Now that your mortars are laid in the direction of fire, you need to know what charge and elevation to use for the range you determine. This is the time to look at your firing tables.

The 81mm and 60mm mortars adjust range by both charge and elevation adjustments. Because of the extremes of elevation and charges possible and the overlapping range characteristics of the ammunition, it is impossible to make an accurate estimate of the charge and elevation for these mortars. The best way to determine the charge and elevation for both, therefore, is to use a firing table. The second best method is to use the abridged firing table that comes packed with the ammunition. This is better by far than not having anything.

But even when you have no firing tables for a 60mm or an 81mm mortar, you still have an alternative. First, for both mortars being used in the ground mounted role, the maximum elevation is 1511 mils and the minimum elevation is 0800 mils. (In the M125A1 mortar carrier a maximum elevation of 1598 mils and a minimum elevation of 713 mils are possible. See page 8, FT 81-A1-3.) Using your experience, your familiarity with the firing tables, and luck, consider that you have a charge range of 0 to 9 with the 81mm mortar. At the minimum elevation (0800), the maximum range is as shown here for each charge.

You should try to memorize the maximum range for each charge for both the 60mm and 81mm mortar. Then, when faced with an emergency, you should be able to closely estimate the charge and elevation you will need to hit your target. (This is the least desirable method of determining charge and elevation, but it beats nothing. And with experience and practice, you should be able to make swift and accurate changes in range without the aid of a firing table.)

Charge	Maximum Range
0	401 meters
1	1,037 meters
2	1,508 meters
3	1,991 meters
4	2,466 meters
5	2,929 meters
6	3,374 meters
7	3,802 meters
8	4,209 meters
9	4,595 meters

With the 107mm mortar, there is a fixed elevation and a varying charge. In an emergency, therefore, when you need to fire and do not have either firing tables or a ballistic plate, you can use another improvised method to estimate the charge you need to hit a target. This method comes from a study of FT 4.2-H-2 and is based on a maximum range for HEM329A1 ammunition of 5,650 meters (elevation 0800 with extension) charge 41, and a minimum range of 920 meters (elevation 1065 without extension) charge 5. Using these two extremes, and what you remember from studying the firing tables, you should be able to determine the approximate charge needed.

I have found that for elevations 0800 and 0900 with or without extension, one-eighth of a charge will move the round 20 meters most of the time; at elevation 1065, it will move the round 10 meters.

With practice and common sense, this can be a very accurate way of getting your mortars onto a target. Remember that when you use it you will not have the normal FDC equipment; you will have only some guns, ammunition, men, and, hopefully, communication equipment. The whole idea is to keep putting fire on the target, no matter what.

The three techniques discussed here are for emergency use only — when there are no other means of fire control. Any one of them can be accurate and effective, but it takes a competent computer to determine the data to fire. Using data from missions you have fired successfully or from the team drills that are given to each Infantry mortar platoon course student at Fort Benning, you can train your computers and squad leaders to effectively control their fire even if they do not have FDC equipment.

Fire control is based on a direction and a distance from a gun to a target. If it seems you have lost everything, stay calm, use the techniques discussed here, and keep shooting.

STAFF SERGEANT JOHN E. FOLEY teaches 81mm and 107mm mortar FDC procedures at the U.S. Army Infantry School. He previously served with the 172d Infantry Brigade in Alaska, where he wrote "Arctic Airborne Mortars," which appeared in INFANTRY's September-October 1982 issue (page 15).

Mortars in the Desert

LIEUTENANT DOUGLAS W. McENIRY

The United States Army has not fought a major battle in the desert, let alone a war, since the North African campaign during World War II. Now, in the Army of the 1980s, attention is once again focused on the possibility of conducting desert operations. Several major field exercises, such as the annual Bright Star maneuvers and our continued use of the National Training Center at Fort Irwin, California, are helping to build our in-

formation on desert operations. But there is still a great deal to be learned.

One such area that has not been fully explored is that of how to employ and use the infantry mortar effectively in the desert. Currently there are no specific guidelines in any of the available references on the tactical employment or the general use of mortars in the desert. This indicates that the issue is an open one and that the Army should give some kind of consideration to it. If the doctrine must be changed or new techniques developed, it is to our advantage to do so now. We certainly cannot afford to wait until the heat of battle is upon us to decide how we will settle a baseplate or displace a section in desert terrain.

Aside from the tactical employment of mortars in the desert, there are certain other considerations and situations that must be addressed. And on the basis of my experiences as leader of a battalion 81mm mortar platoon while on duty in the Sinai with the 101st Airborne Division (Air Assault), I offer the following thoughts on using mortars in desert operations.

First, the terrain affects the ability of mortarmen to support a unit effectively while it is conducting operations. Solid ground for good firing positions is not always available. The surface (at least in the Sinai) generally ranges from very coarse to very fine sand. In places where the surface is not sand, it is either sandstone or decaying granite or coral reef. Such surfaces cause problems in settling the baseplate and in constructing mortar firing positions.

When soft sand can be found it is, of course, the best place to put the baseplate. Where there is only rock or coral reef, a layer of proportionally filled sandbags has to be put down first and the baseplate placed on top of them. The sandbags help prevent cracked baseplates and damaged cushion rings, which might occur during the firing of higher charges.

When constructing a standard mortar firing position as outlined in FM 7-11C1, Indirect Fire Infantryman, or in FM 5-15, Field Fortifications, sandbags or, if they are available, used ammunition crates can be put in place to keep the sides from caving in. The problem of cave-in can also be overcome if the sides are properly revetted and deadmen put into place.

Another problem with the terrain is that it offers little cover or concealment. Defilade positions, the best form of cover for a mortar, are rare. Consequently, unless firing is done from a constructed mortar pit, the crews are exposed to enemy fire.

Concealment in the desert is equally difficult, but there are a few possible solutions. One is the radar deflective desert camouflage net, which can be used to break up the outline of a gun pit quite effectively, or as concealment for ammunition or vehicles. Vegetation is sparse to nonexistent, and what there is is usually green. Even when this vegetation can be used effectively, it tends to stand out because it conflicts with the dominant sandy color.

To conceal the sandbags used in mortar pits the crewmen can first paint them with a white or tan paint and then, while the paint is still wet, toss loose sand or dirt directly onto the painted areas. The sand or dirt adheres to the sandbags, and when it dries it effectively breaks up the outline and helps to reduce shine.

Road networks and general trafficability are a problem, too; hard-surfaced roads are not always available, and cross-country movement is more the rule than the exception. When wheeled transportation is used, it must be able to keep up with the unit it is supporting.

WEATHER

Besides these terrain limitations, the weather, too, can have adverse effects on everything from the gun crews to the weapon systems and the ammunition. First, it took my soldiers an average of two weeks to become acclimated to the Sinai before they could operate at the level they had achieved in the United States. During this time, each man drank more than three gallons of water in an average eight-hour day. Their effectiveness was sluggish at first until routines were established. Rest, too, was a key factor. By the end of the two weeks, they were able to stay in open work areas for up to 12 hours, and their water consumption decreased to an average of one to one and one-half gallons per man per day, depending on the daily activities.

HOT METALS

During peak hours of the day in the desert, any exposed metal (such as the baseplate or cannon) becomes extremely hot. This means that the troops have to conduct crew drill with sleeves down and wearing gloves to avoid severe burns from contact with the metal. (The gloves do somewhat impair the gunner's ability to manipulate the sight.)

The effect of the severe heat in desert areas on mortar ammunition needs further study. I have seen, for example, what can happen to white phosphorus rounds when they are exposed to temperatures above 85° Fahrenheit before firing, even when precautions have been taken. The rounds tumble end over end, and many fail to explode when they hit the ground.

Other questions that need to be considered are "Should meteorological (METT) data be computed in order for mortar fires to be accurate?" and "Will mortars need to be near a METT station to insure accurate firing data?" Wind speed and direction in the Sinai are unpredictable, and their effects on rounds will have to be considered. This is especially true if a precision registration is to be fired.

With the harsh conditions found in the desert, maintenance is also a subject to be considered. Sand or dust is the biggest problem in maintaining the mortar and its associated fire control equipment. Whenever possible, the cannon should be covered with the muzzle cover. This prevents sand and dust from getting inside and causing possible misfires later. The sight and the aiming circle, too, should be kept covered when not in use. The working

parts of the mortar, such as the traversing and elevating mechanisms, should be only lightly lubricated to prevent a possibly abrasive paste of sand and oil from forming.

The desert is different in so many ways from other environments in which we normally employ mortars. Now that we are again faced with the possibility of conducting desert operations, we need to reexamine these differences. Only by learning in advance what needs to be done can we be sure that responsive indirect fire from our mortars will be available when it is needed.

LIEUTENANT DOUGLAS W. McENIRY is now assigned to the G3 Training Division of the 101st Airborne Division (Air Assault). A graduate of North Georgia College, he has completed the Infantry Officer Advanced Course and the Infantry Mortar Platoon Course.

Winning at the NTC:
Defeat at Brigade Hill

MAJOR VERNON W. HUMPHREY

Small units have to be well prepared to fight the defensive battle, and this includes mobility and defense in depth. Sometimes the units that go to the National Training Center (NTC) at Fort Irwin for their 14 days of training learn these lessons through defeat, as one unit did at a place called Brigade Hill.*

The area in which this particular battle took place is a bowl-shaped valley measuring about six kilometers from north to south and seven kilometers from east to west. The floor of the bowl is slightly undulating and is cut by many small gullies that offer cover and concealment for small elements. Larger gullies or wadis offer considerable cover and serve also as excellent avenues of approach. The entire area is bisected by the "Irwin River," actually a paved road with designated "fording sites."

The key terrain in the area consists of Hill 876, the Dumbbell, the 922-955 hill mass, the fording sites themselves, and Brigade Hill. The passes between Hill 876 and the Dumbbell, and between the Dumbbell and the 922-955 hill mass, are quite restrictive since the hills themselves cannot be traversed by vehicles and can be climbed only with difficulty by dismounted infantry. Although it is dominated by the higher hills to the west and south, Hill 780 does provide cover and concealment for forces approaching from the east (see accompanying map).

THE MISSION

The U.S. task force was ordered to defend in sector, against an attack from the east, with its initial battle line running from Hill 876 to the Dumbbell to the 922-955 hill mass.

The task force's plan called for its Team Alpha to defend intially in the vicinity of Hill 876. Its Team Bravo was to defend in the vicinity of the Dumbbell, while its Team Charlie was to defend the pass between the Dumbbell and the 922-955 hill mass. Obstacles, consisting of antitank ditches, wire, and mines, were to be constructed in the passes. The companies were also directed to reconnoiter positions in the vicinity of Brigade Hill.

At first light, several units reported OPFOR movement. Most of the reports concerned small units moving at high speed. On the heels of these reports, motorized OPFOR elements drove past the U.S. task force's TOC. The task force commander ordered the task force to fall back to positions near Brigade Hill.

One team had just been resupplied, but it pulled out and left its log pack on the ground. As the task force pulled out, its attached engineer company could be seen working on the obstacles. Not aware of the task force's pull-back, the engineers continued working, and eventually "went into the bag" without firing a shot.

The task force raced pell-mell for the Irwin River, with each team commander choosing his own route. Eventually, Team Bravo took up a perimeter defense in the immediate vicinity of Brigade Hill. Teams Charlie and Alpha took up perimeter defenses about 1,000 meters apart along the edge of the major wadi to the west of Brigade Hill. None of the companies covered fronts of more

* *This is the third in a series. The views expressed are the author's own and do not necessarily reflect those of the Department of Defense or any element of it.*