

APPENDIX B

Navigation and Tracking

Section I. GENERAL

This appendix assumes that the reader already knows the basics of map reading and land navigation. For a review of these sub-

jects, the reader should refer to *FM 21-26*.

Section II. JUNGLE NAVIGATION

Navigating in the jungle can be difficult for those troops not accustomed to it. This appendix outlines techniques which have been used successfully in jungle navigation. With training and practice, troops should be able to use these techniques to navigate in even the thickest jungle.

canopy, topographic survey is difficult and is done mainly from the air. Therefore, although maps of jungle areas generally depict the larger features (hill, ridges, larger streams, etc.) fairly accurately, some smaller terrain features (gullies, small or intermittent streams, small swamps, etc.), which are actually on the ground, may not appear on the map. Also, many older maps are inaccurate. So, before going into the jungle, commanders and staff should bring their maps up to date.


NAVIGATION TOOLS

MAPS


Because of the isolation of many jungles, the rugged ground, and the presence of the

METHODS OF MAP UPDATING


Aerial photographs. (These should be no more than 3 or 4 months old, because trails or clearings can be overgrown rapidly.)




Aerial reconnaissance.



Streams like this one may not be shown on jungle maps.



Information from patrols, natives, hunters, or anyone else who has been in the area recently.



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COMPASS

No one should move in the jungle without a compass. It should be tied to the clothing by a string or bootlace. The three most common methods used to follow the readings of a compass are:

Sighting along the desired azimuth. The compass man notes an object to the front (usually a tree or bush) that is on line with the proper azimuth and moves to that object. *This is not a good method in the jungle as trees and bushes tend to look very much alike.*

Holding the compass at waist level and walking in the direction of a set azimuth. *This is a good method for the jungle.* The compass man sets the compass for night use with the long luminous line placed over the luminous north arrow and the desired azimuth under the black index line. There is a natural tendency to drift either left or right using this method. Jungle navigators must learn their own tendencies and allow for this drift.

Sighting along the desired azimuth and guiding a man forward until he is on line with the azimuth. The unit then moves to the man and repeats the process. This is the most accurate method to use in the jungle during daylight hours, but it is slow. In this method, the compass man cannot mistake the aiming point and is free to release the compass on its string and use both hands during movement to the next aiming point.

The keys to navigation are maintaining the right direction and knowing the distance traveled. Skill with the compass (acquired through practice) takes care of the first requirement. Ways of knowing the distance traveled include checking natural features with the map, knowing the rate of movement, and pacing.

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CHECKING FEATURES

Major recognizable features (hills, rivers, changes in the type of vegetation) should be noted as they are reached and then identified on the map. Jungle navigators must BE CAUTIOUS ABOUT TRAILS—the trail on the ground may not be the one on the map.

RATE OF MOVEMENT

Speed will vary with the physical condition of the troops, the load they carry, the danger of enemy contact, and the type of jungle growth. *The normal error is to overestimate the distance traveled.* The following can be used as a rough guide to the maximum distance covered in 1 hour during daylight.

DAYLIGHT MOVEMENT		MAXIMUM DISTANCE (in meters per hour)
TYPE TERRAIN		
TROPICAL RAIN FOREST		1,000
DECIDUOUS FOREST, SECONDARY JUNGLE, TALL GRASS		500
SWAMPS		100 TO 300
RICE PADDIES (WET)		800
RICE PADDIES (DRY)		2,000
PLANTATIONS		2,000
TRAILS		1,500

PACING

In thick jungle, this is the best way of measuring distance. It is the only method

which lets the soldier know how far he has traveled. With this information, he can estimate where he is at any given time—something that must be known to call for indirect fire support in a hurry. To be

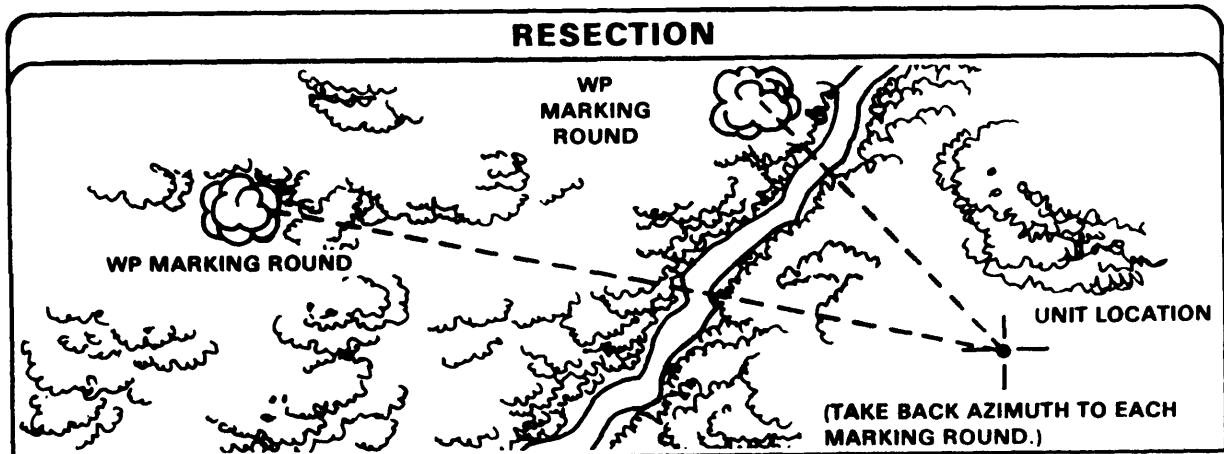
accurate, soldiers must practice pacing over different types of terrain. Each soldier should make a PERSONAL PACE TABLE like this one—

PACE TABLE		
SWAMP	100 METERS	— PACES
RAIN FOREST	100 METERS	— PACES
SECONDARY JUNGLE	100 METERS	— PACES
SAVANNA	100 METERS	— PACES
PADDIES (WET) (DRY)	100 METERS	— PACES
TRAIL	100 METERS	— PACES
UPHILL	100 METERS	— PACES
DOWNHILL	100 METERS	— PACES

At least two men in each independent group should be compass men, and three or four should be keeping a pace count. The artillery fire support team (FIST) chief should keep an accurate fix on his location, as should the platoon forward observers (FO). He can be a great help to the rifle

company commander in matters of navigation. When in doubt, the commander should do a resection, using artillery marking rounds as outlined in *FM 21-26, paragraph 10*.

NOTE: Jungle foliage will often require that artillery marking rounds be sensed by sound.



To locate a position by resection, the general location must be known. White phosphorus rounds (airbursts) are then called on two widely separated grids which are not on terrain features like the one the unit is occupying and which are a safe distance from the estimated location. A back azimuth to each of these rounds is taken and plotted on the map. The point where they intersect is the observer's approximate location.

LOCATION OF AN OBJECTIVE

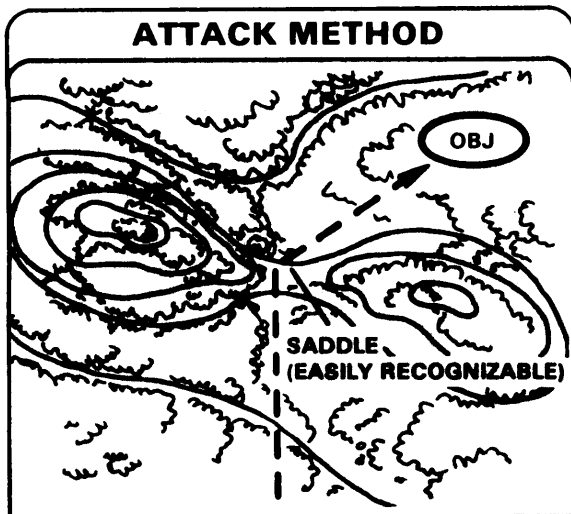
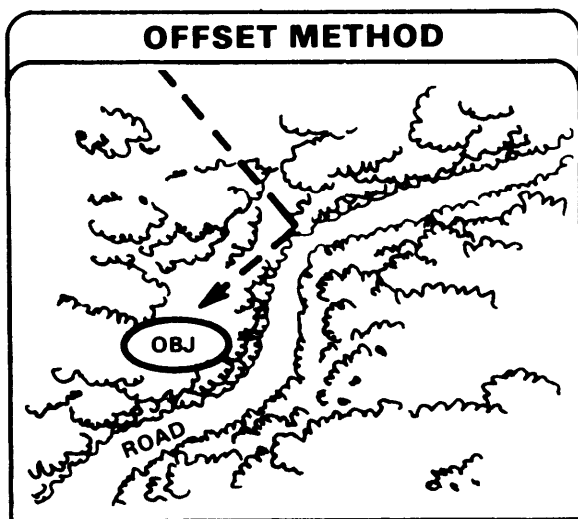
In open terrain, an error in navigation can be easily corrected by orienting on terrain features which are often visible from a long distance. In thick jungle, however, it is possible to be within 50 meters of a terrain feature and still not see it. Here are two methods which can aid in navigation.

OFFSET METHOD

This method is useful in reaching an objective that is not large or not on readily identifiable terrain but is on a linear feature, such as a road, stream, or ridge. The unit plans a route following an azimuth which is a few degrees to the left or right of the objective. The unit then follows the azimuth to that terrain feature. Thus, when the unit reaches the terrain feature, the members know the objective is to their right or left, and the terrain feature provides a point of reference for movement to the objective.

ATTACK METHOD

This method is used when moving to an objective not on a linear feature. An easily recognizable terrain feature is chosen as close as possible to the objective. The unit then moves to that feature. Once there, the unit follows the proper azimuth and moves the estimated distance to get to the objective.



WHAT TO DO IF LOST

Do not panic. Few soldiers have ever been permanently lost in the jungle, although many have taken longer to reach their destination than they should.

Disoriented navigators should try to answer these questions. (If there are other navigators in the group, they all should talk it over.)

What was the last known location?

Did the unit go too far and pass the objective? (They should compare estimates of time and distance traveled.)

Does the terrain look the way it should? (They should compare the surroundings with the map.)

What features in the area will help to fix the unit's location? (They should try to find these features.)

If the unit is unable to locate itself using these techniques, the leader can call for an air or artillery orienting round. However, this may cause a loss of security, particularly if the unit is moving by stealth.

An airspot can usually be obtained from Army or Air Force aircraft. The pilot can be contacted and guided to the general location by radio. A mirror, smoke, panels, or some other signal can be shown to the pilot. He will be able to determine the unit's location and report it to them.

This, also, is a loss of security and should only be a last resort.

NIGHT MOVEMENT

The principles for navigation at night are the same as those for day movement. The problem in night movement is one of control, not navigation. In clear weather, through sparse vegetation and under a bright moon, a unit can move almost as fast by night as by day. If the sky is overcast, vegetation is thick,

or there is little or no moon, movement will be slow and hard to control. The following points can assist a unit during night movement.

Attach *luminous tape* to the back of each soldier's headgear. Two strips, side by side, each about the size of a lieutenant's bar, are recommended. *The two strips aid depth perception and reduce the hypnotic effect that one strip can cause.*

When there is no light at all, distance between soldiers should be reduced. When necessary to prevent breaks in contact, each soldier should hold on to the belt or the pack of the man in front of him.

The leading man should carry a long stick to probe for sudden dropoffs or obstacles.

In limited visibility conditions, listening may become more important to security than observing. A unit which hears a strange noise should halt and listen for at least 1 minute. If the noise is repeated or cannot be identified, patrols should be sent out to investigate. Smell, likewise, can be an indication of enemy presence in an area.

All available night vision devices should be used.

NAVIGATIONAL TIPS

- Trust the map and compass, but understand the map's possible shortcomings. Use the compass bezel ring, especially during night navigation.
- Break brush. Do not move on trails or roads.
- Plan the move, and use the plan.
- Do not get frustrated. If in doubt, stop and think back over the route.
- Practice leads to confidence.

Section III. TRACKING

Visual tracking is following the paths of men or animals by the signs they leave, primarily on the ground or vegetation. Scent tracking is following men or animals by the odors they leave.

Practice in tracking is required to achieve and maintain a high standard of skill. Because of the excellent natural concealment the jungle offers, all soldiers should be familiar with the general techniques of visual tracking to enable them to detect the presence of a concealed enemy, to follow the enemy, to locate and avoid mines or booby-traps, and to give early warning of ambush.

Tracking is important in counter-guerrilla operations where it is often difficult to locate the enemy. Guerrillas who conduct raids and ambushes will normally return to their bases as quickly as possible. Well-developed tracking skills will help units to maintain contact with the enemy.

SIGNS

Men or animals moving through jungle areas leave signs of their passage. Some examples of these signs are listed below.

TRACKING POINTS	
<p style="text-align: center;">SAVANNA</p> <p>NOTE: If the grass is high, above 3 feet, trails are easy to follow because the grass is knocked down and normally stays down for several days. If the grass is short, it springs back in a shorter length of time.</p> <ul style="list-style-type: none"> ■ Grass that is tramped down will point in the direction that the person or animal is traveling. ■ Grass will show a contrast in color with the surrounding undergrowth when pressed down. ■ If the grass is wet with dew, the missing dew will show a trail where a person or an animal has traveled. ■ Mud or soil from boots may appear on some of the grass. ■ If new vegetation is showing through a track, the track is old. ■ In very short grass (12 inches or less) a boot will damage the grass near the ground and a footprint can be found. 	<p style="text-align: center;">ROCKY GROUND</p> <ul style="list-style-type: none"> ■ Small stones and rocks are moved aside or rolled over when walked on. The soil is also disturbed, leaving a distinct variation in color and an impression. If the soil is wet, the underside of the stones will be much darker in color than the top when moved. ■ If the stone is brittle, it will chip and crumble when walked on. A light patch will appear where the stone is broken and the chips normally remain near the broken stone. ■ Stones on a loose or soft surface are pressed into the ground when walked upon. This leaves either a ridge around the edge of the stone where it has forced the dirt out, or a hole where the stone has been pushed below the surface of the ground. ■ Where moss is growing on rocks or stones, a boot or hand will scrape off some of the moss.

TRACKING POINTS CONTINUED

PRIMARY JUNGLES

NOTE: Within rain forests and deciduous forests, there are many ways to track. This terrain includes undergrowth, live and dead leaves and trees, streams with muddy or sandy banks, and moss on the forest floor and on rocks, which makes tracking easier.

- Disturbed leaves on the forest floor, when wet, show up a darker color when disturbed.

- Dead leaves are brittle and will crack or break under pressure of a person walking on them. The same is true of dry twigs.

- Where the undergrowth is thick, especially on the edges of the forest, green leaves of the bushes that have been pushed aside and twisted will show the underside of the leaf—this side is lighter in color than the upper surface. To find this sort of trail, the tracker must look through the jungle instead of directly at it.

- Boot impressions may be left on fallen and rotting trees.

- Marks may be left on the sides of logs lying across the path.

- Roots running across a path may show signs that something has moved through the area.

- Broken spiderwebs across a path indicate that something has moved through the area.

SECONDARY JUNGLE

- Broken branches and twigs.

- Leaves knocked off bushes and trees.

- Branches bent in the direction of travel.

- Footprints.

- Tunnels made through vegetation.

- Broken spiderwebs.

- Pieces of clothing caught on the sharp edges of bushes.

RIVERS, STREAMS, MARSHEs, AND SWAMPS

- Footprints on the banks and in shallow water.

- Mud stirred up and discoloring the water.

- Rocks splashed with water in a quietly running stream.

- Water on the ground at a point of exit.

- Mud on grass or other vegetation near the edge of the water.

DECEPTION

The enemy may use any of the following methods to deceive or discourage trackers. They may, at times, mislead an experienced tracker.

These deceptions include:

- Walking backwards. The heel mark tends to be deeper than that of the ball of the foot. The pace is shorter.
- More than one person stepping in the same tracks.

- Walking in streams.
- Splitting up into small groups.
- Walking along fallen trees or stepping from rock to rock.
- Covering tracks with leaves.

WARNING:

A TRACKER SHOULD ALWAYS BE ALERT TO THE POSSIBILITY THAT THE ENEMY IS LEAVING FALSE SIGNS TO LEAD THE UNIT INTO AN AMBUSH.