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## CHAPTER 8

# FIRE WITHOUT A FIRE DIRECTION CENTER

*The use of the target-grid method of fire control may not always be possible or desirable for placing fire on a target. Communications failure, casualties from enemy fire, lack of equipment, or the tactical situation may require that one or more mortars be employed without an FDC.*

### Section I. FIRE PROCEDURES

When the squads are under squad control, the FO or squad leader observes the target area, and adjusts and controls the fire by commands that are sent directly to the mortar crew. Employment of mortars without an FDC is only temporary--the FDC should be established as soon as possible.

#### 8-1. ADVANTAGES AND DISADVANTAGES

Some of the advantages and disadvantages of operating without an FDC are discussed herein.

a. Advantages of operating without an FDC include:

- Speed in engaging a target.
- Better response to commanders.
- Fewer requirements for personnel and equipment.

b. Disadvantages of operating without an FDC include:

- The limited movement capability of the FO.
- The difficulty of massing or shifting fires on all targets within the range of the mortar.
- The necessity of locating the mortar position too far forward, where it is subject to enemy fire delivered on the friendly frontlines.
- Greater ammunition resupply problems.

#### 8-2. FIRING DATA

The direct-alignment or direct-lay methods can be used to lay the mortar for direction. Initial range can be determined by--

- Eye estimation.
- Map, photographic map, or aerial photograph.
- Mil-relation formula.

### 8-3. OBSERVER CORRECTIONS

In fire without an FDC, the FO makes corrections differently than when operating with an FDC. He makes all his deviation corrections with respect to the gun-target (GT) line rather than with respect to the observer-target (OT) line. All deviation corrections are sent in mils or turns of the traversing handwheel.

**a. Forward Observer Within 100 Meters of Mortar Position.** The best FO location for rapid fire adjustment on the mortar is at the mortar position.

(1) The tactical employment of the mortar usually requires the FO to be in a position other than at the mortar. However, if the FO is located within 100 meters of the mortar position, the deviation error he reads in his binoculars can be applied directly to the sight without computation. This is true because the angle between the observer-burst line and OT line is equal to the angle between the mortar-burst line and GT line. Any slight difference between these two angles is compensated for by the inherent dispersion of the weapon and the bursting area of the round.

(2) For example, if the FO from a position within 100 meters of the mortar location observes the burst to the left of the target and reads that it is 40 mils left on the mil scale of his binoculars, he orders a correction of RIGHT FOUR ZERO. This correction is sent to the mortar in mils and is not converted to meters. The gunner applies this correction directly to the previous deflection setting using the LARS (left add, right subtract) rule.

**b. Forward Observer More Than 100 Meters From Mortar Position.** The FO cannot always be located within 100 meters of the mortar position.

(1) When the FO cannot locate within 100 meters of the mortar position, he must be within 100 meters of the gunXtarget line (Figure 8-1). This might prevent him from visualizing the gun-target line and getting within 100 meters of it. If the FO is attacking targets over a wide frontage, he would be required to move often but with limited movement. Therefore, the angle that exists between the mortar-burst line and GT line is not equal to the angle that exists between the observer-burst line and OT line--computations must be made to correct these differences.

(2) For example, if the FO is halfway between the mortar and target, the correction to be made on the sight is one-half his deviation spotting; if the mortar is half-way between the FO and the target, the correction is twice his deviation spotting. As other distances give other ratios, a correction factor must be applied to the number of mils spotted before ordering a deflection change. This factor is a fraction, the numerator of which is the OT distance and the denominator of which is the GT distance.

#### EXAMPLE:

If the distance from the FO to the target is 1,000 meters, the GT distance is 1,200 meters, and the deviation of the burst from the target, as read by the FO, is 60 mils (Figure 8-1), the correction is--

$$\frac{1,000}{1,200} \text{ (or } \frac{5}{6}) \times 60 \text{ mils} = 50 \text{ mils}$$

In applying this factor, simplicity and speed are important. The distances used should be to the nearest 100 meters.

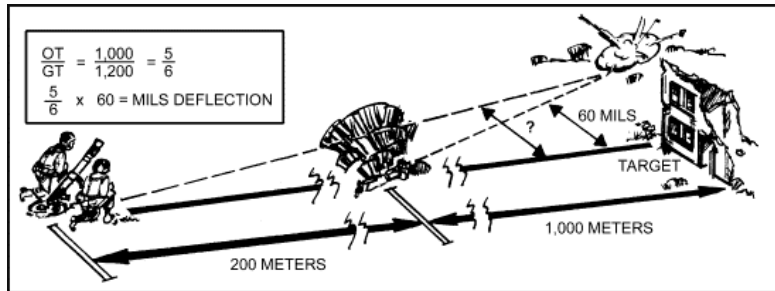


Figure 8-1. Observer more than 100 meters from mortar but within 100 meters of GT line.

#### 8-4. INITIAL FIRE COMMANDS

Initial fire commands contain the necessary data to lay the mortars and fire the first round. The sequence for transmission of the initial fire command is as follows:

- Mortars to follow.
- Type of projectile and fuze.
- Mortars to fire.
- Method of fire.
- Deflection.
- Charge.
- Time setting.
- Elevation.

#### 8-5. FIRE COMMANDS

Fire commands originate with the squad leader at the observation post when mortars are employed without an FDC.

a. **Normal Fire Commands.** The commands used in observed fire procedures without an FDC follow the procedure outlined above with the following exceptions:

(1) *Direction.* When operating without an FDC, the FO gives the direction as a shift from a known point (normally the registration point) in the initial fire command. In subsequent commands, he gives the deflection correction from the last round fired. For example, during an adjustment the FO requests moving the next burst right 50 mils. Regardless of the sight setting, his command for deflection is RIGHT FIVE ZERO. The gunner applies the LARS rule to obtain the deflection to be placed on the sight. The sight has a deflection setting of 20 mils; therefore, the gunner subtracts 50 mils from 20 mils and obtains the new sight setting of 3150 mils. Normally, when the registration has been completed, the aiming posts are placed out on a referred deflection.

(2) *Elevation (range).* The FO may refer to a firing table, determine the charge and elevation (in mils) corresponding to the GT range, and announce this charge and elevation in his fire command. He may, however, announce the range in meters and have the gunner refer to a firing table to determine the charge and elevation.

b. **Modified Fire Commands.** Modified fire commands differ from normal fire commands only in that the deflection and elevation changes in subsequent commands are given as turns of the traversing handwheel and elevating crank.

(1) The advantages of modified fire commands are speed and simplicity of execution by the gunner. One turn of the traversing handwheel is equal to about 10 mils of deflection, and unabridged firing tables have a column for the number of turns of the elevation crank to change the range 100 meters. When using modified fire commands, deflection and elevation changes are computed to the nearest quarter turn. When the FO anticipates using modified fire commands involving turns of the elevating crank, he is required to announce the range element of the initial fire command as a charge and elevation. This ensures that the FO and gunner are working in the same charge zone, since the number of turns required to move the burst of a round a given distance on the ground can vary considerably between two charge zones.

(2) The gunner lays the mortar for direction and elevation as given in the initial fire command; he does not need to refer to a firing table. Following the initial fire command, the gunner makes no attempt to align the sight on the aiming point or to level the elevation bubble. He makes the corrections by taking the turns given in the subsequent commands and keeping the cross-level bubble centered. If the gunner can no longer traverse in the desired direction, he should be able to align the sight on the aiming point,

to center the traversing bearing, to relay on the aiming point, and to resume traverse.

(3) In computing the number of turns of the elevation crank between two elevations in mils (taken from the firing table), the FO subtracts the smaller elevation from the larger and divides by 10 (one turn of the elevating crank being equal to about 10 mils of elevation). In the ladder method and bracketing method of adjustment for range, once the FO has obtained a bracket on the target, he does not need the firing table. He continues the adjustment by halving the number of turns of the elevating crank that established the preceding bracket.

**EXAMPLE:**

<b>MODIFIED FIRE COMMANDS</b>	<b>NORMAL FIRE COMMANDS</b>
RIGHT FOUR TURNS	RIGHT FOUR ZERO
DOWN NINE TURNS	ONE SEVEN ZERO
LEFT TWO TURNS	ZERO
UP FOUR AND ONE- HALF TURNS	LEFT TWO ZERO
RIGHT ONE TURN	ONE SIX ZERO ZERO
DOWN TWO TURNS	
THREE ROUNDS	RIGHT ONE ZERO
UP ONE TURN	ONE SIX FIVE ZERO
	THREE ROUNDS
	ONE SIX TWO FIVE

In this example, the first round burst between the FO and target. In a different example, assume that the first round was fired at a range of 900 meters and burst beyond the target. The FO wants to DROP ONE ZERO ZERO (100) for the next round and gives a modified fire command in turns of the elevating crank. Using charge 1, the elevation for the first round at 900 meters is 1275 mils. The elevation for a range of 800 meters is 1316 mils. Subtracting 1275 mils from 1316 mils gives a difference in elevation for the two ranges of 41 mils, or 4 turns. Therefore, the subsequent command to fire the second round is UP FOUR TURNS. The second round now bursts short of the target, establishing a bracket. The FO desires to split the bracket and commands, DOWN TWO TURNS, or one-half the number of turns that he previously gave to bracket the target. With this command, the FO is splitting a 100-meter bracket and could specify an FFE if he was engaging a tactical area target.

## **8-6. FIRE CONTROL**

The FO controls the fire from an observation post, issuing fire commands directly to the mortar crew. He may select an OP close enough to the mortar so that he can give his fire commands orally to the mortar crew. When the OP is not close to the mortar position, the FO uses a telephone or radio to transmit fire commands.

## **8-7. MOVEMENT TO ALTERNATE AND SUPPLEMENTARY POSITIONS**

When time or the situation dictates, the mortar may be moved to both alternate and supplementary positions, and registered on the registration point, final protective fire (in the defense), and as many targets as possible.

## **8-8. SQUAD CONDUCT OF FIRE**

Conduct of fire includes all operations in placing effective fire on a target--for example, the FO's ability to open fire when he desires, to adjust fire, to determine the distribution of fire upon the target, to shift fire from one target to another, and to regulate the kind and amount of ammunition expended. Quick actions and teamwork of squad members are required.

- a. The normal sequence of instruction is on the 1,000-inch range, followed by the training shell range, and, finally, in the field with practice or combat ammunition.
- b. To ensure maximum efficiency, each squad member is acquainted with the principles of technique of fire for each type of adjustment and FFE. Frequent rotation of duty helps squad members to better understand this technique of fire. The FO is trained in all methods and techniques used in bringing effective fire on a target as quickly as possible.

## **8-9. REFERENCE LINE**

The normal method of establishing initial direction when operating without an FDC is the direct-alignment method. After the initial direction has been established, the FO should conduct a registration on his registration point using only the direction stake as a reference point. After registration is completed, a reference line should be established by placing out aiming posts on a referred deflection, which then becomes the registration point or base deflection.

## **8-10. FIRE ADJUSTMENT**

The FO normally adjusts fire by the bracketing or creeping method. He makes his spottings and gives his corrections with respect to the OT line. An off-line burst is brought to the OT line by applying a correction, which is determined by multiplying the observed deviation in mils by the estimated OT distance in thousands of meters (the deflection conversion table may also be used to determine this correction). The deviation

correction is sent to the FDC as RIGHT or LEFT. Bursts are kept graphically on the OT line by the FDC. The FO sends range corrections in meters to the FDC. When using the bracketing method of adjustment, the FO determines range corrections along the OT line by seeking an initial range bracket and thereafter successively splitting the bracket until the correct range is determined. When using the creeping method, the FO proceeds as discussed in Section IV.

#### 8-11. SQUAD USE OF ILLUMINATION AND SMOKE

Illumination is designed to assist friendly forces with light for night operations. Smoke is used to obscure the enemy's vision for short periods.

a. **Use of Smoke.** After careful evaluation of the terrain and weather, the FO locates a point on the ground where he wishes to place a flank on his screen. For example, if a flanking wind prevails, the FO normally locates the point of impact in front of the target and upwind. If necessary, the FO adjusts fire to determine the correct location of this point. For a screening mission, splitting a 100-meter bracket is normally sufficient.

b. **Use of Illumination.** Control over the use of infantry mortar illuminating rounds is exercised by the battalion commander after coordination with adjacent units through the next higher headquarters. The correct relative position of the flare to the target depends upon the wind and terrain. The point of burst is so placed as to give the most effective illumination on the target and to make sure that the final travel of the flare is not between the FO and target. It is not necessary to adjust the round directly over the target due to the wide area of illumination.

(1) If there is a strong wind, the point of burst must be placed some distance upwind from the target so the flare drifts to the target location. The flare should be slightly to one flank of the target and at about the same range. When the target is on the forward slope, the flare is placed on the flank and at a slightly shorter range.

(2) For adjustment on a prominent target, better visibility is obtained by placing the flare beyond the target to silhouette it and to prevent adjustment on the target's shadow. When firing continuous illumination, a strong wind can decrease the time interval between rounds. For maximum illumination, the flare is adjusted to burn out shortly before reaching the ground.

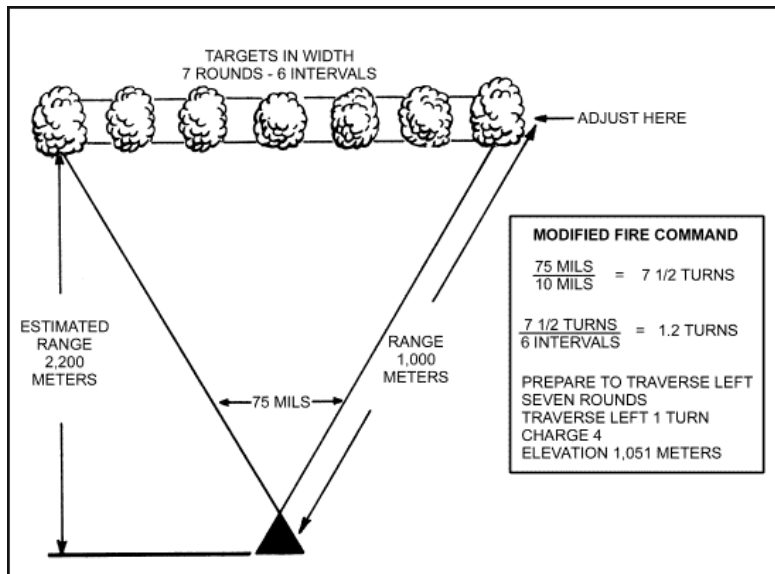
#### 8-12. ATTACK OF WIDE TARGETS

To attack wide targets, the FO must use distributed FFE. In distributed FFE, the gunner fires a specified number of rounds but manipulates the mortar for range or deflection between each round. Distributed fire on wide targets is called *traversing fire*. To place

traversing fire on a target, the FO must adjust fire on one end of the target, normally the end nearest to a known point.

- a. After adjustment, the FO determines the width of the target in mils by using the mil scale in the binoculars, or by reading an azimuth to each end and subtracting the smaller from the larger. He then divides the mil width by 10, which is the number of mils that one turn of the traversing handwheel moves the mortar. This determines the number of turns needed to traverse across the target (computed to the nearest one-half turn).
- b. In computing the number of rounds, the FO divides the width of the target by the bursting area of the round. He then divides the total number of turns by the number of intervals between the rounds to be fired to determine the number of turns between rounds (computed to the nearest one-half turn). There will always be one less interval than the number of rounds fired in the FFE phase.
- c. After adjustment and before issuing the subsequent fire command, the FO must tell the gunner to prepare to traverse right or left. The gunner traverses the mortar all the way in the direction commanded and then back two turns (four turns on M120) on the traversing handwheel. With the aid of the assistant gunner, the gunner moves the bipod legs until he is approximately re-laid on his aiming posts. Using the traversing mechanism, the gunner then completes realigning the mortar and announces, "Up."
- d. When the mortar is laid, the FO issues his subsequent fire command, announcing the number of rounds to be fired and the amount of manipulation between each round.
- e. In Figure 8-2, the FO measures the width of his target to be 75 mils. Using a map, he estimates the range to be 2,200 meters. Using the mil relation formula, he determines the width of the target to be 165 meters and decides to attack the target with seven rounds. There will be six intervals between the seven rounds. Since the target is 75 mils wide, he determines the number of turns to be  $7 \frac{1}{2}$  turns. To determine the number of turns between rounds, he divides the number of turns by the number of intervals ( $7 \frac{1}{2}$  divided by 6 = 1.07). This is rounded off to the nearest one-half turn (1 turn).



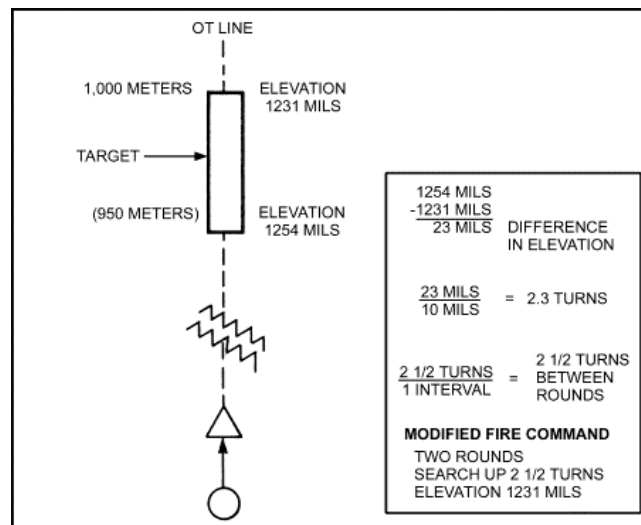


**Figure 8-2. Traversing fire.**

**Note:** When determining the rounds for FFE, the FO applies the following rule: one round for each 30 meters and four rounds for each 100 meters.

### **8-13. ATTACK OF DEEP TARGETS**

The FO uses searching fire to place effective fire on deep targets (Figure 8-3). To engage a deep target, the FO must adjust on one end of the target, normally the far end. When the FO anticipates using searching fire, he announces the range as a charge and elevation. (See FM 23-91 for information on zone fires.)



**Figure 8-3. Searching fire.**

- After adjustment is completed on one end of the target, the FO estimates the range to the other end of the target. Use of the firing table determines the number of turns of the elevating crank needed to change the range 100 meters. If the FO does not have this information, he can decide the number of turns by determining the difference in elevation in mils that exists between the two ranges. He divides this difference by 10 to determine the number of turns needed on the elevating crank to cover the target.
- The FO must then determine the number of rounds to be fired. Usually five rounds covers an area 100 meters deep, except at long ranges where dispersion is greater. Once he has determined the number of rounds to be fired, he determines the number of intervals between rounds. There will *always* be one less interval than the number of rounds fired.
- The FO then divides the total number of turns required by the total number of intervals to determine the number of turns the gunner must make between each round (compute to the nearest one-half turn).

**EXAMPLE:**

If the FO has adjusted to the far end of the target and found it to be 1,000 meters, he estimates the near edge of the target to be 950 meters. By using the firing table, he determines that he must make

five turns of the elevating crank to change the range 100 meters. Since the FO only wants to make a 50-meter change, he makes only half of the turns, which is 2 1/2 turns. If he did not have this information, he would determine that there is a 23-mil difference in elevation for the two ranges (elevation 1231 mils for range 1,000 meters, and elevation 1254 mils for range 950) and, by dividing by 10, that it would require two turns of the elevating crank.

The FO has determined that he will use three rounds to attack the target. There will be one interval between the two rounds fired. Then the FO divides the total number of turns required by the number of intervals, and rounds off the answer to the nearest one-half turn.

$$2 \frac{1}{2} \div 1 \text{ (interval)} = 2 \frac{1}{2} \text{ turns between rounds}$$

The FO is now ready to send the subsequent fire command to the gunner. The commands are:

TWO ROUNDS  
SEARCH UP TWO AND ONE-HALF TURNS  
ELEVATION ONE TWO THREE ONE (1231)

The gunner is told to search in the direction that the barrel moves. For this example, the barrel moves from 1231 mils to 1254 mils of elevation; therefore, the command is SEARCH UP.

## **Section II. DIRECT-LAY METHOD**

In the direct-lay method of emplacing a mortar, the gunner sees the target through the mortar sight. No directional or aiming posts, FO, or FDC is used. The firing table should be used to try to obtain a first-round hit. If the first-round hit is not achieved, the firing table should be used to obtain a bracket. Depending on the location of friendly troops to the target, the bracket method, modified ladder method, or creeping method of adjustment apply.

### **8-14. STEP 1: INITIAL FIRING DATA**

The elevation setting and charge selected should be obtained from a firing table. In the absence of a firing table, they can be determined through unit SOP or by other expedient techniques such as memorizing charge and elevation for 1,000, 2,000, and 3,000 meters; and firing with the charge and elevation setting closest to the estimated target range.

- a. Determine initial range by--

- Estimating.
- Using maps, photographic maps, and so on.
- Intersecting.

**Note:** When using the 4.2-inch mortar, the gunner must add drift to the sight after laying on the center of the target.

b. Place a 3200-mil deflection on the sight, and lay on the center of the target. With the appropriate elevation setting on the sight, center all bubbles by adjusting the lay of the barrel. Take appropriate actions to preclude damage to the sight and, with established charges, fire the first round. Replace the sight, if needed, and observe the burst of the round.

#### **8-15. STEP 2: REFERRING THE SIGHT**

Referring the sight centers the vertical line of the sight reticle on the burst.

- If the burst is over the target, turn the elevating crank up 4, 8, or 16 turns (8, the median, gives a significant change without becoming extreme), depending on the gunner's sensing of the round, range to the target, and other possible factors. If the burst is short, turn the elevating crank down 4, 8, or 16 turns.
- Turn the sight elevation micrometer knob to center the elevation bubble. (If the deflection change requires a bipod displacement, the desired range change is maintained.)
- Re-lay the barrel on center of target (centering both bubbles by adjusting the barrel. Fire the second round and observe the burst.

**Note:** Any alternate method of correction for range is to use the firing table.

#### **8-16. STEP 3: BRACKETING THE TARGET**

If the second round is a line shot and brackets the target, the bracket is split by changing the elevation of the barrel half the number of turns used in STEP 2. (If in STEP 2 the barrel was cranked up eight turns, now crank down four.) The third round is fired.

- If the second round is not a line shot but does bracket the target, refer the sight to center of burst and split the bracket by changing the elevation of the barrel half the number of turns used in STEP 2. Change the sight to the center elevation bubble, and then re-lay the barrel on center of target (centering both bubbles by changing the lay of the barrel).
- If the second round is not a line shot and does not bracket the target, repeat STEP 2 until a bracket is obtained.

#### **8-17. STEP 4: FIRE FOR EFFECT**

The appropriate actions of STEP 3 are repeated until an effect on the target is seen, then mortars fire for effect.

- a. After obtaining hits, change the sight to center the elevation bubble and vertical line of the sight reticle on the target, then record these data. Number the target and retain the number along with appropriate firing data. The mortar can be taken out of action, moved a short distance, and placed back into action with the mortar able to quickly and accurately attack the recorded target or other close targets.
- b. If fired upon during any of the above steps, the mortar can be displaced 75 to 100 meters with minimal effect on the fires as long as the elevation setting for the last round fired has been recorded or memorized. Once in the new position, use the recorded/memorized data as a starting point and then complete the interrupted step.

### **Section III. DIRECT-ALIGNMENT METHOD**

When the FO/squad leader prepares the initial firing data, he uses the quickest and simplest method available. Initial data consist of a direction of fire and mortar-target range.

#### **8-18. MORTAR DISMOUNTED**

If the mortar is dismounted, the squad leader moves to a vantage point where he can see the targets and places out an aiming post. He directs a member of the mortar squad to place out a second aiming post (to be used as a baseplate assembly stake), aligning it with the first aiming post and target. The mortar crew mounts the mortar at the baseplate assembly stake, places 3200 mils deflection on the sight, and traverses the mortar, aligning the sight on the aiming post placed out by the squad leader. The gunner uses this aiming post as an aiming point or he may place out other aiming posts to be used as aiming points.

#### **8-19. MORTAR MOUNTED**

If the mortar is mounted, the squad leader moves to a vantage point on a line between the mortar and target. He places out an aiming post (direction stake) on which the gunner lays the mortar with the deflection set at 3200. The gunner uses this aiming post as an aiming point or he may place out other aiming posts to be used as aiming points.

**Note:** The squad leader can also move to a vantage point behind the gun.

#### **8-20. NATURAL OBJECT METHOD**

When the tactical situation does not permit alignment of aiming posts and the mortar is rapidly placed into action, the squad leader can establish the mounting azimuth as follows: He selects an object with a clearly defined vertical edge that is situated in the general direction of fire. He directs the gunner to mount and lay the mortar on the edge of this object with the deflection scale set at 3200 mils. By using the aiming point as a reference point, he can place fire on a target to the right and left by determining the angle in mils between the aiming point and target. He directs the gunner to place the corresponding deflection on the mortar using the LARS rule.

#### **Section IV. ADJUSTMENT OF RANGE**

The normal procedure for the adjustment of range is the establishment of a bracket along the OT line. A bracket is established when one group of rounds falls over and one group of rounds falls short of the adjusting point. The FO must establish the bracket early in the adjustment and then successively decrease the size of the bracket until it is appropriate to enter FFE.

#### **8-21. RANGE SPOTTINGS**

Definite range spottings are required to make a proper range adjustment. Any range spotting other than DOUBTFUL or LOST (UNOBSERVED) is definite.

a. Definite range spottings include:

- A burst or group of bursts on the OT line.
- A burst(s) not on the OT line by using a knowledge of the terrain, drifting smoke, shadows, and wind; caution and good judgment are required.
- The location of the burst fragmentation pattern on the ground.

b. Possible range spottings include:

- (1) *Over*. A burst that appears beyond the adjusting point.
- (2) *Short*. A burst that appears between the FO and adjusting point.
- (3) *Target*. A round that bursts within the target area.
- (4) *Range correct*. A burst or center of a group of bursts that is at the proper range.
- (5) *Doubtful*. A burst that can be observed but cannot be determined as over, short, target, or range correct.
- (6) *Lost over (short)*. A burst that is not observed but known to be definitely beyond or short of the adjusting point.

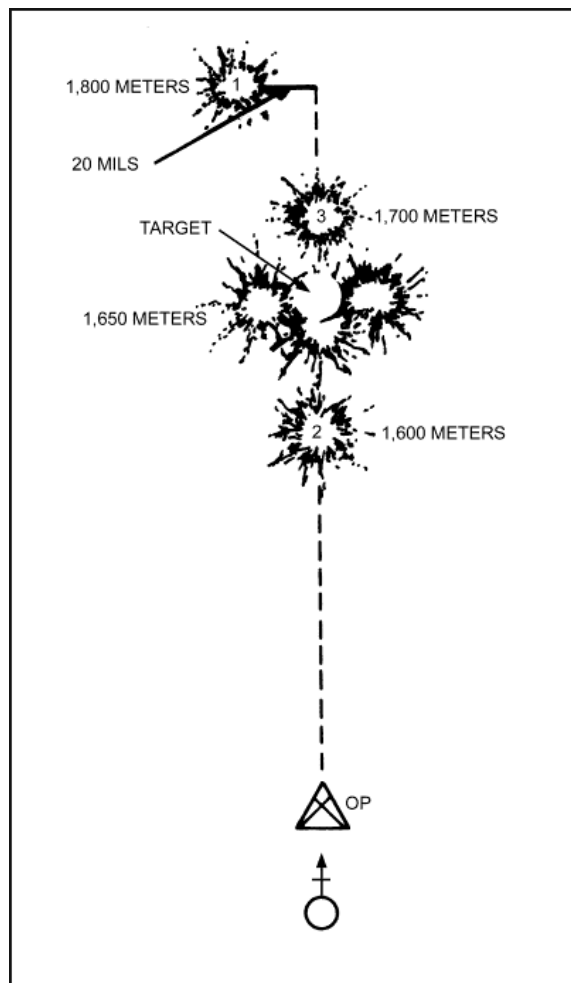
## 8-22. MISCELLANEOUS SPOTTINGS

Miscellaneous spottings are described herein.

- a. **Lost.** A burst is lost when its location cannot be determined. Lost rounds must be reported to the FDC, and a bold shift in deviation or range should be made.
- b. **Erratic.** A round that varies greatly from normal behavior is classified as an erratic round.

## 8-23. BRACKETING METHOD

When the first definite range spotting is obtained, the FO should make a range correction that is expected to result in a range spotting in the opposite direction--for example, if the first definite range spotting is SHORT, the FO should add enough to get an OVER with the next round. The inexperienced FO should use the following guide to determine the initial range change to establish a bracket (Figure 8-4).



**Figure 8-4. Bracketing method.**

OT DISTANCE	MINIMUM RANGE CHANGE (ADD OR DROP)
Up to 999 meters	100 meters



Over 1,000 to 1,999 meters	200 meters
2,000 meters and over	400 meters

a. Once a bracket has been established, it is successively decreased by splitting it in half until it is appropriate to enter FFE. FFE is usually requested in area fire when a 100-meter bracket is split.

b. The FO must use his knowledge of the terrain, knowledge gained from previous firing, general experience, and good judgment in determining the size of the initial and subsequent range changes. For example, if the FO adds 800 after an initial range spotting of SHORT and the second range spotting is OVER but the bursts are much closer to the adjusting point than the initial rounds, a range change of DROP 200 would be appropriate.

#### 8-24. CREEPING METHOD OF ADJUSTMENT

When danger-close mission is requested, the creeping method of adjustment is used. When the FO requests an adjustment on a target that is within 400 meters of friendly troops, he adds a 200-meter safety factor to ensure that the first round does not fall short. When the initial round is spotted, he estimates the overage in meters. He then makes the correction for range by dropping half of the estimated overage. Once he has given a correction of DROP FIVE ZERO (50), he continues a DROP FIVE ZERO (50) until he has either a RANGE CORRECT or TARGET or SHORT spotting. If, during the adjustment, a round falls short of the target, the FO continues the adjustment using the bracket method of adjustment.

#### 8-25. NORMAL FIRE COMMANDS

The commands used in conduct of fire without an FDC follow the procedures discussed in paragraphs 8-4 and 8-5 with the following exceptions:

a. **Deflection (Direction).** When operating without an FDC, the FO normally gives the deflection as a shift from a known point in the initial fire command. In subsequent commands, he gives the deflection correction from the last round fired. For example, during an adjustment an FO desires to move the next burst 50 mils right. Regardless of the sight setting, his command for deflection is RIGHT FIVE ZERO. The gunner arrives at the deflection to be placed on the sight by applying the LARS rule.

b. **Elevation (Range).** The FO may refer to a firing table to determine the charge and elevation corresponding to the gun-target range. He announces this charge and elevation in his fire command. He may, however, announce the range in meters and have the gunner refer to the firing table to determine the charge and elevation. The gunner applies the deflection correction to the previous deflection

setting, determines the charge and elevation for the given range on the firing table, announces the charge to the first ammunition bearer, sets the elevation on the sight, and then lays for elevation and deflection. After selecting a constant elevation, the FO announces the charge for only range changes.

#### **8-26. MODIFIED FIRE COMMANDS**

The deflection and range changes in subsequent commands differ from usual fire commands in that they are given as turns of the traversing crank and changes in charge. The advantages of modified fire commands are speed and simplicity of execution by the gunner.

- a. One turn of the traversing crank is equal to about 10 mils of deflection, while three-eighths of a charge is equal to about 50 meters change in range. When using modified fire commands involving changes in range, the FO announces the range element of the initial fire command as charge and elevation. This ensures that the squad leader and gunner are working with the same constant elevation.
- b. The gunner lays the mortar for direction and elevation as given in the initial fire command. He does not need to refer to a firing table for the remainder of the mission. Following the initial fire command, he makes no attempt to align the sight on the aiming point. Corrections for deviation are made by applying the turns given in the subsequent commands. Range changes for the 4.2-inch mortar are made by varying the number of propellant increments (charges).
- c. In the bracketing method and ladder method of adjustment, once the FO obtains a bracket on the target, he does not need a firing table. He continues the adjustment by splitting successively the charge difference that established the preceding bracket.

#### **8-27. FIRE CONTROL**

The squad leader controls the fire from an OP, issuing fire commands directly to the mortar crew. He may select an OP close to the mortar so that he can give his fire commands orally or by arm-and-hand signals. When the OP is not close to the mortar position, he uses a telephone or radio.

#### **8-28. ESTABLISHMENT OF A REFERENCE LINE AND SHIFTING FROM THAT LINE**

The normal method of establishing initial direction when operating without an FDC is the direct--alignment method. After initial direction has been established, the FO should conduct a registration using only the direction stake. After he completes this registration, he establishes the GT line as a reference line. This is accomplished by referring the sight to the desired deflection (usually 3200 mils) and then realigning the direction stake on

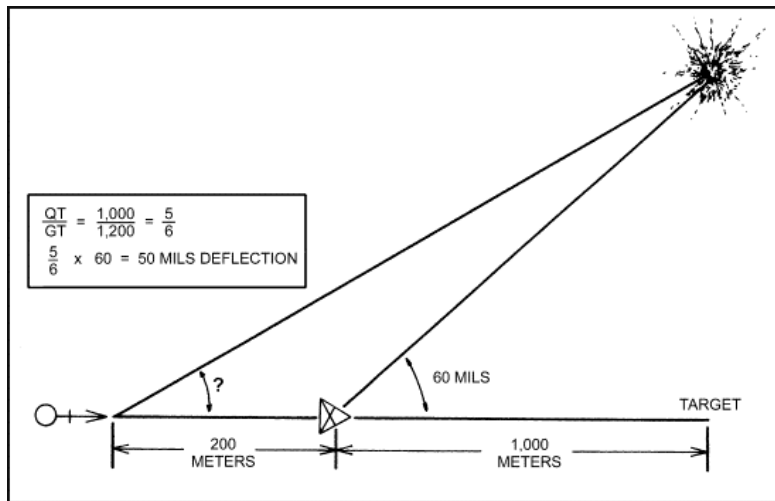
this deflection. The following is an example of the FO located within 100 meters of the mortar position.

- a. An FO has adjusted the fire of his squad on a target. A reference line has been established at 3200 mils on the azimuth scale. The FO observes another target and decides to adjust onto it. He estimates the GT range to be 1,800 meters, determines with his binoculars that the target is 60 mils to the right of the first target or registration point, and issues an initial fire command:

**NUMBER ONE  
HE QUICK  
ONE ROUND  
THREE ROUNDS IN EFFECT  
FROM REGISTRATION POINT, RIGHT SIX ZERO (60)  
RANGE ONE EIGHT ZERO ZERO (800)**

The gunner sets his sight with a deflection of 3200 mils and applies the LARS rule (60 mils subtracted from 3200 mils equals a deflection of 3140). Looking at the FT, he finds the charge to be 9 5/8 at elevation 0900. He announces the charge to the ammunition bearer, and at the same time places the elevation on the sight. He lays the mortar and commands, FIRE.

- b. This first round bursts beyond the target and 20 mils to the left as shown in Figure 8-5. The squad leader issues a subsequent fire command correcting the deflection and decreasing the range between himself and the target, thereby establishing a bracket. He commands, RIGHT TWO ZERO (20), RANGE ONE SIX ZERO ZERO (1600).



**Figure 8-5. Observer more than 100 meters from the mortar but within 100 meters of the GT line.**

c. The second round bursts between the FO and target and on the GT line as shown in Figure 8-5. The deflection is now correct, and a 200-meter bracket has been established. The squad leader's subsequent fire command is RANGE, ONE SEVEN ZERO ZERO (1700). The gunner selects the charge from his firing table, announces the charge to the first ammunition bearer, and when all is ready he commands, FIRE.

d. This third round bursts beyond the target and on the GT line (Figure 8-4). A 100-meter range bracket has now been established. In his next fire command, the squad leader combines the adjustment with FFE:

THREE ROUNDS  
RANGE, ONE SIX FIVE ZERO (1650)

e. The bursting area of these rounds and their normal dispersion cover the target area with casualty-producing fragments. If the FFE fails to cover the target adequately, the squad leader makes any necessary changes in deflection or range and again orders FFE. This adjustment can also be fired using modified fire commands.

f. Modified fire commands for this mission are as follows:

NUMBER ONE  
HE QUICK  
ONE ROUND  
THREE ROUNDS IN EFFECT  
FROM RP  
RIGHT SIX ZERO (60)  
CHARGE 9 5/8  
ELEVATION ZERO NINE ZERO ZERO (0900)

---

RIGHT TWO TURNS  
CHARGE 8 4/8

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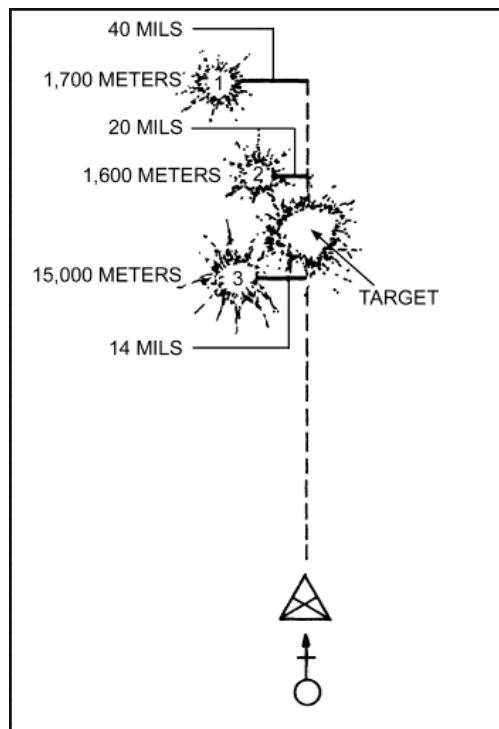
CHARGE 9

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THREE ROUNDS  
CHARGE 8 6/8

#### **8-29. LADDER METHOD OF ADJUSTMENT**

Since surprise is an important factor in placing effective fire on a target, any form of adjustment that reduces the time interval between the burst of the first round for adjustment and FFE is useful. The ladder method of adjustment, a modification of the bracketing method, reduces the time interval and permits FFE to be delivered rapidly. The ladder method may also be used by the FO when firing with an FDC (Figure 8-6).



**Figure 8-6. Ladder method of fire adjustment.**

**Note:** In the following example, the FO is located within 100 meters of the mortar position.

a. The FO measures the deviation of a target from the registration point as right 30 mils. He estimates the GT range to be 1,600 meters. The size of the ladder is based on the minimum range change guide. To obtain a 200-meter ladder, the FO adds 100 meters to this estimated range to establish one range limit for the ladder and subtracts 100 meters from the estimated range to establish the other limit. This should result in a ladder that straddles the target. Three rounds are fired in this sequence: far, middle, and near at 10-second intervals. This helps the FO make a spotting, since no burst is obscured by the dust and smoke from a preceding burst. The FO checks his firing table to obtain the charge for the far range, 1,700 meters (charge 9); the middle range, 1,600 meters (charge 8 4/8); and the near range, 1,500 meters (charge 8), and issues the following initial fire command:

NUMBER ONE  
HE QUICK  
FIVE ROUNDS IN EFFECT  
100-METER LADDER  
FROM REGISTRATION POINT, RIGHT THREE ZERO (30)  
ONE ROUND, CHARGE 9  
ONE ROUND, CHARGE 8  $\frac{4}{8}$   
ONE ROUND, CHARGE 8  
ELEVATION ZERO NINE ZERO ZERO (0900)

b. This method of fire element in the normal initial fire command for the ladder contains the word "ladder." The elevation element gives the constant elevation to conduct the mission. The word "ladder" tells the gunner that three rounds will be fired as follows: the first at the charge announced (far range), the second at the announced middle charge, and the third at the last announced charge. The gunner indexes his sight for deflection at the base deflection minus 30, while the first ammunition bearer prepares the rounds with the designated charges.

c. The average deviation of all three rounds is left 30 mils. The target is bracketed between second and third bursts. The squad leader now has a 100-meter bracket of the target between 1,500 and 1,600 meters, and is ready to FFE. He issues the following subsequent fire command:

FIVE ROUNDS  
RIGHT THREE TURNS  
CHARGE 8  $\frac{2}{8}$