basis of METT-T (mission, enemy, terrain, troops, and time available), but the lists shown in the accompanying box can help a logistician prepare for the support of various types of missions. (These lists can be found in several logistical field manuals, but they have been brought together and modified for this article on the basis of numerous after action reports from field training, command post, and emergency deployment readiness exercises.)

Successful logistical operations require a great deal of planning and timely execution as well. The lists presented here are designed to stimulate the thought processes of the logistician as he tries to balance the tasks and resources he has been given. These lists should be used, modified, and updated as required.

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Aiming Circle Accuracy

CAPTAIN J. KEVIN MUILMAN

Accuracy is as critical for a mortar platoon as for any other combat unit, and it begins with the precise declination of the M-2 aiming circle.

In the U.S. Army Infantry School's Infantry Mortar Platoon Course at Fort Benning, Georgia, students are taught that the aiming circle is declinated using at least two distinct points (each at least 1,000 meters from the aiming circle) whose direction from the point the aiming circle is set on has been surveyed to an accuracy of plus or minus two mils.

In West Germany and away from the major U.S. training areas, however, declination points surveyed in mils are nonexistent, and mortar platoons are usually unable to declinate their aiming circles accurately. There are many surveyed points across the countryside, of course, but these points, published by the government of the Federal Republic of Germany in pamphlets called *Trigliste*, are all in longitude and latitude. The solution is a simple one, though—to declinate aiming circles accurately in Europe, longitude and latitude must be converted into the mil relationships that U.S. soldiers are trained to use.

When a direct support field artillery battalion is nearby, its survey data will give a mortar platoon leader all the declination information he will need. But when direct support battalions are decisively engaged or are not present, mortar platoons need to know how to make these conversions.

To convert longitude and latitude to mil relationships, therefore, a mortar platoon needs the following equipment: a 1:50,000 scale map of the area in which it is operating, a *Trigliste* for the area, a calculator, and a trigonometric functions table (if the calculator does not have trig functions on it).

First, through a map reconnaissance of the area, the mortar platoon leader chooses a surveyed point on which to set the aiming circle. (On most 1:50,000 scale maps of Europe, these surveyed points are represented by a small triangle with a point in the center marking the exact location of the surveyed point.) This point must have at least two other surveyed points within eyesight and be 1,000 meters or more from the aiming circle. These second two points are the distant aiming points.

By using the *Trigliste*, he determines the longitude and latitude of the aiming circle point and the two distant aiming points. He labels these points on the map with a point number and a map sheet number and references them in the *Trigliste* by these numbers. (For example, a point labeled "134/7522" is point number 134 on map sheet 7522.)

He then calculates the mil direction of each of the distant aiming points from the aiming circle separately. Each distant aiming point falls into one of four quadrants formed by the north-south and east-west grid lines that pass through the aiming circle point (Figure 1).

He draws a right triangle, making the

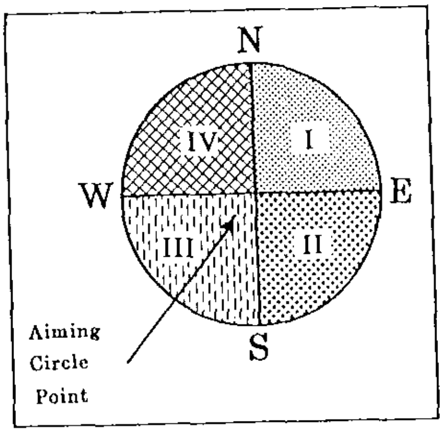

Figure 1

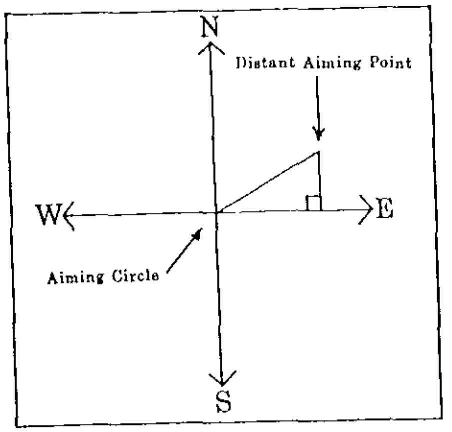

Figure 2

aiming circle point one corner, the distant aiming point the vertex, and the base of the triangle *a cardinal direction grid line*. Thus, the base of the triangle for a distant aiming point in quadrant I is the east grid line; *in quadrant II, it is* the south grid line; in quadrant III, the west grid line; and in quadrant IV, the north grid line (Figure 2).

He then labels the side of the triangle opposite the aiming circle "A," labels the base of the triangle "B," and labels the angle at the aiming circle "C" (Figure 3).

After this has been done, the platoon leader determines the lengths of the sides A and B of the triangle. He does this by subtracting the smaller of the longitudes from the larger of the longitudes, and the same for the latitudes, keeping in mind that there are 60 seconds to one minute and 60 minutes to one degree. The results are the lengths of the sides A and B in minutes and seconds. He converts any

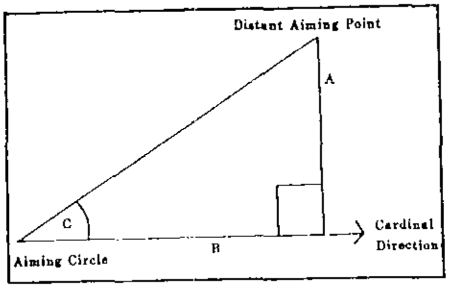

Figure 3

minutes to seconds by multiplying the minutes by 60 to express the result entirely in seconds.

Since the tangent (TAN) of angle C is equal to the length of side A divided by the length of side B (A/B), he locates the result in the TAN column of a standard trigonometry table and finds the corresponding degree relationship. If the result of A/B is greater that 1 (1.3, for example), then the 1 is automatically equal to 45 degrees in the degree column, and 0.3 is referenced in the tangent column of the trig tables. The result for 0.3 is 16.7 degrees. Thus, if A/B equals 1.3, TAN 1 (45 degrees) plus TAN 0.3 (16.7 degrees) equals 61.7 degrees. Angle C then equals 61.7 degrees.

He must now convert the angle from degrees to mils, and does this by multiplying the number of mils per degree (17.7778) by the number of degrees in the angle (61.7), which equals 1096.890

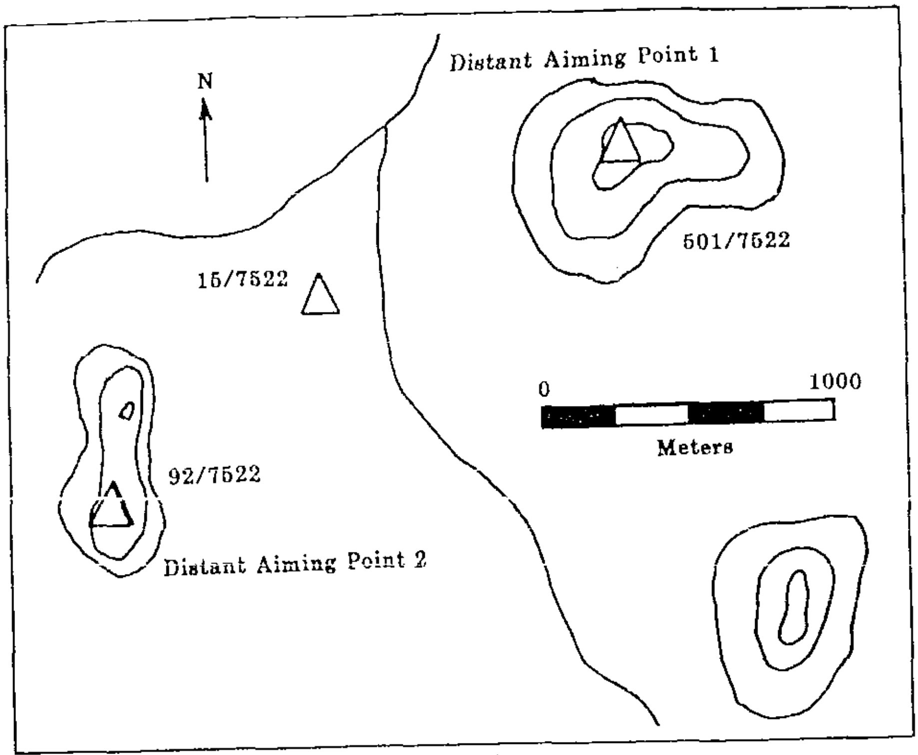

Figure 4

mils. He repeats this process for each distant aiming point.

The following are the mil relationships between the distant aiming points and the cardinal directions used to construct the right triangles. Simple addition and subtraction will give the mil angles between the distant aiming points and grid north:

- If the distant aiming point is in quadrant I, subtract the mil angle from 1600.
- If the distant aiming point is in quadrant II, subtract the mil angle from 3200.
- If the distant aiming point is in quadrant III, subtract the mil angle from 4800.
- If the distant aiming point is in quadrant IV, subtract the mil angle from 6400.

The results are the azimuths of the distant aiming points. Once the declination constant from the map is applied, the aiming circle can be declinated as usual.

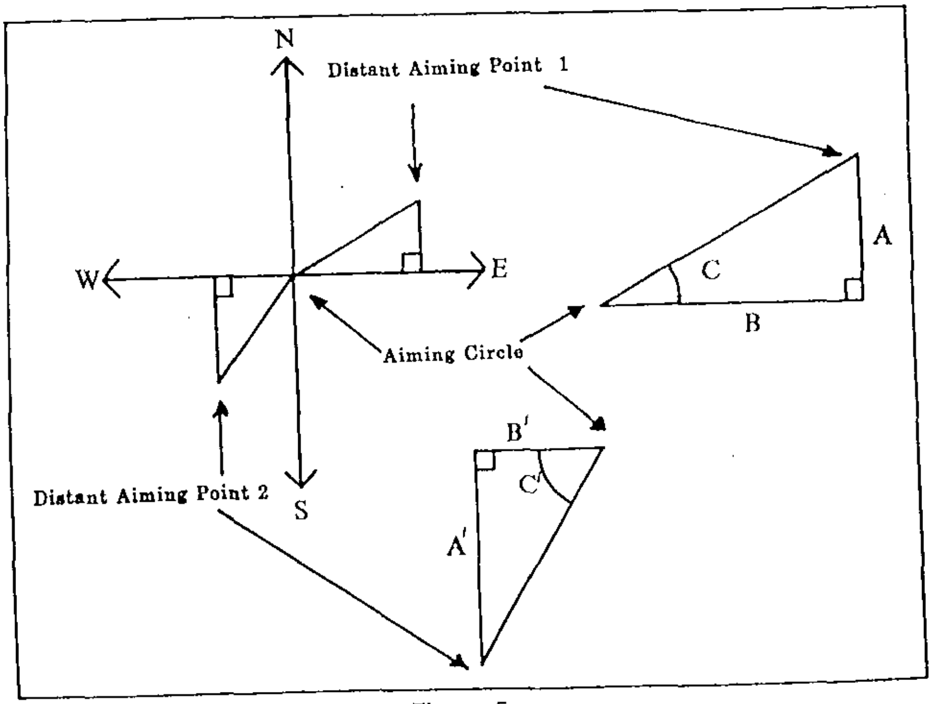

Figure 5

POINT	LATITUDE	LONGITUDE
Aiming Circle	9° 27′ 02″	48° 28′ 32″
Distant Aiming Point 1	9° 27′ 36″	48° 28′ 53″
Distant Aiming Point 2	9° 26′ 30″	48° 28′ 20″

Table 1

Longitude of distant aiming point 1	48° 28′ 53″
Longitude of aiming circle	-48° 28′ 32″
Difference in longitude	21″
Latitude of distant aiming point 1	9° 27′ 36″
Latitude of aiming circle	-9° 27′ 02″
Difference in latitude	34″

Table 2

For example, the platoon leader does a map reconnaissance and finds three points that he will use to declinate his aiming circles (Figure 4). Using the *Trigliste* for the area, he determines the longitude and latitude for the points (see Table 1).

He superimposes these points on a grid with the aiming circle at the center, and constructs right triangles with the aiming circle being the angle opposite the right angle. He labels the sides and the aiming circle angle as outlined in Figure 5.

Using distant aiming point 1, the platoon leader then determines the differences in longitude and latitude between this point and the aiming circle by subtracting the smaller longitude from the larger and then repeats the step for the latitudes (Table 2).

The difference in longitude is the length of side A in seconds and the difference in latitude the length of side B. Side A (21″) divided by side B (34″) gives the tangent of angle C—0.617647.

The platoon leader then uses a standard trigonometric table or a calculator with trig functions to determine the relationship of TAN 0.617647, which is 31.7 degrees. When this figure is multiplied by 17.7778 (mils per degree), the result will be angle C in mils—563.556. (He uses the same procedure to find angle C for distant aiming point 2.)

These are the mil relationships between the distant aiming points and the cardinal directions used in constructing the right triangles. Once the platoon leader knows both angles, he figures the mil relationships between the distant aiming points and grid north on the basis of the quadrant the aiming point falls into.

Using the rules given previously, the platoon leader subtracts the mil angle for distant aiming point 1 from 1600 (since the distant aiming point is in quadrant I): 1600 minus 563.556 equals 1036.444 mils. He subtracts the mil angle for distant aiming point 2 from 4800 since it is in quadrant III.

His final task is to apply the declination constant from the map to convert the mil relationships between the distant aiming points and grid north to the relationships between these points and magnetic north. The results are the mil angles that he can use in declinating his aiming circles.

Mortar platoons do not have to use aiming circles for all fire missions, of course. In combat there will be times when the need to declinate the aiming circle is outweighed by the need to lay in the guns and fire a mission as rapidly as possible using the aiming circles "as they are." But a declinated aiming circle is analogous to a zeroed rifle and will increase the effectiveness of the mortars, the battalion commander's only indirect fire support.

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"Please Use Me!"

The Cry of A Mortar Platoon Leader

LIEUTENANT RENE G. BURGESS

Let's say you're a brand new light infantry mortar platoon leader, intent upon making your platoon an integral part of the battalion combat team. Your men are trained and competent, your fire direction center (FDC) is fast and accurate, and you have more vehicles and radios than you ever expect to need. Given a light infantry battalion's limited fire power, you expect to hear your radios crackling with calls for fire, but you go through a battalion-sized infiltration or attack