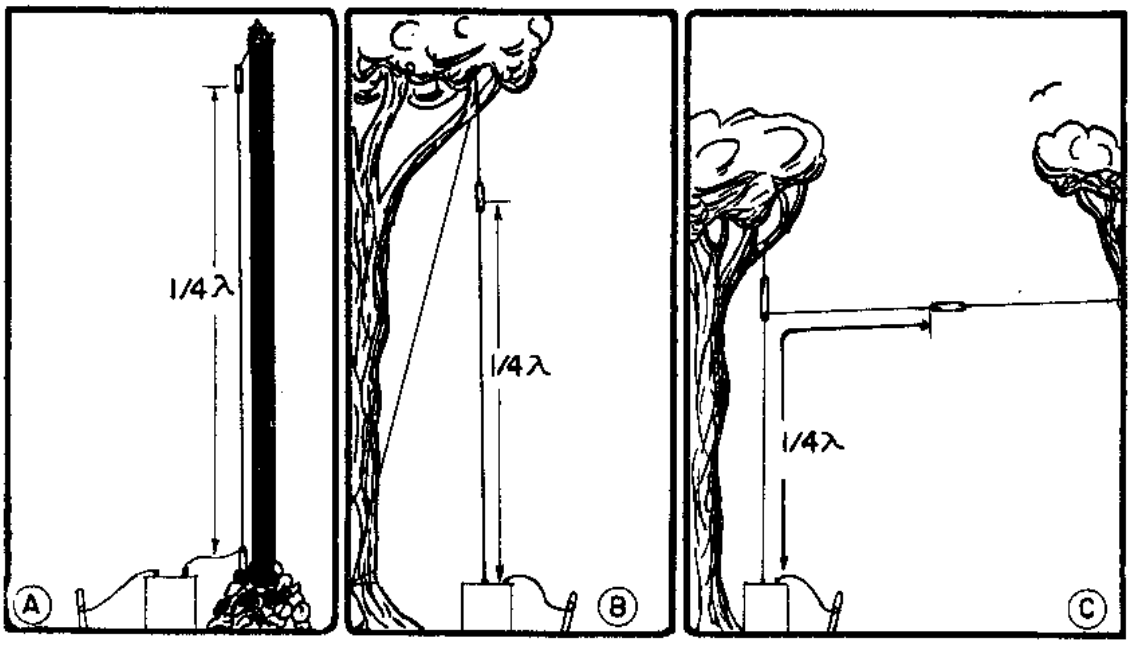

Figure 10–3. One-quarter-wavelength antenna (vertical).

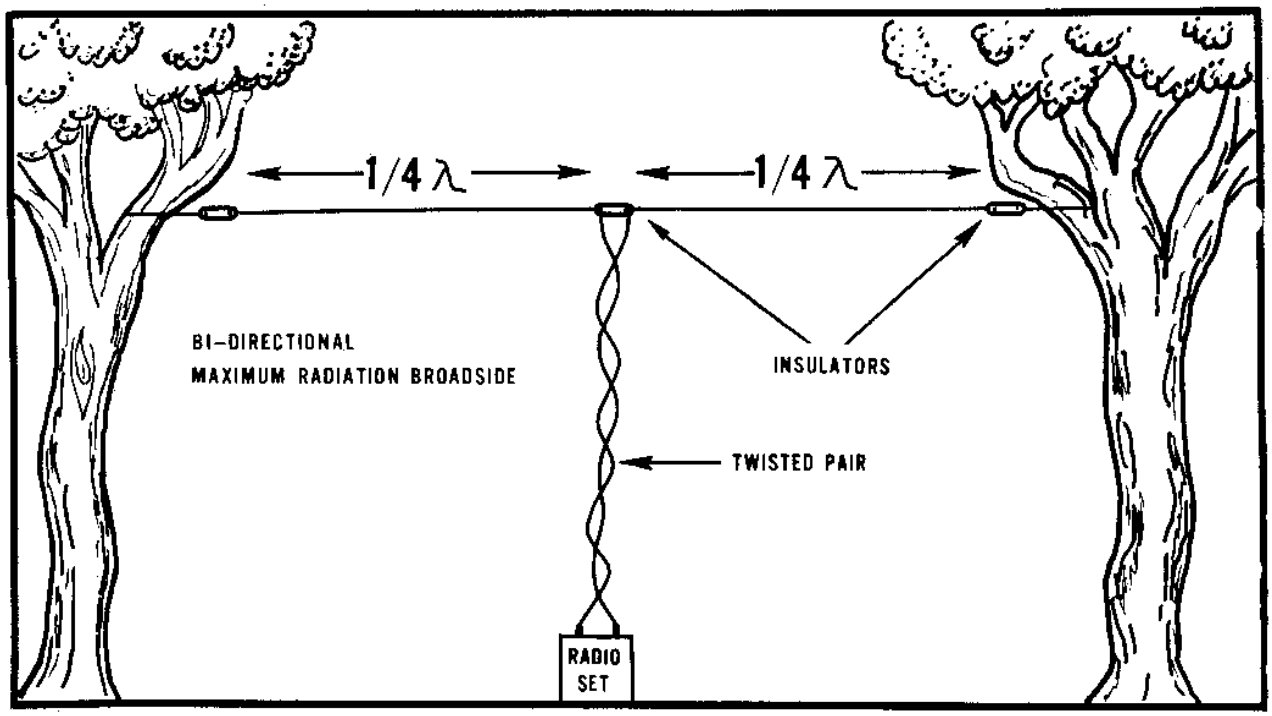

Figure 10–4. Half-wave doublet antenna.

at a 90° angle from the antenna. When it is constructed in a vertical plane, it has a radiation pattern of 360 degrees. This antenna is superior to the quarter-wave-length antenna. When connecting this antenna to the radio set, one lead goes to the antenna binding post; the other goes to the ground

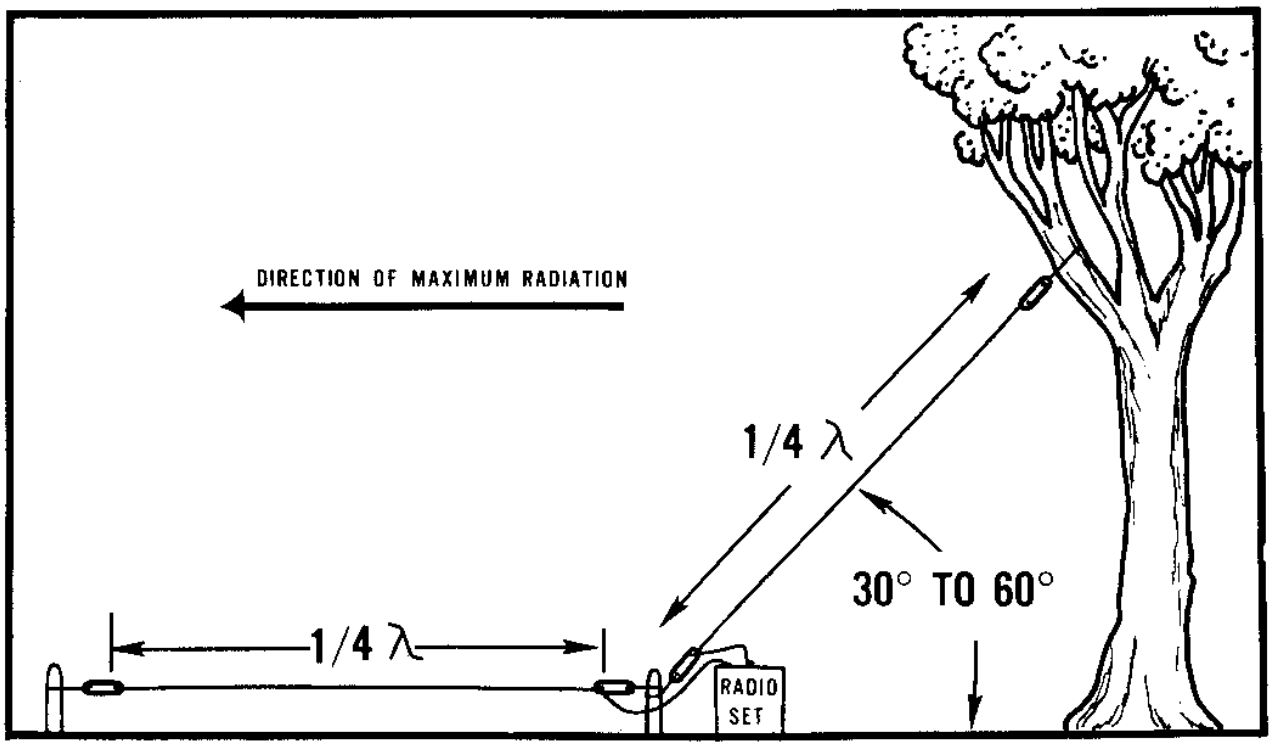

Figure 10–5. Slant-wire antenna.

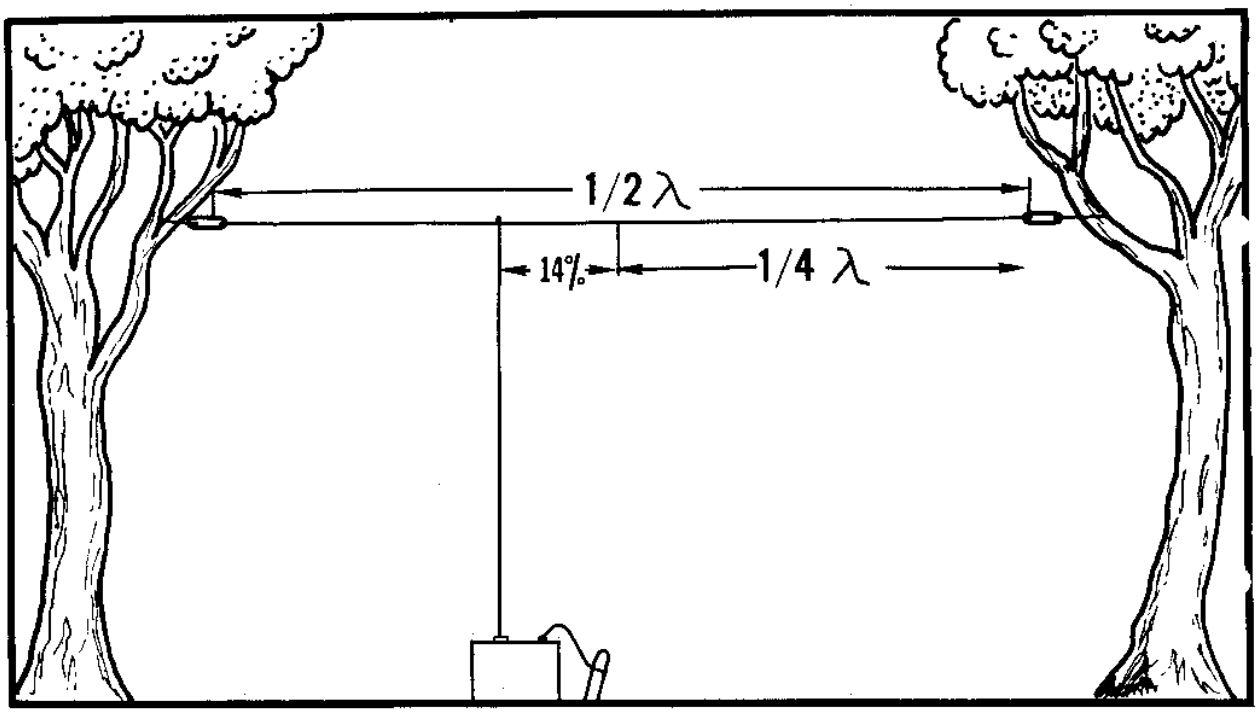

Figure 10–6. Fourteen percent off-center fed antenna.

binding post. No additional ground is necessary.

d. Slant-Wire Antenna. The slant-wire antenna is an efficient radiating system using only a single antenna support. Two pieces of wire, each one a quarter-wavelength long, are used to make up the antenna. One piece is slanted down from the antenna support at an angle of 30 ° to 60 ° and is connected to the antenna post on the transmitter. The other wire is used as a counterpoise just above the ground and laid out from the transmitter away from the slanting wire. If the wire used as a counterpoise is not insulated, it must be insulated from the ground; the counterpoise is connected to the radio ground post. Maximum radiation occurs in the direction of the counterpoise (see fig 10-5).

e. Fourteen Percent Off-Center Fed Antenna. In the event no suitable transmission line is available such as coaxial cable, or twisted pair, a suitable antenna can be constructed using an antenna one half-wavelength long and feeding it with a single wire at a point 14 percent of a one-half wavelength, or the total length of the antenna. This antenna is suitable for use with radios such as the AN/GRC-109 and AN/GRC-87. Maximum radiation occurs at 90° from the antenna (see fig 10-6).

f. Indoor Antennas. There are times when a Special Forces radio operator must operate from inside a building. When this is necessary, a suitable antenna can still be constructed. Any of the antennas mentioned in this chapter can be used if there is space available inside the building.

(1) If space is limited, a loop antenna may be constructed (fig 10-7). This antenna is a full wavelength long and is fed directly in the center. It is limited to frequencies whose wavelengths will not exceed the dimensions, of the room.

(2) For operation tin lower frequencies, a half-wave, square-loop antenna (fig 10-8) may be used inside a building. Excellent results may be obtained if care is taken in constructing and tuning the antenna. This is important when operating the AN/GRC-109 since the indicator lamp of the antenna will not glow brightly with either the full-wave loop or the half-wave open loop. Although these antennas may be used indoors, it must be remembered that best results are obtained when operating with an outdoor system.

g. Other Antennas. It may be necessary to have patrols operating outside the normal range of FM radio sets. When this is necessary, an antenna system can be constructed which will allow communications beyond the normal range of current radios. This can be

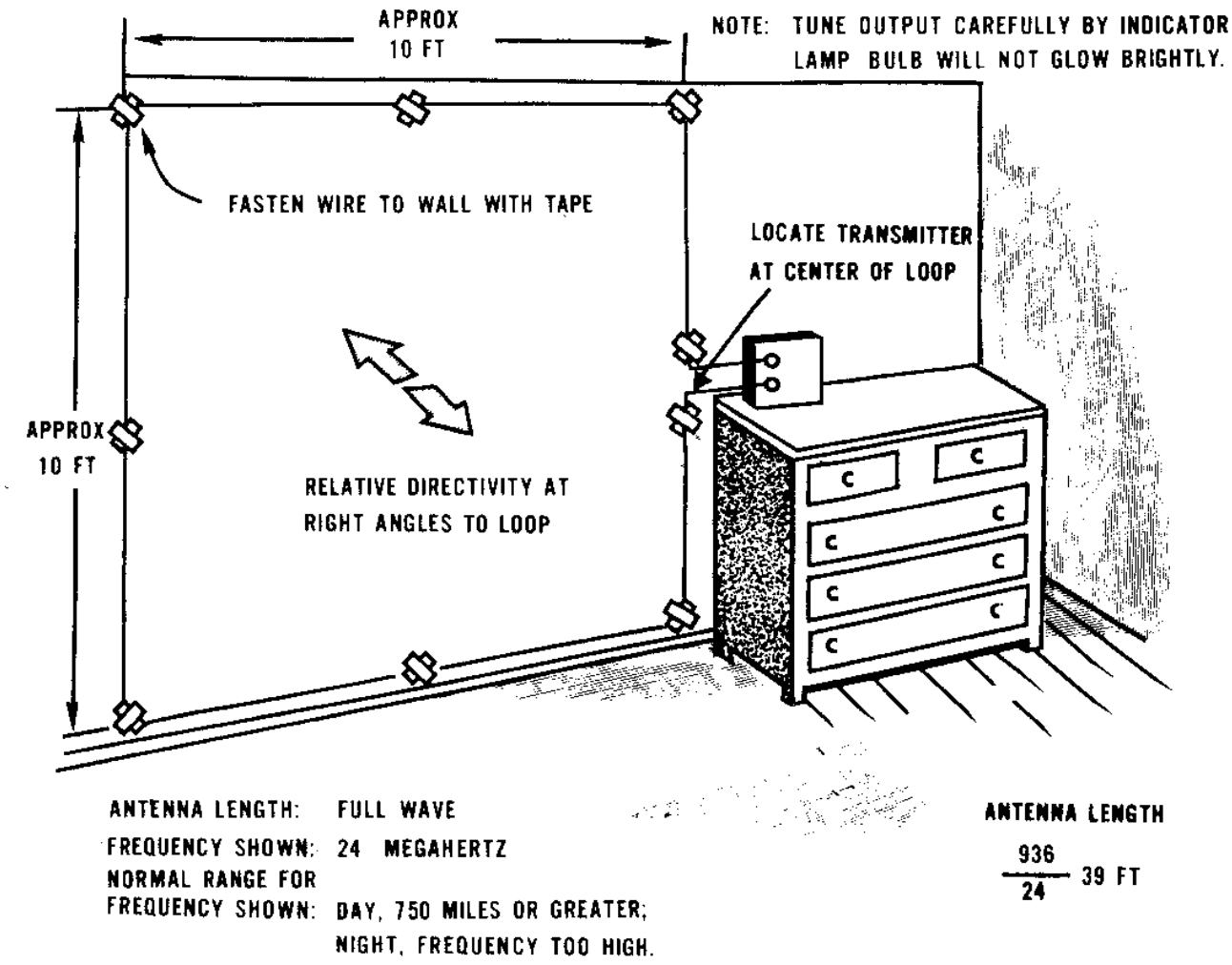

Figure 10–7. Full-wave square-loop antenna.

accomplished through the use of the jungle antenna (fig 10-9) or the half-rhombic antenna (fig 10-10). When operating on frequencies above 30 MHZ, the transmission range can be increased by improved antennas. The use of any one of these antennas should more than double the range of standard FM radio sets.

10-7. Communication Security

a. Security is of particular importance to a Special Forces detachment located in a UWOA. A violation of any of the principles of communication security endangers the detachment. Communication security is the protection resulting from all measures designed to deny unauthorized persons information of value which might be derived from a study of communications. Communication security is obtained through proper physical security, transmission security, and cryptographic security.

b. Physical security is defined as that element of security which results from the physical measures taken to safeguard communication documents, equipment, and personnel. Within the SFOB, physical security measures are similar to those of any military organization.

(1) Operational detachment personnel obtain security clearance before infiltration. The detachment commander must use his judgment and discretion in dealing with indigenous personnel and allowing them access to classified information. Information on cryptographic systems used by Special Forces is never released to indigenous personnel.

(2) Classified material is kept on the person of one of the detachment members or under constant

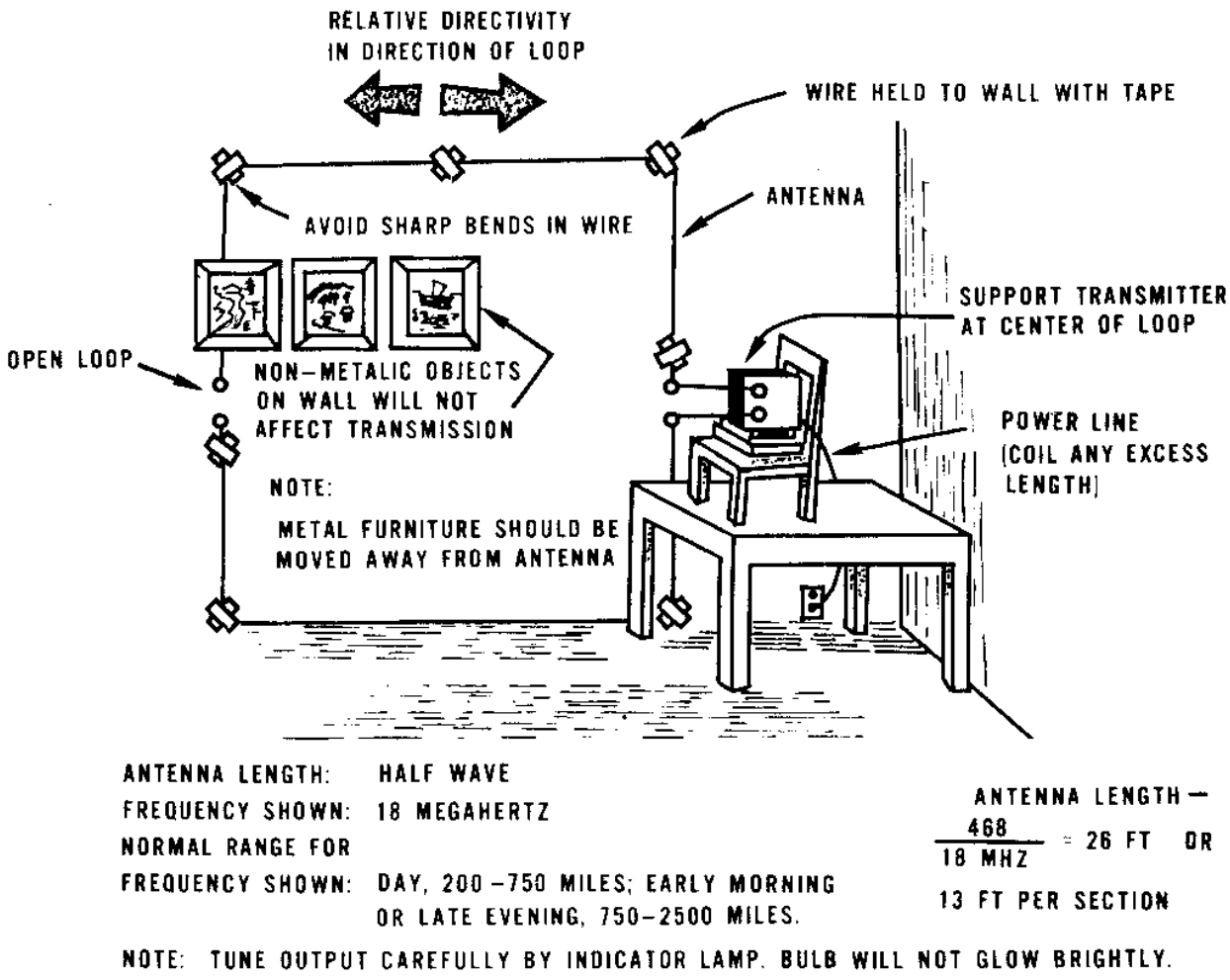

Figure 10–8. Half-wave square-loop antenna.

guard. The physical security of the radio set is maintained by choosing goon transmission and storage locations and by having a minimum number of persons know these locations. Techniques of physical security applicable to Special Forces in a UWOA are:

(a) Avoid easily identifiable and prominent geographical locations such as mountaintops.

(b) Move the radio after each transmission.

(c) Sterilize radio sites.

(d) Place surveillance on radio sets before and after transmission.

(e) Post guards when waiting for, and during, actual transmission.

(f) Do not carry classified material to transmission site.

(3) Detachment cryptographic systems and SOI's must not fall into enemy hands. Care must be taken not to destroy these items prematurely since replacement is difficult. Remember, however, that destruction by burning is not complete unless the ashes are destroyed.

c. Transmission security includes all measures designed to protect transmissions from interception, traffic analysis, direction finding, and imitative deception. Some techniques of transmission security applicable to Special Forces operations in a UWOA are:

(1) Make minimum transmissions.

(2) Do not tune transmitters until exact contact times.

(3) Locate transmitter sites so that known direction finding stations are beyond groundwave distances.

(4) Transmit on an irregular schedule.

(5) Never transmit from the same area twice.

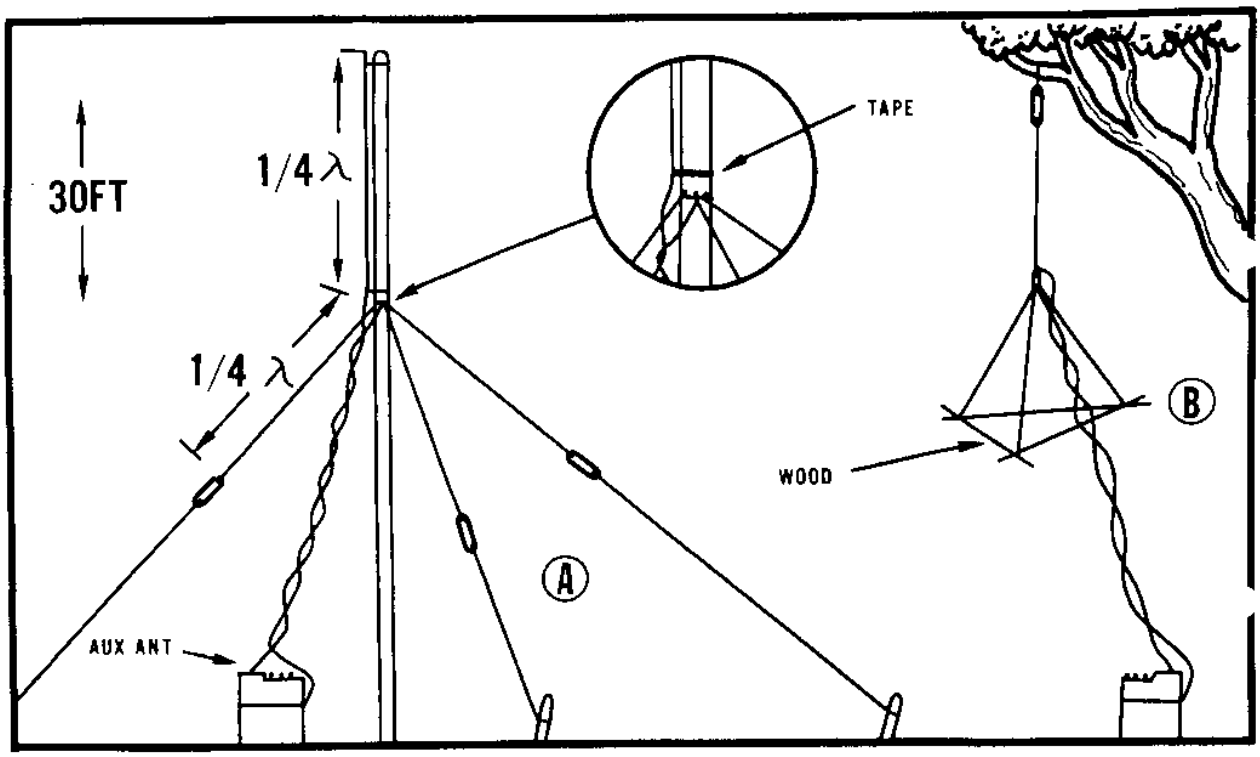

Figure 10–9. Jungle antenna.

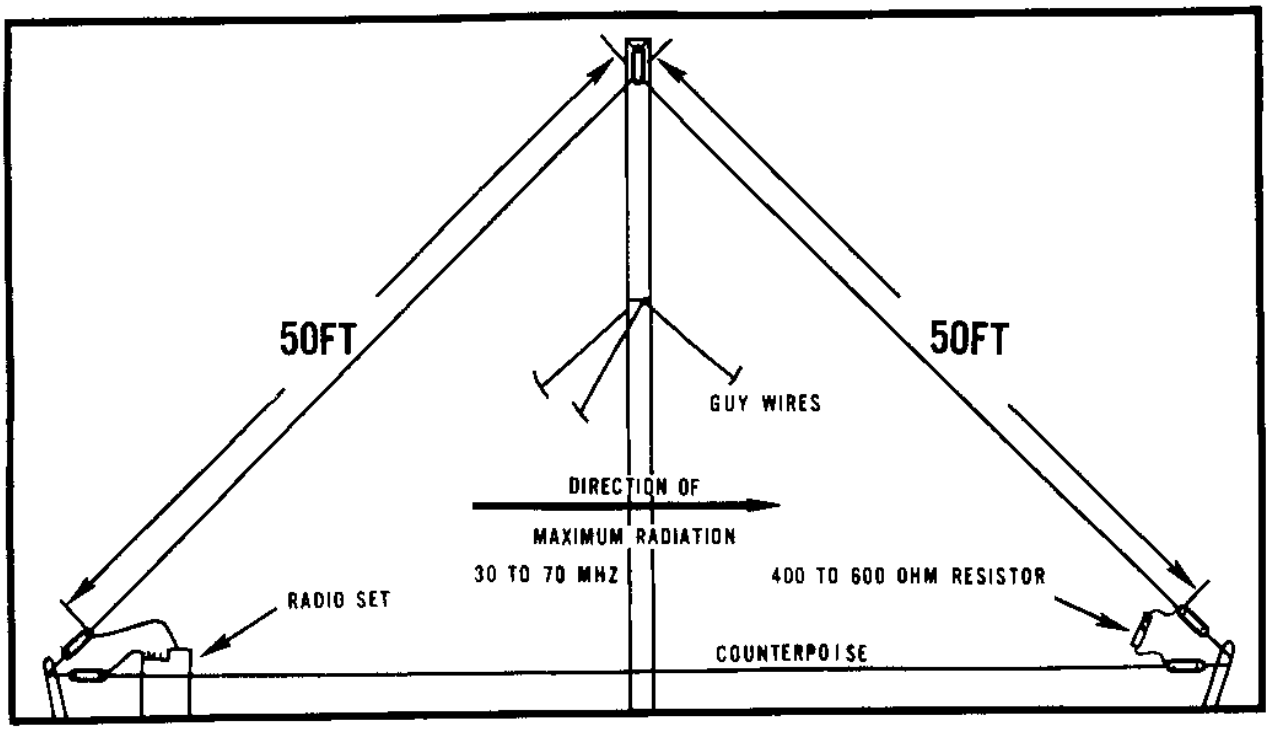

Figure 10–10. Half-rhombic antenna.

(6) Send short messages.

(7) Use, highly directional antennas.

d. Many times it may be necessary, in the interest of transmission security, to compromise between technically favorable transmission sites and transmission sites which meet the physical and transmission security criteria outlined above.

e. Cryptographic security results from the proper use of technically sound cryptographic systems. Systems and means available to the SFOB and the detachment commanders will vary with missions and operational areas. Specific instructions, techniques, and methods to be used are covered in premission briefings on a need-to-know basis.

f. See FM 31-21.