CHAPTER 13
TYPES OF MISSIONS

Certain missions require that special procedures be applied to effectively engage targets; therefore, these missions should not be fired on the observed chart. Area targets have width or depth or both, requiring the mortar section to use either searching or traversing fire, or a combination of these.

13-1. TRAVERSING FIRE

Traversing fire is used when the target has more width than a section firing a parallel sheaf can engage. Each mortar of the section covers part of the total target area and traverses across that area. The M16/M19 plotting board can be constructed as any one of the three firing charts. Table 13-1 lists the data used to set up the plotting board for traversing fire.

GRID INTERSECTION	04/64
DIRECTION OF FIRE	2700 MILS
MOUNTING AZIMUTH	2700 MILS
MORTAR POSITION	02006500
MORTAR POSITION ATTITUDE	1080 MILS
MORTAR ALTITUDE	400 METERS
REFERRED DEFLECTION	0700 MILS

Table 13-1. M16 plotting board data for traversing fire.

a. Upon receiving the call for fire, the section sergeant determines from the size and description of the target that traversing fire must be used to cover the target. (To effectively engage a target using traversing fire, the section sergeant ensures the attitude of the target is within 100 mils of the attitude of the firing section.) The section sergeant then completes the FDC order (Figure 13-1).

b. The three or four mortars are plotted separately on the M16/M19 plotting board, using the attitude of the section. During the mission, the computer ensures that the correct plots are used to determine data required—for example, during the adjustment, the impact point is aligned with the No. 2 mortar plot. Using the information in the call for fire, the FDC order, and the observer corrections, the computer computes the data to adjust the No. 2 mortar onto the center mass of the target. After the adjustment is complete (Figure 13-2), the computer must complete the following procedure:

- Plot the 250-meter length of target on plotting board using the attitude of the target.
- Divide the target into segments.
- Determine the number of rounds for each segment.
- Determine the mil width of one segment.
- Determine the number of turns required to cover one segment.
- Determine the number of turns between rounds.

COMPUTER'S RECORD

For use of this form, see FM 23-91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
B Co 1/29 IN			D61	CA 0701

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 038 629
OT DIRECTION: 2400
ALTITUDE: 420

SHIFT FROM:
OT DIRECTION: ALTITUDE:
☐ LEFT / ☐ RIGHT
☐ ADD / ☐ DROP
☐ UP / ☐ DOWN

POLAR:
OT DIRECTION: ALTITUDE:
DISTANCE:
☐ UP / ☐ DOWN
VERTICAL ANGLE ☐ + / ☐ –

TARGET DESCRIPTION: CIO 250×50 ATI 0720
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER

MORTAR TO FFE: Sec
MORTAR TO ADJ: #2
METHOD OF ADJ: 1 Rd
BASIS FOR CORRECTION:
SHEAF CORRECTION: Open
SHELL AND FUZE: HEQ in ADJ
PROX in FFE
METHOD OF FFE: 3 RDS
RANGE LATERAL SPREAD:
ZONE:
TIME OF OPENING FIRE: W/R

INITIAL CHART DATA

DEFLECTION:
DEFLECTION CORRECTION: ☐L ☐R
RANGE:
VI/ALT CORRECTION: ☑+ ☐ –
RANGE CORRECTION: ☐+ ☐ –
CHARGE/RANGE:
AZIMUTH:
ANGLE T:

INITIAL FIRE COMMAND

MORTAR TO FOLLOW:
SHELL AND FUZE:
MORTAR TO FIRE:
METHOD OF FIRE:
DEFLECTION:
CHARGE:
TIME SETTING:
ELEVATION:

ROUNDS EXPENDED

OBSERVER CORRECTION			CHART DATA		SUBSEQUENT COMMANDS					
DEV	RANGE	TIME (HEIGHT)	DEFL	CHARGE (RANGE)	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV

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Figure 13-1. Example of completed DA Form 2399 for a completed call for fire and FDC order.

COMPUTER'S RECORD

For use of this form, see FM 23-91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
B Co 1/24 IN			D61	CA 0701

☐ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 038 629
OT DIRECTION: 2400
ALTITUDE: 420

SHIFT FROM:
OT DIRECTION: ALTITUDE:
☐ LEFT / ☐ RIGHT
☐ ADD / ☐ DROP
☐ UP / ☐ DOWN

POLAR:
OT DIRECTION: ALTITUDE:
DISTANCE:
☐ UP / ☐ DOWN
VERTICAL ANGLE ☐ + / ☐ –

TARGET DESCRIPTION: CIO 250 x 50 ATT 0720
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec	DEFLECTION: 0918	MORTAR TO FOLLOW: Sec	
MORTAR TO ADJ: #2	DEFLECTION CORRECTION:	SHELL AND FUZE: HEQ	
METHOD OF ADJ: 1 Rd	☐L ☐R		
BASIS FOR CORRECTION:	RANGE:	MORTAR TO FIRE: #2	
SHEAF CORRECTION: Open	VI/ALT CORRECTION:	METHOD OF FIRE: 1 Rd	
SHELL AND FUZE: HEQ in ADJ	☑+ ☐ – 20	3 Rd PROX in FFE	①
PROX in FFE	RANGE CORRECTION:	DEFLECTION: 0918	HE
METHOD OF FFE: 3 Rds	☐+ ☐ – 0	CHARGE: 5	
RANGE LATERAL SPREAD:	CHARGE/RANGE: 5	TIME SETTING:	
ZONE:	AZIMUTH: 2320	ELEVATION: 0963	
TIME OF OPENING FIRE: W/R	ANGLE T: 80		

OBSERVER CORRECTION			CHART DATA		SUBSEQUENT COMMANDS						
DEV	RANGE	TIME (HEIGHT)	DEFL	CHARGE (RANGE)	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV	
4120			0960	2750			0960			0963	② HE
	-100		0962	2650			0962			1010	③ HE
	-50	FFE	0963	2600	PREPARE		TO TRAVERSE RIGHT				

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Figure 13-2. Example of completed DA Form 2399 for completed adjustment.

c. To plot the target on the plotting board, the computer rotates the azimuth disc until the target attitude (taken from the call for fire) is indexed. The computer erases all the plots except the last plot. After ensuring that the attitude is indexed, the computer divides the total target area into segments. These plots represent the starting points for each mortar. The area between the plots is the area each mortar must cover with fire (Figure 13-3).

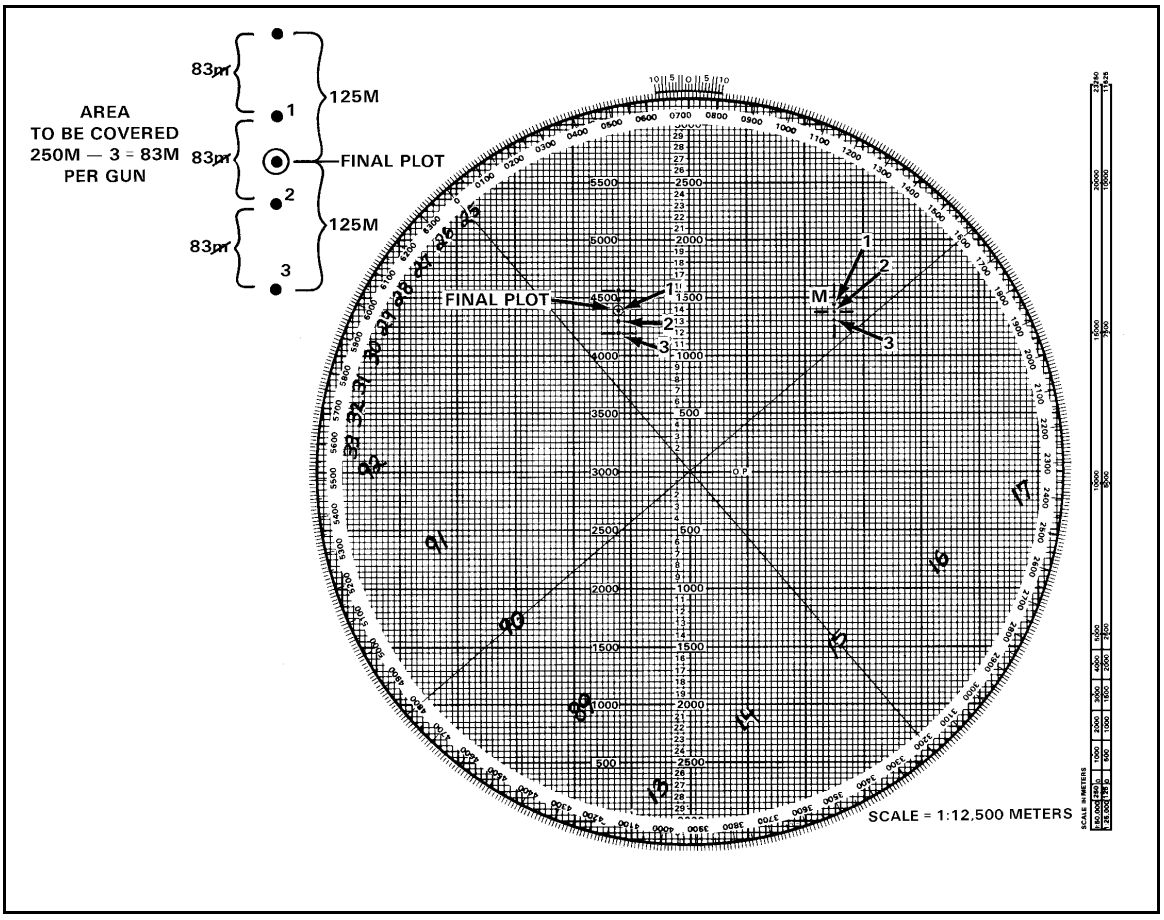

Figure 13-3. Plotting of starting points.

d. The target is now divided into three segments. Once the remaining data for one segment have been determined, the data will apply to all three mortars. Since each segment of the target is 75 meters, if the computer determines the mil width of one segment, the other two will be the same. The computer can use one of two methods to determine the number of mils for one segment.

(1) In the first method, the computer knows the deflection that was used to hit the No. 3 point. By aligning the No. 2 plot and No. 3 mortar, the computer can determine the deflection to fire to hit the start point for the No. 2 mortar (Figure 13-4). Subtracting these two numbers determines the mil width of the segment:

Number 3 plot deflection	2993 mils
Number 2 plot deflection	2942 mils
Mil width of segment	51 mils

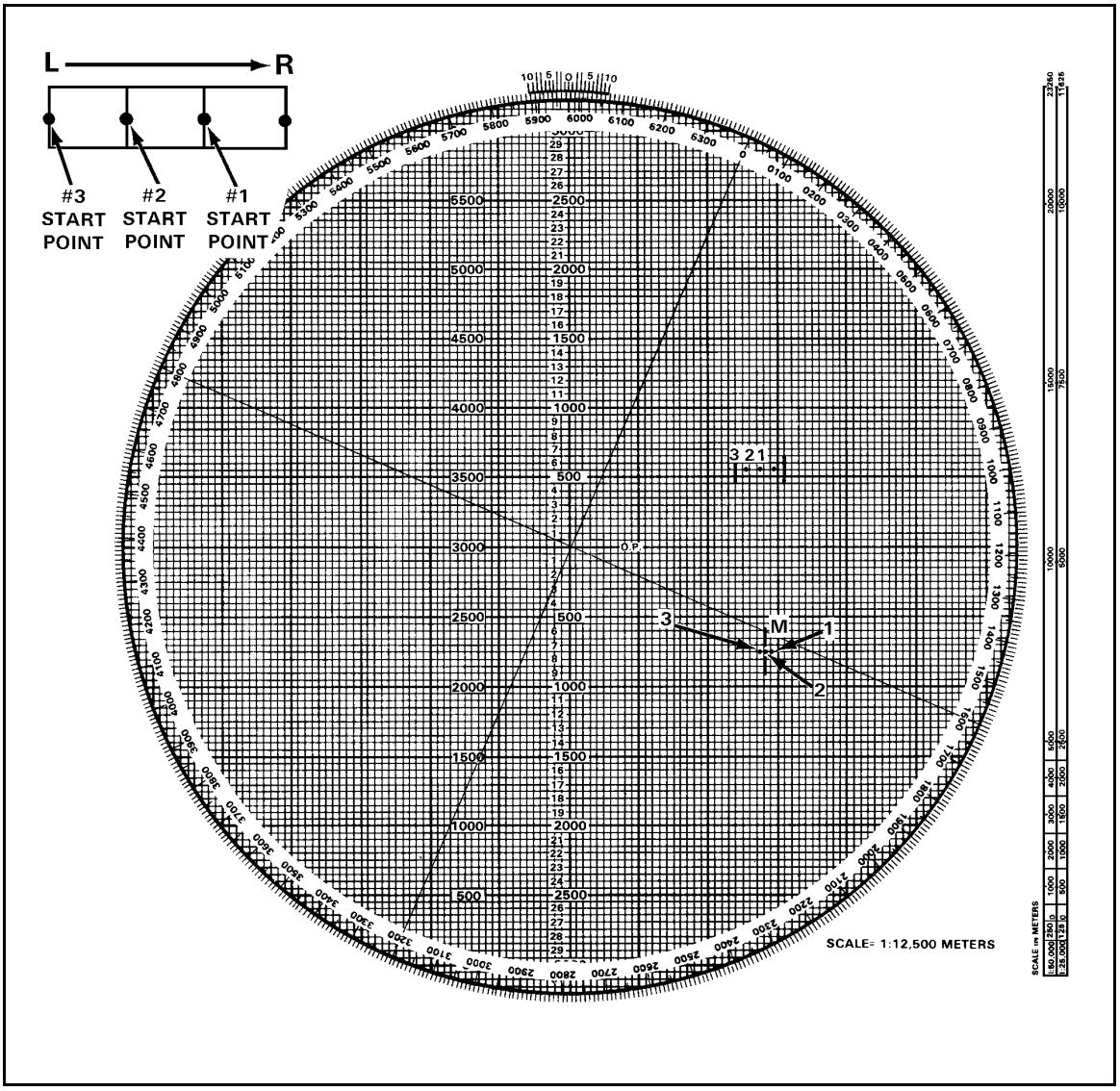

Figure 13-4. Alignment of No. 2 and No. 3 plots.

(2) The second method uses the DCT to determine the mil width of one segment. The computer enters the DCT at the final chart range that is rounded off to the nearest 100 meters. He goes across the deflection-in-meters line to the closest meters (75) to cover the segment. The point at which the range line and the deflection line meet is the number

of mils that will cover the segment. Each turn of the traversing handwheel is about 10 mils. By dividing the mil width of each segment (29) by 10, the computer obtains the total number of turns to cover the segment (round off to the nearest whole turn):

```
  2.9 = total turns each segment
10/29.0
  20
   9 0
   9 0
```

e. To compute the number of turns to take between rounds, the computer must know how many rounds will be fired for each segment. This information is given in the FDC order (3 rounds). To determine the turns between rounds, the computer divides the total turns by the interval between rounds (there will always be one less interval than the number of rounds: 3 rounds = 2 intervals).

```
  1.5 = 1 1/2 turns between rounds
2/3.0
  2
  1 0
  1 0
```

Turns between rounds are rounded to the nearest half turn. The number of rounds to fire is based on the rule: four rounds per 100 meters of target width, or one round per 30 meters.

f. At this point, the computer must determine the deflection and range for each mortar by aligning each mortar with its start point, completing the subsequent command, and issuing it to the mortar section. If there is a range change of 25 meters or more, the mortar will receive its own elevation.

g. Upon completion of the adjustment phase of the mission, the section is given the command PREPARE TO TRAVERSE RIGHT (LEFT). The gunners then traverse the mortars all the way in the direction opposite to that given, back off two turns, and await further instructions (Figure 13-5).

COMPUTER'S RECORD

For use of this form, see FM 23-91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
B Co 1/29 IN			D61	CA 0701

☐ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 038 629
OT DIRECTION: 2400
ALTITUDE: 420

SHIFT FROM:
OT DIRECTION: ALTITUDE:
☐ LEFT / ☐ RIGHT
☐ ADD / ☐ DROP
☐ UP / ☐ DOWN

POLAR:
OT DIRECTION: ALTITUDE:
DISTANCE:
☐ UP / ☐ DOWN
VERTICAL ANGLE ☐ + / ☐ –

TARGET DESCRIPTION: CIO 250 X 50 ATT 0720
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER

MORTAR TO FFE: Sec
MORTAR TO ADJ: #2
METHOD OF ADJ: 1 Rd
BASIS FOR CORRECTION:
SHEAF CORRECTION: Open
SHELL AND FUZE: HEQ in ADJ
PROX in FFE
METHOD OF FFE: 3 Rds
RANGE LATERAL SPREAD:
ZONE:
TIME OF OPENING FIRE: W/R

INITIAL CHART DATA

DEFLECTION: 0918
DEFLECTION CORRECTION:
☐ L ☐ R
RANGE:
VI/ALT CORRECTION:
☑ + ☐ – 20
RANGE CORRECTION:
☐ + ☐ – 0
CHARGE/RANGE: 5
AZIMUTH: 2320
ANGLE T: 80

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ
MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd
3 Rd PROX in FFE
DEFLECTION: 0918
CHARGE: 5
TIME SETTING:
ELEVATION: 0963

ROUNDS EXPENDED

① HE

OBSERVER CORRECTION			CHART DATA		SUBSEQUENT COMMANDS						ROUNDS EXPENDED
DEV	RANGE	TIME (HEIGHT)	DEFL	CHARGE (RANGE)	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV	
L120			0960	2750			0960			0963	② HE
	-100		0962	2650			0962			1010	③ HE
	-50	FFE	0963	2600	PREPARE TO TRAVERSE RIGHT						
					Sec	3 Rds PROX	TRAVERSE RIGHT 1½ TURNS				
							1) 0958	2625		1021	
							2) 0974	2600		1031	
							3) 1000	2575		1041	④ PROX

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Figure 13-5. Example of a completed DA Form 2399 for a completed mission.

13-2. SEARCHING AND ZONE FIRE

An area target having more depth than 50 meters can be covered by mortars by either elevating or depressing the barrel during the FFE. An area up to 50 meters can be covered by a section—three mortars firing four rounds on the same elevation and deflection—due to range and deflection dispersion. In the call for fire, the FO sends the size of the target and attitude since it is more area to cover than a section firing a parallel sheaf can engage. The FO gives the width and then depth of the attitude of the target. Attitude is the direction (azimuth) through the long axis of the target.

a. **Searching Fire**. For the mortar section to effectively engage a target using only searching fire, the attitude of the target cannot be more than 100 mils difference from the attitude of the gun section. If the difference is more than 100 mils, the target should be engaged using a combination of searching and traversing fire, or traversing fire only. When the section is firing a searching mission, the adjustment phase of the mission is the same as a regular mission using the base mortar (No. 2) as the adjusting mortar. The base mortar is adjusted to center mass of the target.

(1) Upon completion of the adjustment phase of the mission, the computer must compute the data to cover the target with fire. He must determine the number of rounds to cover the target, the turns required to cover the target, and the turns between rounds.

(2) With the target area given in the call for fire, the computer can determine the number of rounds needed to cover the target. When firing on a target using traversing or searching fire, the computer uses 4 rounds for every 100 meters of either target width or depth, or 1 round for every 30 meters. The computer must always consider the number of rounds on hand and the resupply rate when determining the number of rounds to fire.

EXAMPLE

Assume that the depth of the target is 350 meters. Multiply the even 100's by 4: 4 x 3 = 12. For the remainder of the target depth (50 meters), one round covers 30 meters, which would add one more round: 12 + 1 = 13 rounds. At this point, 20 meters of target is left. To cover the 20 meters, add one more round: 13 + 1 = 14 rounds to cover 350 meters).

(3) When determining the number of turns needed to cover the target, the computer can use one of two methods. If the computer is using the unabridged firing table (all escept for FT 4.2-K-2), the number of turns in elevation required for a 100-meter change in range is given in column 4 of Table D (basic data).

EXAMPLE

Assume that the target is 350 meters in depth, the range to the target center of mass is 2,125 meters (always use chart range), and the firing charge is 4. To determine the turns, determine the range to the center of mass of the target (2,125), enter the firing table at charge 4, range 2,125, and go across to column 4. Four turns are needed to cover 100 meters. Multiply 4 by 3.5 (range in hundreds): 4 x 3.5 = 14 turns to cover the target. The mortars are adjusted to center of mass. To obtain the range to the far edge (search up), add half the target area to the range to the center of mass.

EXAMPLE

The range to the center is 2,125 meters; target area is 100 meters by 350 meters; half of target depth is 350 divided by 2 = 175 meters; and the range to the far end is 2,300 meters. To search down, start at the near edge and subtract half the target depth from target center.

(4) Applying the second method, the computer must determine the mil length of the target by using the firing tables. He uses the elevation for the far end of the target (adjusting point) and the elevation to hit the near end of the target:

Range to adjusting point	2,300 meters	Elevation 974 mils
Range to near end	1,950 meters	Elevation 1128 mils

By subtracting the two elevations, the computer has the mil length of the target:

1128 mils
− 974 mils
Length of target 154 mils

(5) Each turn of the elevating crank is 10 mils (5 mils for the 120-mm mortar). Dividing the mil length of the target (154 mils) by 10 gives the computer the total turns to cover the target:

15.4 = 15 total turns to cover target.
10/154.0
10
54
50
40

NOTE: Table D (basic data) in all FTs (except for FT 4.2-K-2), column 4, gives the number of turns per 100 meters difference in range. Data may be used to determine the total turns to cover the target.

(6) To compute the number of turns to take between rounds, the computer must know how many rounds each mortar will fire. The computer computes this information or finds it in the FDC order (14 rounds). To determine the turns between rounds, he divides the total turns by the intervals between rounds (there will always be one less interval than the number of rounds: 14 rounds = 13 intervals).

1.15 = 1 turn between rounds
13/15.0
13
20

(7) The computer rounds turns to the nearest half turn. The number of rounds to fire is based on the rule: four rounds per 100 meters of target depth, or one round per 30 meters. At this point, the computer has all the information needed to complete the subsequent command. The command can then be issued to the mortars (Figure 13-6, page 13-10).

COMPUTER'S RECORD

For use of this form, see FM 23-91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
BCO 1/29 IN			E35	AL0015

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 149 908
OT DIRECTION: 5890
ALTITUDE:

SHIFT FROM:
OT DIRECTION: ALTITUDE:
☐ LEFT / ☐ RIGHT
☐ ADD / ☐ DROP
☐ UP / ☐ DOWN

POLAR:
OT DIRECTION: ALTITUDE:
DISTANCE:
☐ UP / ☐ DOWN
VERTICAL ANGLE ☐ + / ☐ –

TARGET DESCRIPTION: Supply Depot 100 x 350 ATT 5400
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec	DEFLECTION: 3472	MORTAR TO FOLLOW: Sec	
MORTAR TO ADJ: #2	DEFLECTION CORRECTION:	SHELL AND FUZE: HEQ	
METHOD OF ADJ: 1 Rd	☐L ☐R		
BASIS FOR CORRECTION:	RANGE: 2300	MORTAR TO FIRE: #2	
SHEAF CORRECTION:	VI/ALT CORRECTION:	METHOD OF FIRE: 1 Rd	
SHELL AND FUZE: HEQ	☐+ ☑– 30	14 Rds in FFE	(1)
	RANGE CORRECTION:	DEFLECTION: 3472	
METHOD OF FFE: 14 Rds	☐+ ☐–	CHARGE: 4	
RANGE LATERAL SPREAD:	CHARGE/RANGE: 4	TIME SETTING:	
ZONE:	AZIMUTH: 5440	ELEVATION: 0974	
TIME OF OPENING FIRE: W/R	ANGLE T: 450		

OBSERVER CORRECTION			CHART DATA		SUBSEQUENT COMMANDS						
DEV	RANGE	TIME (HEIGHT)	DEFL	CHARGE (RANGE)	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV	
L100	-100		3534	2250			3534	2250		1002	(2)
	-100		3558	2175			3558	2175		1039	(3)
	+50	FFE	3544	2200	Sec	Amc 14 Rds	3544	2375	(FAR EDGE)	0922	(45)
						SEARCH UP 1 TURN					

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Figure 13-6. Example of completed DA Form 2399 for a search mission.

(8) The only difference between a search UP mission and a search DOWN mission is the starting point. Normally, a search mission is fired by searching UP. This allows the FO to better observe the effect of the rounds on target as the rounds walk toward him (Figure 13-7).

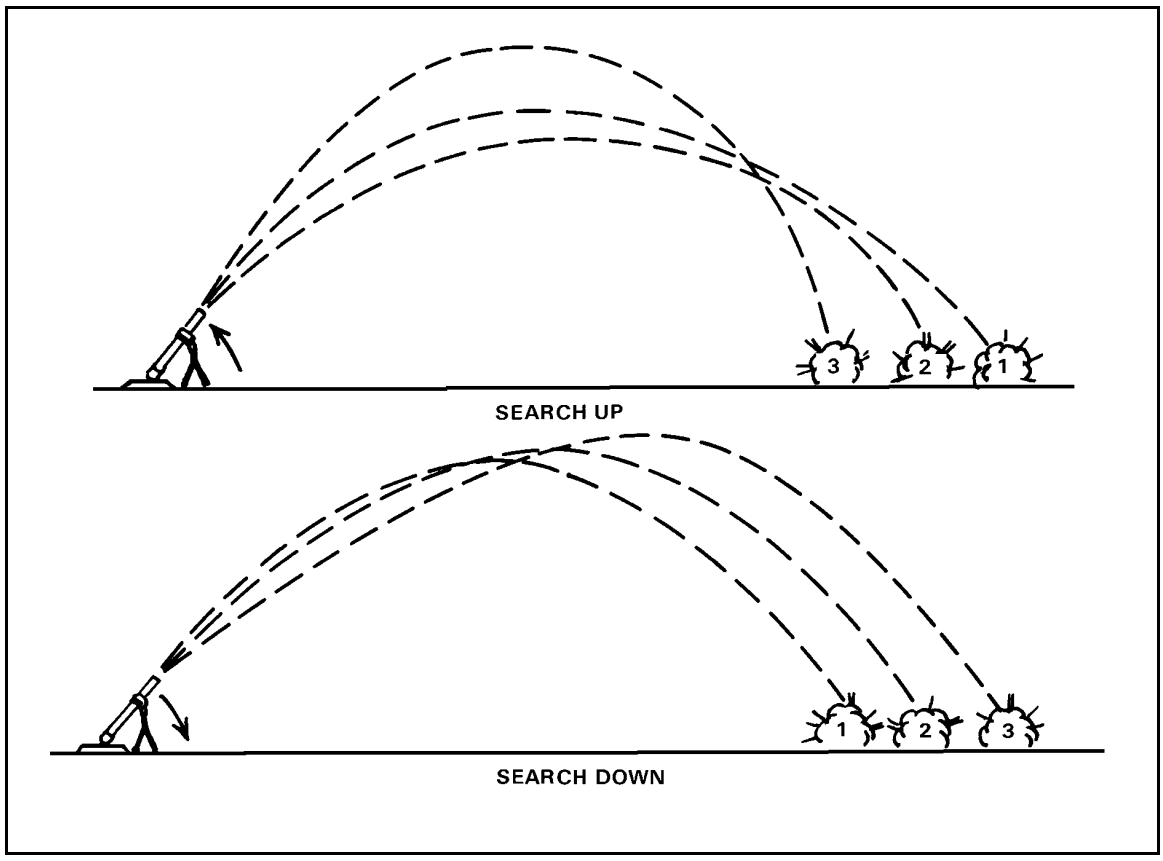


Figure 13-7. Fall of rounds during search mission.

b. **Zone Fire**. The 4.2-inch mortar does not fire a search mission the same as the 120-mm, 81-mm, 60-mm mortars. It does not have the same elevating characteristics as the other mortars; therefore, the 4.2-inch mortar uses zone fire when targets have more depth than a platoon/section can cover when firing a standard sheaf. The 4.2-inch mortar platoon/section usually fires two standard zones: a 100-meter zone (three rounds for each mortar) for a platoon-size target, and a 200-meter zone (five rounds for each mortar) for a company-size target.

NOTE: A larger zone can be covered by firing one round for every 50-meter increase in the target area.

(1) *Establishing the 100-meter zone.* Once FO gives the FFE, the computer proceeds as follows:

(a) Firing without extension (M329A1). Add and subtract 3/8 charge from the base command charge. (The base command charge is the command charge in the FFE center

mass of target.) This gives each mortar three rounds with a different charge on each to cover the 100-meter zone (Figure 13-8).

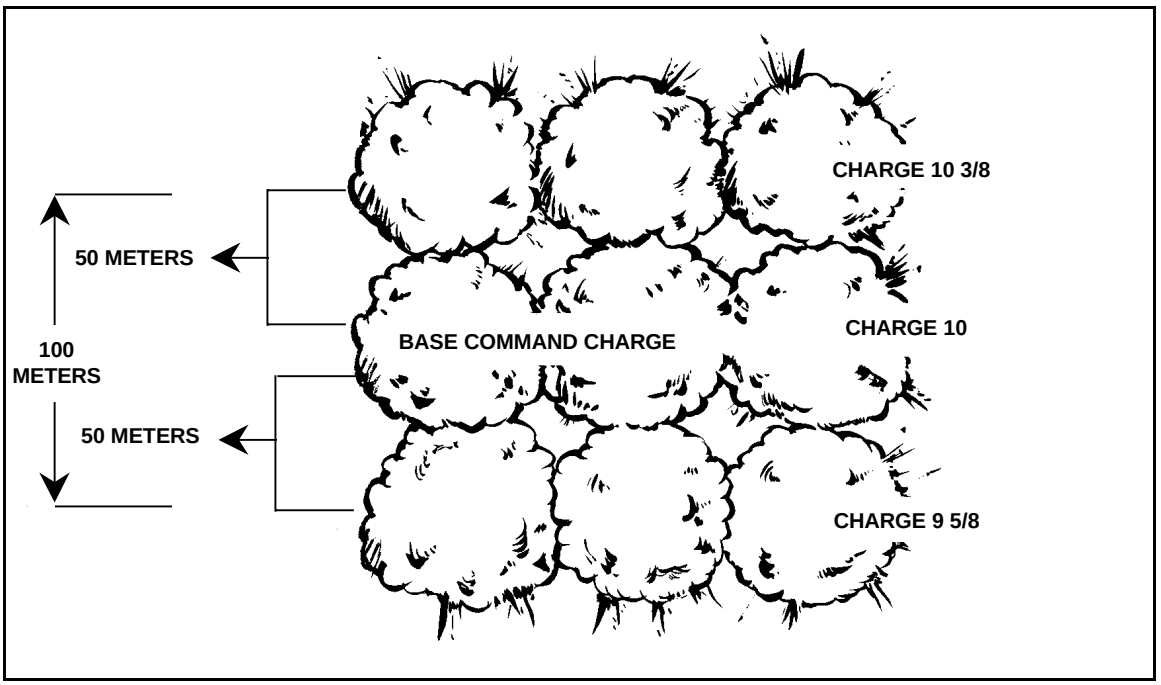


Figure 13-8. Firing without extension, 100-meter zone.

(b) Firing with extension (M329A1). Add and subtract 4/8 charge from the base command charge and use three rounds for each mortar.

NOTE: A 3/8 charge correction to any charge without extension moves the round about 50 meters at any elevation used. A 4/8 charge correction to any charge with extension moves the round about 50 meters at any elevation used.

(c) Firing with M329A2. Add and subtract 2/8 charge from the base command charge.

(d) Firing the 100-meter zone. Once the mortars are up (rounds set for proper charges) and the fire command is given, fix the rounds in any sequence—for example, No. 1 fires long, short, center mass; No. 2 fires center mass, short, long.

(2) *Establishing the 200-meter zone*. Once the FFE has been given by the FO, the computer proceeds as follows:

(a) Firing without extension. Add and subtract 3/8 charge from the base command charge for the rounds on either side of the base round and 6/8 charge for the long and short round (Figure 13-9).

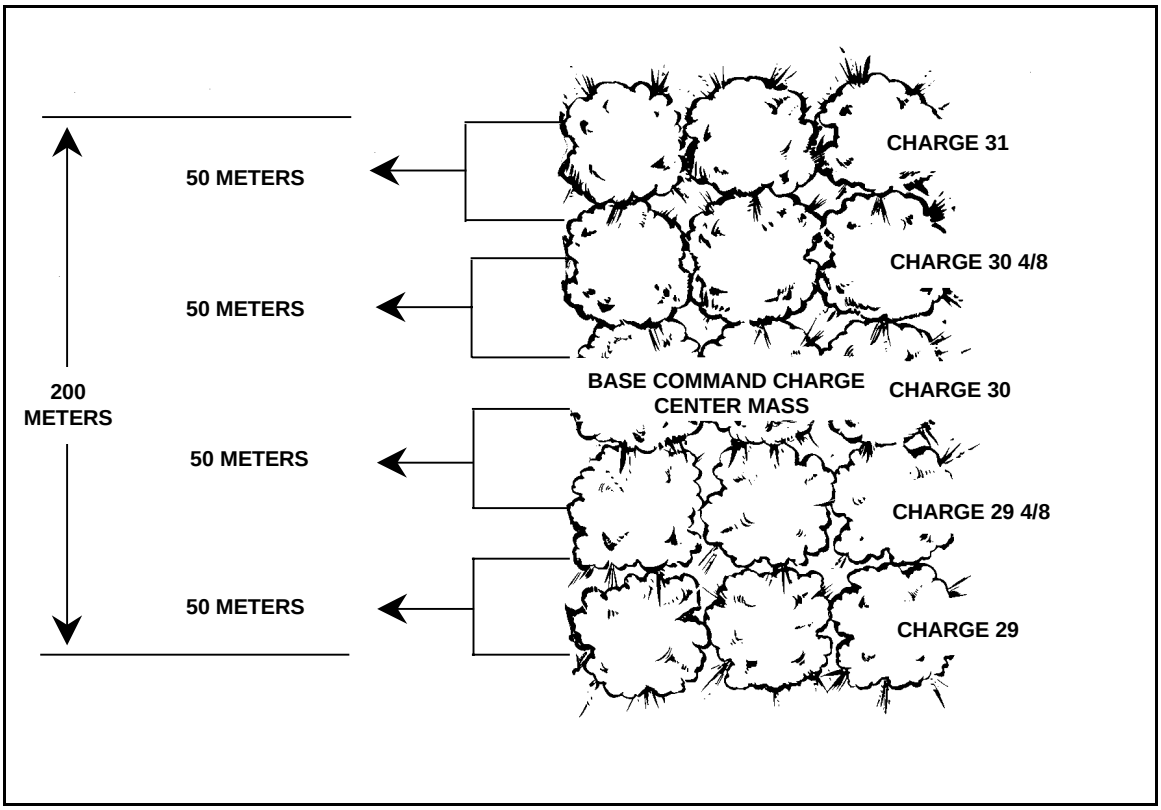


Figure 13-9. Firing without extension, 200-meter zone.

(b) Firing with extension. Add and subtract 4/8 charge from the base command charge for the rounds on either side of the base round and a whole charge for the long and short rounds.

(c) Firing with M329A2. Add and subtract 2/8 charge from the base command charge.

(d) Firing the 200-meter zone. Fire the rounds in any sequence.

13-3. ILLUMINATION

Illumination assists friendly forces with light for night operations. The M16/M19 can be set up for illumination as any one of the three types of firing charts. Determining firing data is the same as with any type of mission, only now the FDC uses one of the flank mortars to adjust the illumination, leaving the base mortar (No. 2) ready to adjust HE. The FO enters corrections for the illumination rounds in range—deviation not less than 200-meter corrections, and corrections for height (up/down) not less than 50-meter corrections.

a. **Observers**. Observers who are to adjust illumination should be informed when the 81-mm mortars are firing M301A3 illumination rounds. The M301A3 has an HOB of 600 meters, while the M301A1 and M310A2 rounds have 400-meter HOBs. There is a difference in adjustment procedure. The M301A1 and M301A2 rounds are adjusted to a ground-level burnout; the M301A3 round should have a burnout 150 to 200 meters above ground. This procedure is based on the fact that all three of the rounds fall at a rate of 6 mps (Table 13-2, page 13-14).

ROUNDS	RATE OF FALL (MPS)	BURN TIME (SECONDS)	HOB (METERS)	FALL BEFORE BURNOUT (METERS)
M301A1	6	60	400	6 X 60 = 360
M301A2	6	60	400	6 X 60 = 360
M301A3	6	60	600	6 X 60 = 360

Table 13-2. Example of adjustment of illumination.

b. **Corrections**. The ranges in the firing tables are in 50-meter increments. (Rule: Always round up, such as range 2,525 meters = 2,550 meters, to enter Part II of the firing tables.) Corrections to the HOB are obtained in columns 4 and 5. These corrections are used to move the round up or down in relation to the HOB line (Figure 13-10 and Figure 13-11, page 13-16).

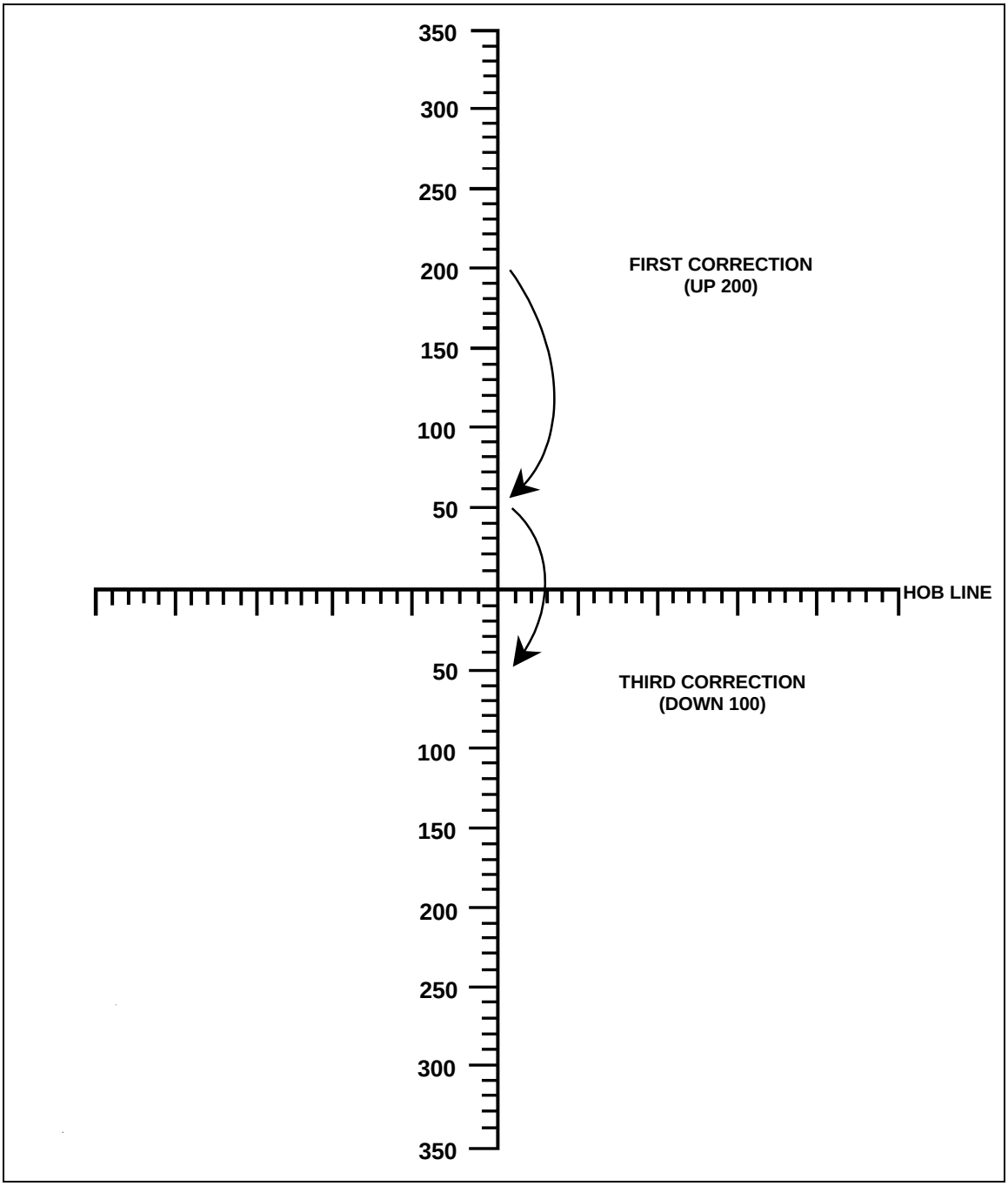
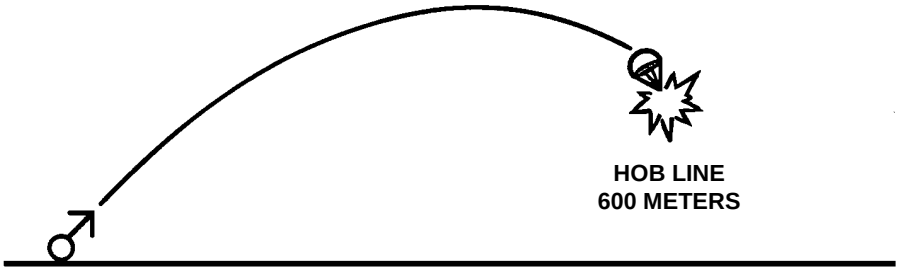


Figure 13-10. Height of burst corrections.



1	2	3	4	5	6	7
RANGE TO BURST	ELEV	FUZE SETTING	CHANGE IN ELEV FS FOR 50M INCREASE IN HEIGHT OF BURST		MAX ORD	RANGE TO IMPACT
M			MILS		M	M
1500	1320	32.1	-3	-0.4	1682	1642
1550 1600 1650	1309 1297 1286	32.0 31.9 31.8	-3 -3 -4	-0.4 -0.4 -0.4	1672 1661 1650	1689 1754 1810
1700	1274	31.6	-4	-0.4	1638	1866
1750 1800 1850	1263 1250 1238	31.5 31.3 31.1	-4 -4 -5	-0.4 -0.4 -0.4	1626 1613 1599	1922 1979 2036
1900	1225	31.0	-5	-0.4	1584	2093
1950 2000 2050	1212 1198 1184	30.8 30.6 30.3	-5 -6 -6	-0.5 -0.5 -0.5	1569 1553 1536	2150 2207 2265
2100	1170	30.1	-7	-0.5	1517	2324
2150 2200 2250	1155 1139 1122	29.8 29.6 29.3	-7 -8 -9	-0.5 -0.5 -0.6	1498 1477 1454	2383 2442 2503
2300	1104	29.0	-10	-0.6	1429	2564
2350 2400 2450	1085 1065 1042	28.6 28.2 27.7	-12 -13 -16	-0.6 -0.7 -0.8	1402 1372 1339	2626 2690 2755
2500	1017	27.2	-21	-0.9	1300	2824
2550 2600	987 948	26.5 25.6	-30	-1.2	1253 1190	2897 2980

Figure 13-11. Height of burst line 81-mm.

EXAMPLE

Chart range to the first round fired: 2,525 meters = 2,550 meters to enter the firing table (FT 81-A1-3).
Optimum charge to use: charge 8
Basic data, columns 1 (Range to Burst), 2 (Elevation) and 3 (Fuze Setting) to give the basic HOB for 600 meters above the mortar position:

Range to Burst = 2,550 meters
Elevation = 1107 mils
Fuze setting = 31.0

c. **Adjustments**. The round is fired and the FO sends: ADD TWO ZERO ZERO (200), UP ONE ZERO ZERO (100). The computed range is now 2,725 = 2,750 (Figure 13-12). The basic data only give an HOB of 600 meters, but the FO requested an UP 100, meaning that the round needs more height. To compute this change, the computer must determine where this round will be in relation to the HOB line: HOB = 600 meters; UP 100 is two increments above the HOB line. Once the number of increments has been determined, the computer goes to column 4 (change in elevation for 50-meter increase in HOB) and column 5 (changes in fuze setting for 50-meter increase in HOB), and multiplies the increments times the correction factors given in these columns.

EXAMPLE

Range to burst 2,750 meters, +2 increments
Column 4 = -14 x 2 increments
(100 mils above HOB) = -28 mils
Column 5 = -0.7 x 2 increments
(100 mils above HOB) = -1.4 seconds

(1) Once the corrections have been determined, apply those to the basic data (columns 2 and 3) to obtain the firing data for the next round.

EXAMPLE

Basic data: column 2 =	1034	(600 meters HOB)
	- 28 mils	(correction)
	1006	(elevation needed to fire)
column 3 =	29.5	(600 meters HOB)
	- 1.4	(correction)
	28.1	(time set needed to fire)

(2) Assume that the second round is fired and the FO sends: DOWN FIFTY (50). Note that a range change was not sent, but an HOB correction was sent. Again, determine the relation to the HOB line and apply the correction factors to the basic data to obtain the firing data.

EXAMPLE

Range to burst 2,750 meters, charge 8, down 50.
The computer is now working with one increment above the HOB line.
Increments (relationship to HOB, 600 meters)
1 x -14 (column 4) = -14
1 x -0.7 (column 5) = -0.7
New data:
1034 mils (basic data) -14 = 1020 mils elevation
29.5 (basic data) -0.7 = 28.8 fuze setting

(3) When the correction is below the HOB line, use the opposite sign of the sign found in columns 4 and 5 to obtain the same HOB. To compute the correction, assume that the chart range to burst is 1,550 meters and the optimum charge is 6. The first round is fired at an elevation of 1260 mils with a fuze setting of 29.0.

(4) The FO sends: DROP TWO ZERO ZERO (200), DOWN ONE FIVE ZERO (150). Assume that the new range is 1,325 meters (= 1,350), and the optimum charge is 5. The procedure for determining the increments is the same as with the last example: 600-meter basic HOB, down 150 = 3 increments below the HOB line.

(5) Determining the correcting factors is the same as before, except that when computing below the HOB line, reverse the signs since columns 4 and 5 are set up for increases in HOB.

3 x -8 (column 4) = -24 mils = +24 mils
3 x -0.6 (column 5) = -1.8 sec = +1.8 sec

Determining new firing data is the same as before.
Basic data:
1245 mils (column 2) +24 mils = 1269 mils elevation
25.9 (column 3) +1.8 sec = 27.7 fuze setting

(6) Assume that the second round is fired and the FO sends: DROP TWO ZERO ZERO (-200), and the new range is 1,150 meters. Note that a range change is given but not an HOB correction. When only a range change is sent, only the increments below the HOB line for the old range must be applied to the new range to keep the HOB correct. To determine the data, apply the steps as before:

Increments below HOB = 3
Correcting factors: 3 x -5 = -15 = +15 (sign reversed)
3 x -0.5 = -1.5 = +1.5 (sign reversed)
New data: 1309 mils + 15 mils = 1,324 mils elevation
26.6 + 1.5 = 28.1 fuze setting

FT 81-A1-3

CHARGE 8

CTG, ILLUMINATING, M301A3
FUZE, TIME, M84A1

1	2	3	4	5	6	7
RANGE TO BURST	ELEV	FUZE SETTING	CHANGE IN ELEV | FS FOR 50M INCREASE IN HEIGHT OF BURST		MAX ORD	RANGE TO IMPACT
M	MILS		MILS		M	M
1500	1351	34.6	-2	-0.4	1903	1621
1550	1342	34.5	-2	-0.4	1895	1675
1600	1332	34.4	-2	-0.4	1886	1730
1650	1322	34.3	-3	-0.4	1876	1784
1700	1313	34.2	-3	-0.4	1866	1839
1750	1303	34.1	-3	-0.4	1856	1894
1800	1293	34.0	-3	-0.4	1845	1949
1850	1282	33.8	-3	-0.4	1834	2004
1900	1272	33.7	-3	-0.4	1822	2060
1950	1261	33.6	-3	-0.4	1809	2115
2000	1250	33.4	-4	-0.4	1796	2171
2050	1239	33.3	-4	-0.4	1782	2226
2100	1227	33.1	-4	-0.4	1768	2282
2150	1216	32.9	-4	-0.4	1753	2338
2200	1204	32.7	-5	-0.4	1737	2395
2250	1191	32.5	-5	-0.4	1720	2451
2300	1179	32.3	-5	-0.5	1703	2508
2350	1165	32.1	-6	-0.5	1684	2565
2400	1152	31.9	-6	-0.5	1664	2623
2450	1137	31.6	-7	-0.5	1643	2681
2500	1123	31.3	-7	-0.5	1621	2739
2550	1107	31.0	-8	-0.5	1597	2798
2600	1091	30.7	-9	-0.6	1571	2858
2650	1073	30.4	-10	-0.6	1543	2919
2700	1054	30.0	-12	-0.6	1512	2981
2750	1034	29.5	-14	-0.7	1478	3045
2800	1011	29.0	-17	-0.8	1439	3110
2850	985	28.4	-22	-1.0	1394	3179
2900	953	27.6	-34	-1.3	1337	3253
2950	907	26.5			1254	3342

Figure 13-12. FT 81-A1-3, charge 8, used in determination of location of round in relation to the height of burst.