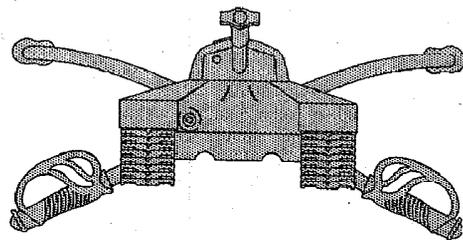
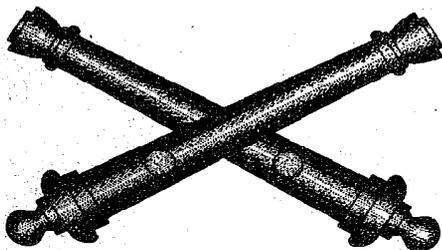


PROGRAMMED TEXT

FKSM 17-30-3-CS

**ADJUST INDIRECT FIRE
FOR
ARMOR LEADERS**



**UNITED STATES ARMY ARMOR CENTER
FORT KNOX, KENTUCKY 40121
SEPTEMBER 1995**

GENERAL INSTRUCTIONS

This programmed text consists of three lessons containing eight learning activities. The learning activities are presented in three parts; a study resource, practice exercises and solution to the practice exercise. Insure you study the resource material prior to attempting the practice exercises. If you should have a problem with a particular aspect of an exercise the solutions will direct you to the appropriate page and paragraph for review. Review the material as required and re-work the practice exercise. Once you have finished all study materials complete the examination in the back of the text. Record all examination answers on the answer sheet provided.

INTRODUCTION

The mission of the field artillery is to provide close and continuous fire in support of your maneuver. The field artillery must be prepared to engage targets that are beyond the range or otherwise cannot be engaged by your direct fire weapons. Artillery fires can give the commander the ability to engage enemy reserves, lines of communication, and to generally disrupt the enemy's rear area. They must always be prepared to suppress, neutralize or destroy targets that pose the greatest threat. In order to accomplish its mission effectively, the field artillery needs to be told where the targets are, what they are doing and how they should be engaged. As Armor Platoon Leaders, or Platoon Sergeants you will serve as the forward observer for your platoon. Follow the procedures outlined in this text and you will be able to put **"steel on target"**.

THE CALL FOR FIRE FOR ARMOR LEADERS

PROGRAMED TEXT

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LESSON ONE

- OBJECTIVE:** 061-283-6003
- TASK:** Locate a target.
- CONDITIONS:** Given complete instructional guidance and materials to include a protractor, a coordinate scale, simulated binocular reticle pattern and simulated target.
- STANDARDS:**
1. Determine the polar plot to within 10 mils in direction, and 100 meters in distance.
 2. Determine the grid coordinate of a target to within 100 meters of the actual location of the target.
 3. Determine the shift from a known point to within 10 mils in direction, 10 meters in lateral shift and 100 meters in range shift of the actual location of the target.
- REFERENCES:** FM 6-30, "Observed Fire Procedures".

1. LEARNING ACTIVITY 1

Upon completion of this learning activity, you will be able to determine direction in the target area by scaling direction from a map to a reference point and then determining a second direction to a target based on the known direction.

a. Study Resources.

DETERMINING DIRECTION. The most important aspect of determining the location of a target in the maneuver area is direction. The accuracy of the target location is in direct proportion to the ability of the observer to determine the direction to the target.

(1) **SCALING FROM A MAP.** Using a map and protractor, the observer can scale direction to an accuracy of 10 mils. This method is particularly useful in determining direction to reference points in the maneuver area. The reference points can then be used to assist in the target location process. To determine direction using a map and protractor:

(a) Locate and mark your position on your map.

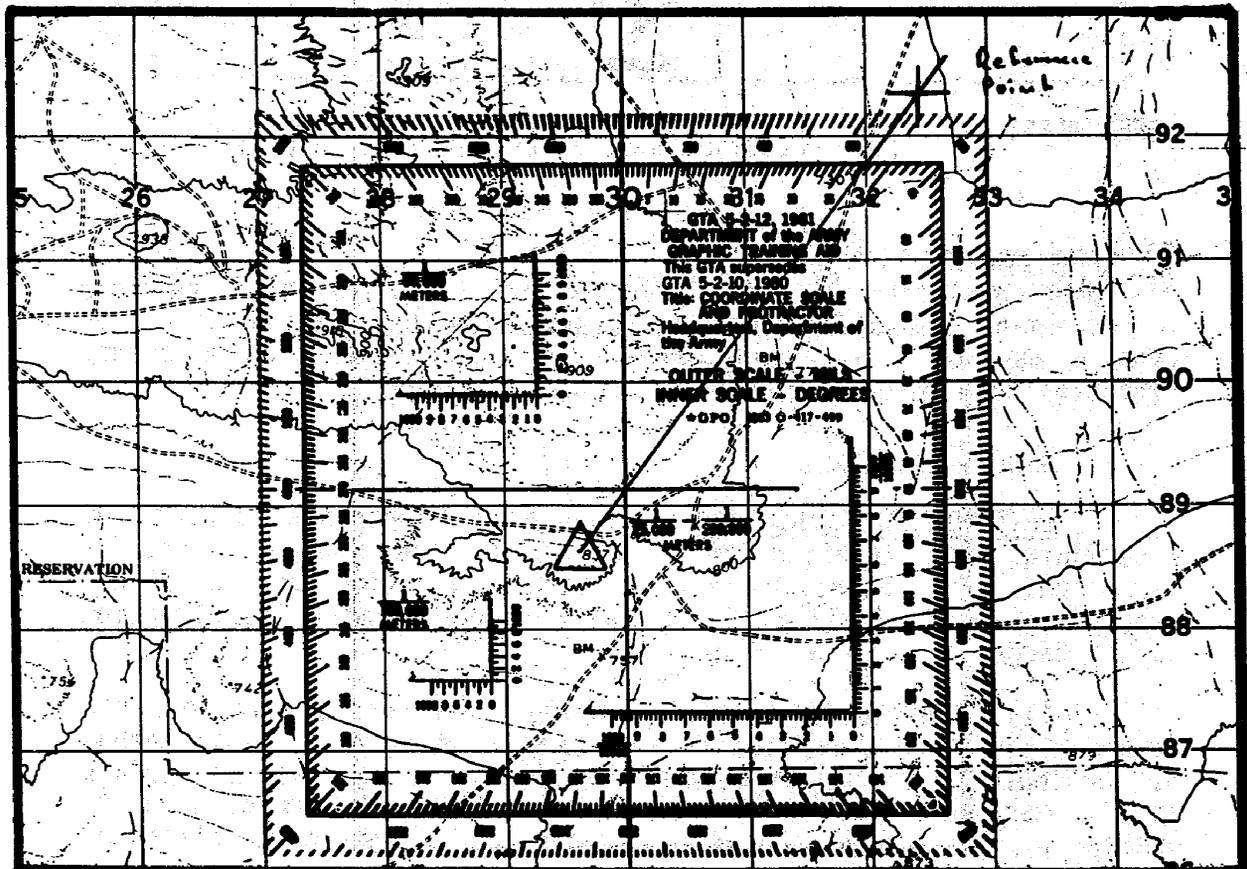
(b) Locate and mark on your map the position of the reference point.

(c) Draw a straight line from your position to the reference point and extend the line at least 5 or 6 inches or until the line extends through the arc of the protractor when it is placed on the map.

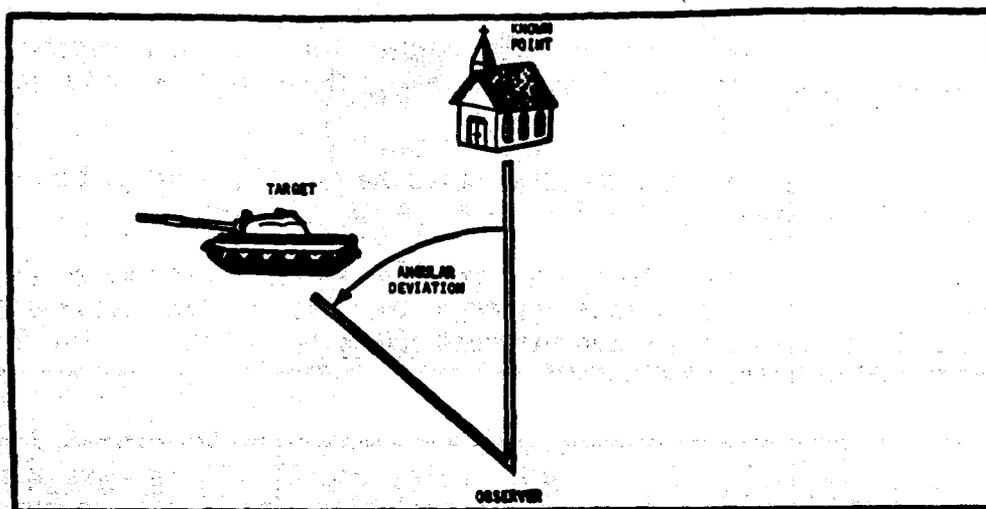
(d) Place the center of the protractor on the intersection of the line you have drawn and a grid north line.

(e) Align the hairline of the protractor with the grid north line.

(f) Read the azimuth to the reference point where the drawn line passes through the arc of the protractor. Measure this azimuth to the nearest 10 mils. This is the grid azimuth to the reference point.

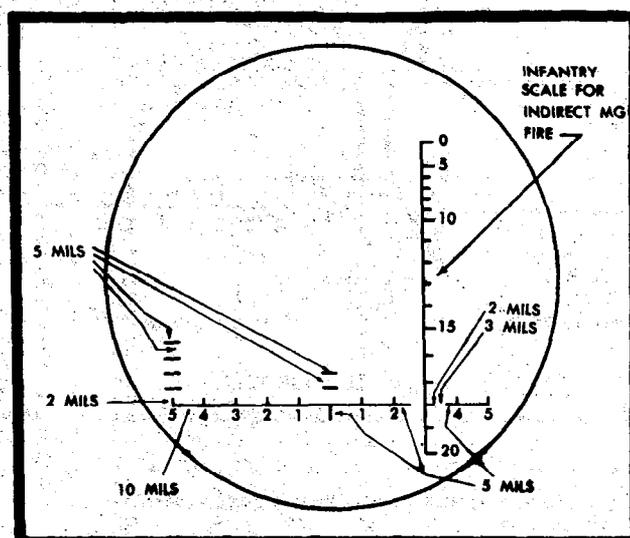


(2) MEASURING FROM A REFERENCE POINT. Using a known point with a known, or base direction (scaled from a map) the observer can measure horizontal angular deviation and apply it to the known direction to rapidly determine direction to a second point. Angular deviations can be measured with binoculars, non-ballistic reticle, azimuth indicator, on tanks so equipped, and estimated with the hand. For purposes of this lesson we will use the binocular reticle method because it is the most common. Angular deviation is the deviation in mils either right or left from a reference point to a second point.

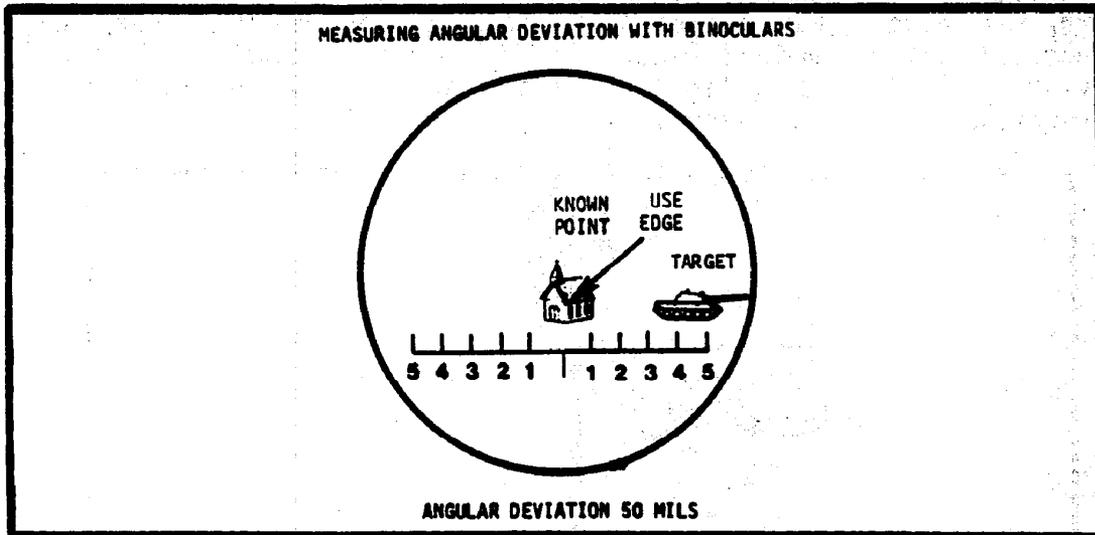


(a) Measuring Angular Deviation With Binoculars.

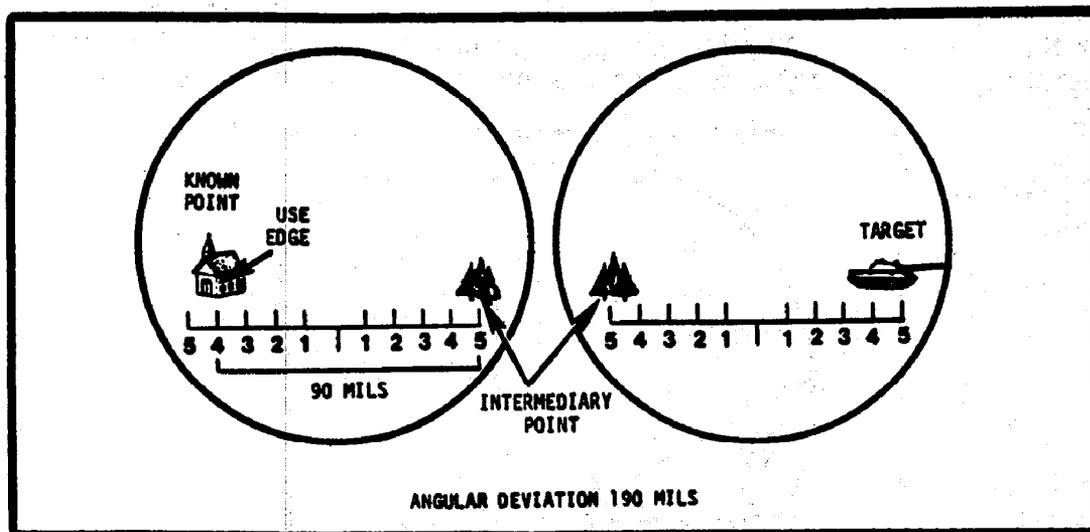
a. Use the horizontal scale of your binoculars. This 100 mil scale is graduated in 10 mil increments beginning in the center and increasing left and right to 50 mils.



(b) Align the horizontal scale over the reference point. Determine the angular deviation by counting the number of graduations between the known point and the center of the second point.

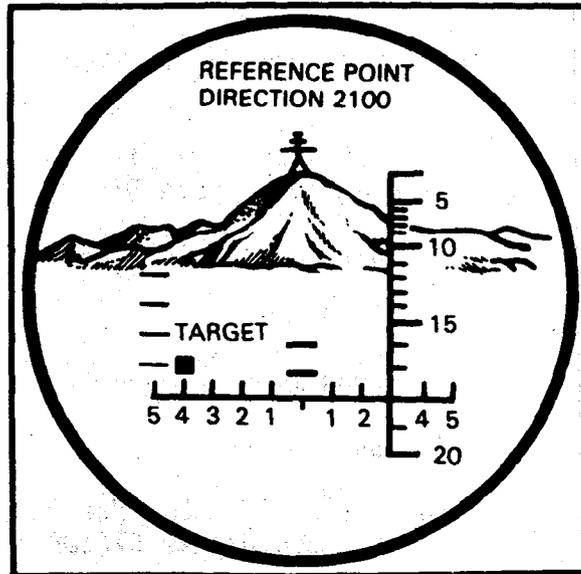


(c) If the known point and the target are more than 100 mils apart, select an intermediary point to measure. Then measure from the intermediary point to the target to determine the total angular deviation.



(d) Adding/Subtracting Angular Deviation.

a. After determining angular deviation, you must apply its value to the known direction using the RALS rule, Right Add, Left Subtract. If the target is to the right of the reference point **ADD** the angular deviation to the base direction to get the direction to the target. If the target is to the left of the reference point **SUBTRACT** the angular deviation from the base direction to get the direction to the target.



NOTE: Direction increases to the right and decreases to the left. To determine the direction to another point or target, apply the number of mils measured right or left of the reference point known direction by use of RALS rule (right add/left subtract). For example, the azimuth to the reference point is 2,100 mils. The target is 40 mils to the left of the reference point. The direction to the target is 2,060 mils (2,100 - 40).

b. Practice Exercise.

(1) The following practice exercise is designed to allow you to practice placing the protractor on a map, orienting to the center of the area of observation, and determining a direction to a reference point. Each exercise will be preceded with information telling you your location followed by a series of grid coordinates to reference points. You will be required to determine the direction to these points to the nearest 10 mils.

(a) You are currently located at grid coordinate 586085.

1. The direction to the Bench Marker located at grid coordinate 559128 is:

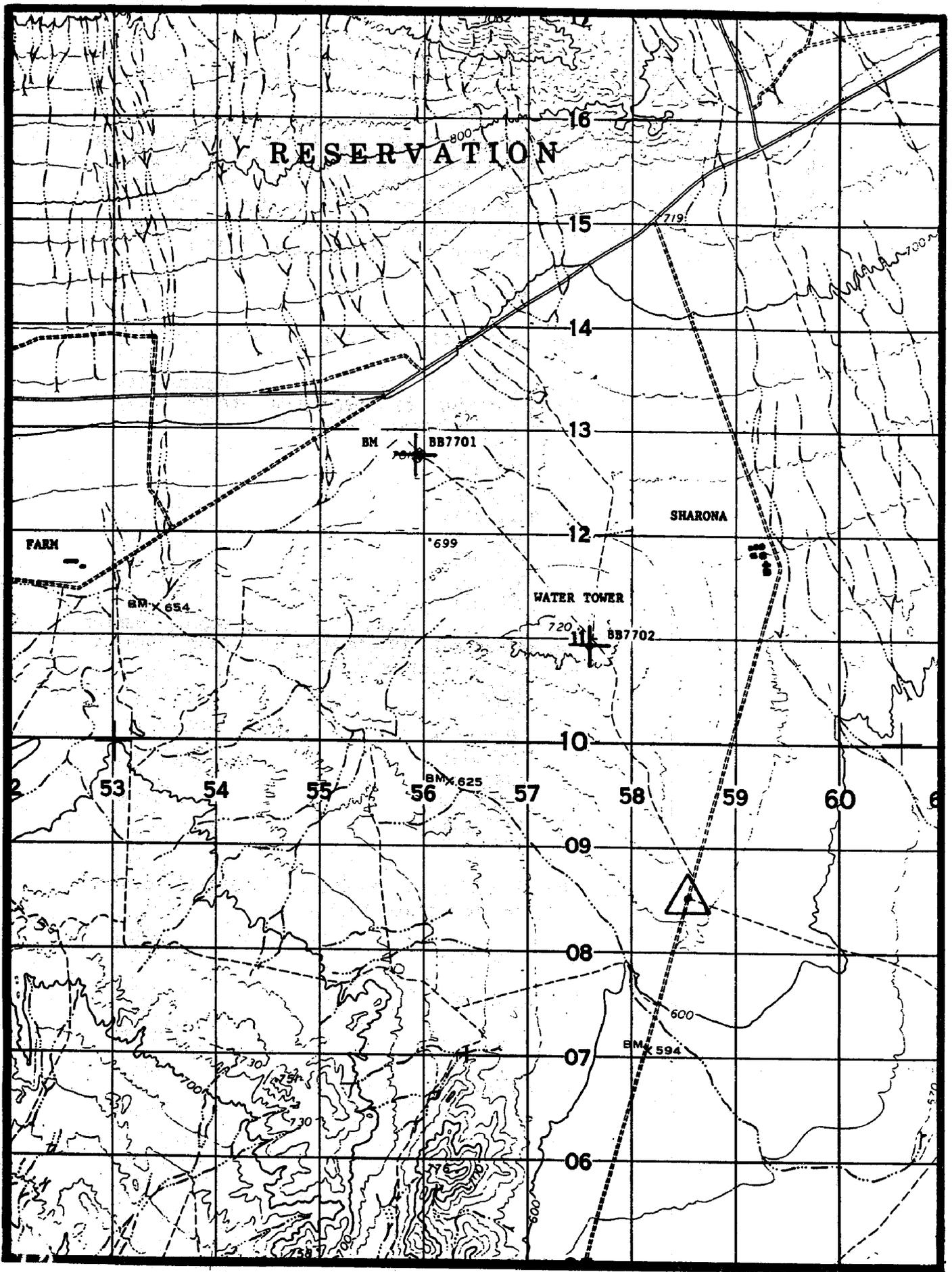
- a. 5720 mils
- b. 5830 mils
- c. 5920 mils
- d. 5970 mils

2. The direction to the Water Tower located at grid coordinate 576109 is:

- a. 6020 mils
- b. 6100 mils
- c. 6120 mils
- d. 6200 mils

3. The direction to the Church (Steeple) located at grid coordinate 593117 is:

- a. 0160 mils
- b. 0200 mils
- c. 0240 mils
- d. 0320 mils



563096.

(b) You are currently located at grid coordinate

1. The direction to the Bench Marker located at grid coordinate 559128 is:

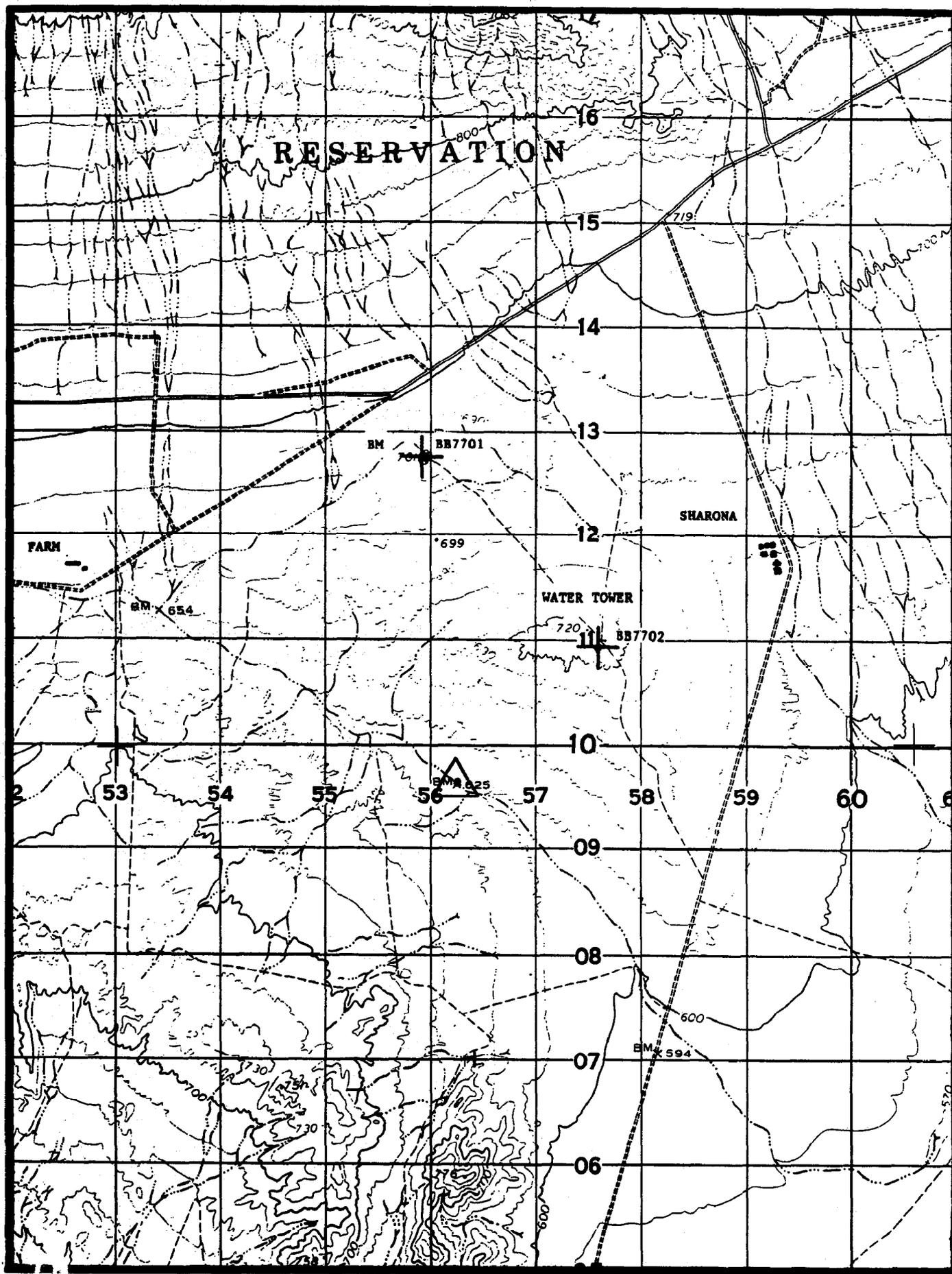
- a. 6150 mils
- b. 6170 mils
- c. 6190 mils
- d. 6290 mils

2. The direction to the Water Tower located at grid coordinate 576109 is:

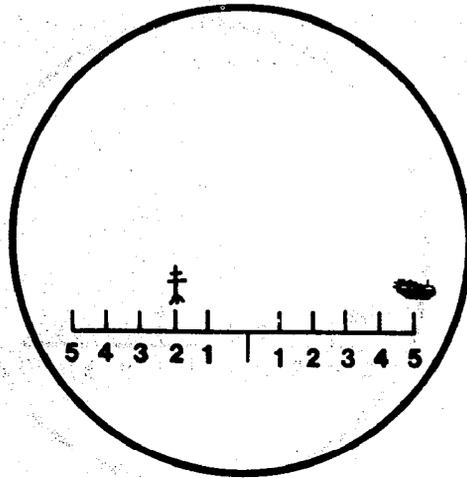
- a. 0760 mils
- b. 0780 mils
- c. 0820 mils
- d. 0880 mils

3. The direction to the Church (Steeple) located at grid coordinate 593117 is:

- a. 0980 mils
- b. 1000 mils
- c. 1050 mils
- d. 1080 mils

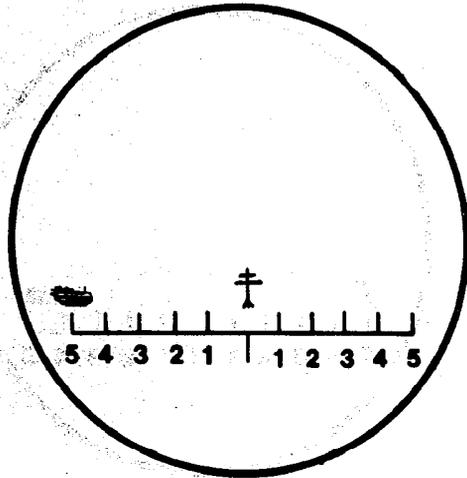


(2) The following exercise is designed to allow you to practice determining direction to a target based on the known direction to a reference point. You will be required to measure the mil deviation between the reference point and the target, add or subtract the measurement to determine the direction to the target.



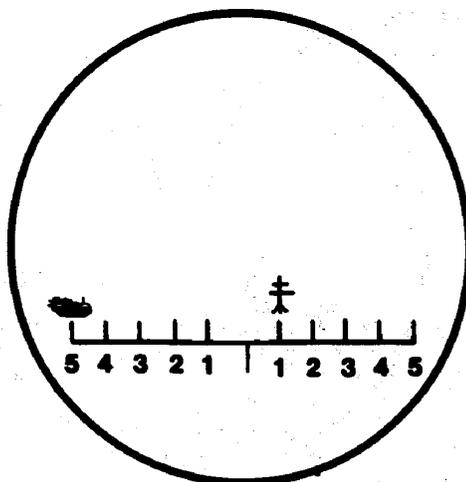
Direction to the Reference Point: 0840 mils

- (a) The direction to the target is:
- | | |
|--------------|--------------|
| a. 0770 mils | c. 0910 mils |
| b. 0840 mils | d. 0940 mils |



Direction to the Reference Point: 1220 mils

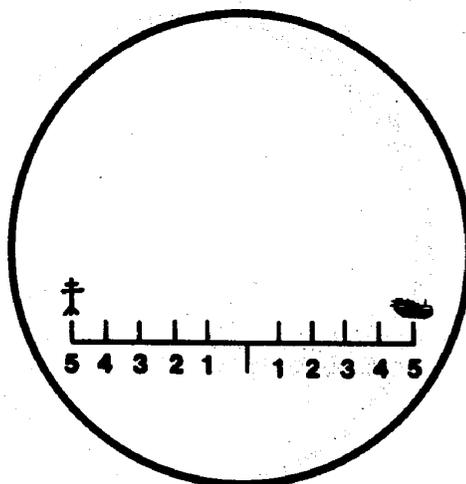
- (b) The direction to the target is:
- | | |
|--------------|--------------|
| a. 1170 mils | c. 1270 mils |
| b. 1220 mils | d. 1300 mils |



Direction to the Reference Point: 1420 mils

(c) The direction to the target is:

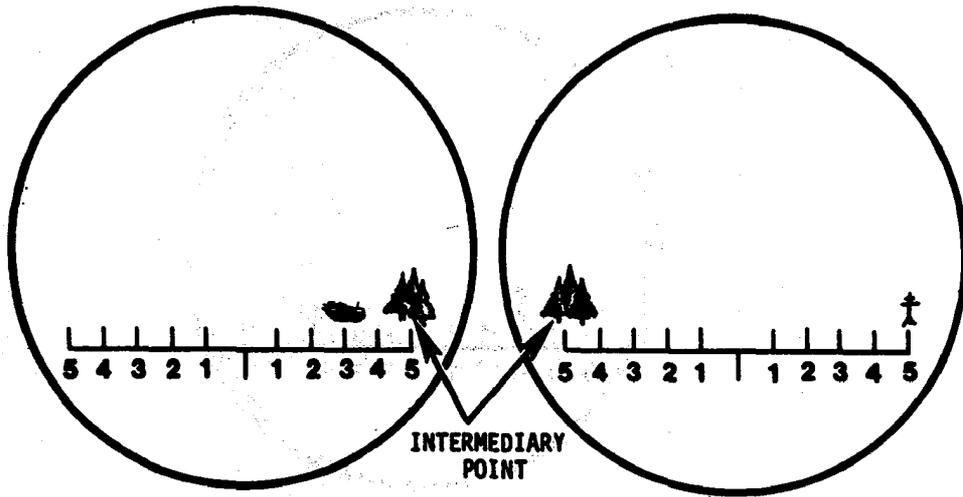
- a. 1360 mils
- b. 1420 mils
- c. 1480 mils
- d. 1520 mils



Direction to the Reference Point: 1890 mils

(d) The direction to the target is:

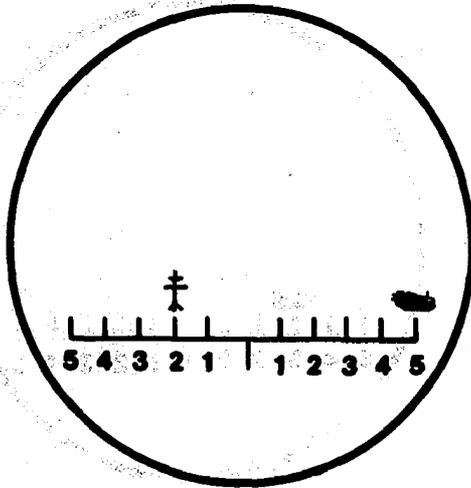
- a. 1790 mils
- b. 1890 mils
- c. 1990 mils
- d. 2090 mils



Direction to the Reference Point: 2450 mils

(e) The direction to the target is:

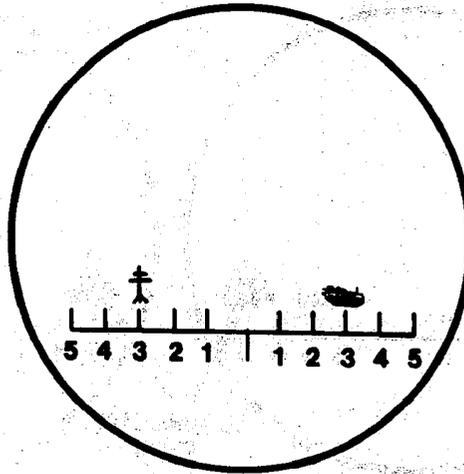
- | | |
|--------------|--------------|
| a. 2700 mils | c. 2450 mils |
| b. 2670 mils | d. 2330 mils |



Direction to the Reference Point: 2810 mils

(f) The direction to the target is:

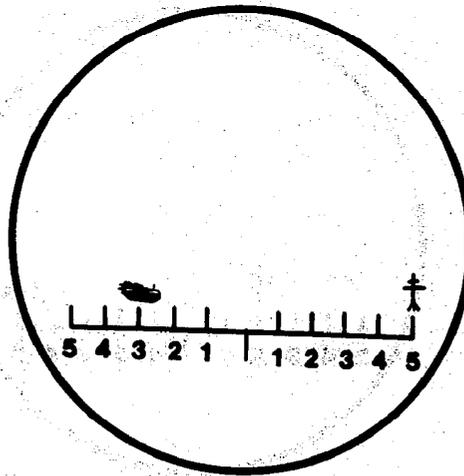
- | | |
|--------------|--------------|
| a. 2950 mils | c. 2740 mils |
| b. 2880 mils | d. 2640 mils |



Direction to the Reference Point: 3640 mils

(g) The direction to the target is:

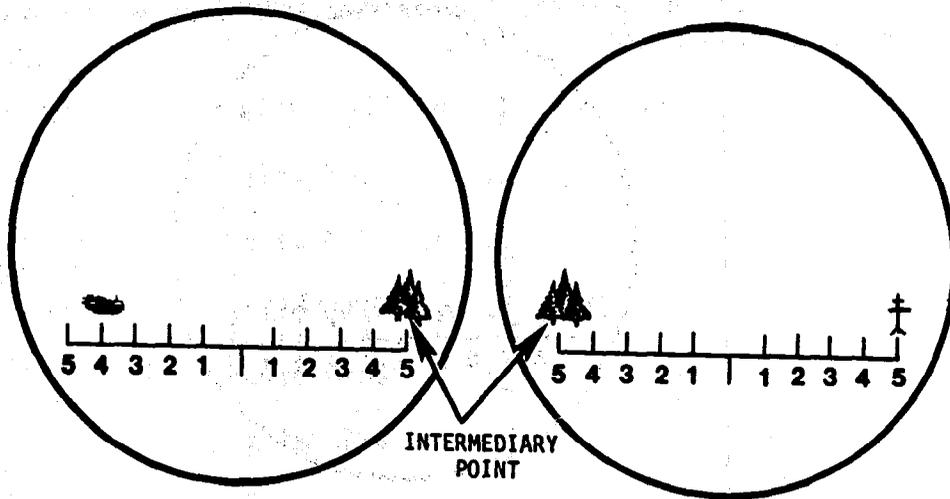
- a. 3700 mils
- b. 3760 mils
- c. 3800 mils
- d. 3860 mils



Direction to the Reference Point: 4200 mils

(h) The direction to the target is:

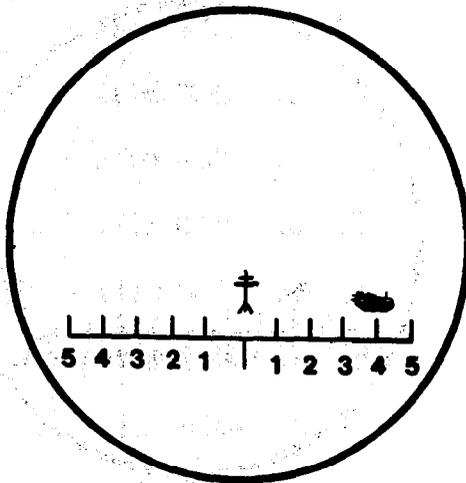
- a. 4280 mils
- b. 4260 mils
- c. 4200 mils
- d. 4120 mils



Direction to the Reference Point: 4870 mils

(i) The direction to the target is:

- a. 4580 mils
- b. 4680 mils
- c. 4870 mils
- d. 5060 mils



Direction to the Reference Point: 5810 mils

(j) The direction to the target is:

- a. 5770 mils
- b. 5810 mils
- c. 5850 mils
- d. 5890 mils

c. Solution to Practice Exercise.

(1) An explanation of how solutions were obtained begins on page 1, paragraph a, (1).

(1), (a), 1. b. 5830 mils

2. a. 6020 mils

3. c. 0240 mils

(b), 1. d. 6290 mils

2. c. 0820 mils

3. a. 0980 mils

(2) An explanation of how solutions were obtained begins on page 3, paragraph a, (2).

(2), (a) c. 0910 mils

(b) a. 1170 mils

(c) a. 1360 mils

(d) c. 1990 mils

(e) d. 2330 mils

(f) b. 2880 mils

(g) a. 3700 mils

(h) d. 4120 mils

(i) b. 4680 mils

(j) c. 5850 mils

2. LEARNING ACTIVITY 2

Upon completion of this learning activity, you will be able to determine distance in the target area using the appearance of objects method and the reticle/mil relation method.

a. Study Resources.

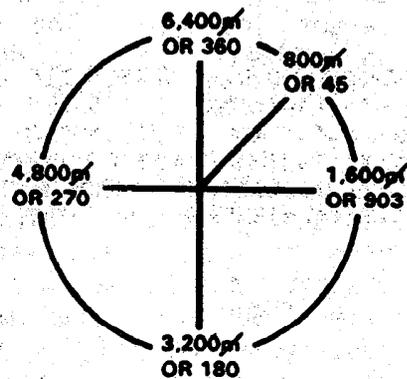
DETERMINING DISTANCE. The most accurate method of determining the range to a target is with the laser range finder. When a laser range finder is not available or is inoperative the observer will have to estimate range in the maneuver area. Estimating range is one of the most difficult tasks for a soldier to learn, but it is also one of the most important aspects of target location. The method, or combination of methods, used to estimate range is dependent on the individual experience and the tactical situation.

(1) **APPEARANCE OF OBJECTS METHOD.** The appearance of objects in the maneuver area can assist the observer in estimating range. This method is particularly effective when used in conjunction with the reticle/mil relation method. The observer should be able to identify armored and wheeled vehicles from 1,500 to 2,000 meters with the naked eye. If you can positively identify a vehicle as a tank but cannot determine the model, it is approximately 1,000 to 1,500 meters away. Binoculars or other optics increase the range at which you can identify targets.

RANGE DETERMINATION RECOGNITION METHOD		
TARGET	NAKED EYE (METERS)	MAGNIFICATION (METERS)
TANK CREW MEMBERS, TROOPS, MACHINE GUN, MORTAR, ANTITANK GUN, ANTITANK MISSILE LAUNCHERS	800	2,000
TANK, ARMORED PERSONNEL CARRIER (APC), TRUCK, BY MODEL	1,000	4,000
TANK, HOWITZER, APC, TRUCK	1,500	5,000
ARMORED VEHICLE, WHEELED VEHICLE	2,000	6,000

(2) RETICLE/MIL RELATION METHOD. The mil relation formula allows the observer to accurately estimate distances in the maneuver area. The one drawback to the reticle/mil relation method of range estimation is that you must know the approximate width, length or height of the target vehicle. An explanation of the mil and meter relationship follows:

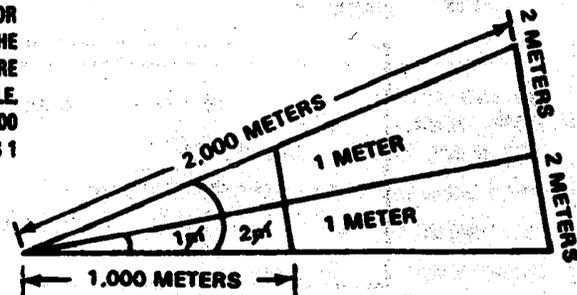
MIL RELATION. THE MIL IS A UNIT OF ANGULAR MEASUREMENT EQUAL TO 1/6,400 OF A CIRCLE. THERE ARE APPROXIMATELY 18 MILS IN 1 DEGREE. ONE MIL CAN BE WRITTEN 1^m; THE MIL IS USED BECAUSE OF THE PRECISE CALCULATIONS AND ADJUSTMENT REQUIRED. FIRE CONTROL EQUIPMENT IS GRADUATED IN MILS TO CONFORM TO THE MIL METHOD OF MEASUREMENT.



A COMPARISON OF MILS AND DEGREES

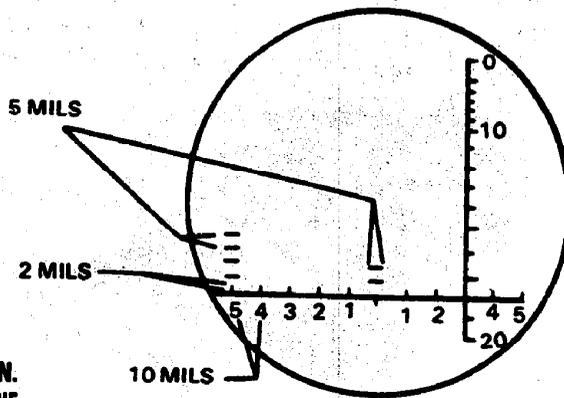
ONE MIL EQUALS WIDTH (W) (OR HEIGHT) OF 1 METER AT A RANGE (R) OF 1,000 METERS.

THIS RELATION IS CONSTANT AS THE ANGLE INCREASES FROM 1 MIL TO 2 MILS AND THE RANGE INCREASES FROM 1,000 METERS TO 2,000 METERS. BECAUSE THE MIL RELATION IS CONSTANT, OTHER UNITS OF MEASURE SUCH AS YARDS, FEET, OR INCHES CAN BE SUBSTITUTED FOR METERS IN EXPRESSING WIDTH OR RANGE; HOWEVER, THE RELATION HOLDS TRUE ONLY IF BOTH W AND R ARE EXPRESSED IN THE SAME UNIT OF MEASURE. FOR EXAMPLE, IF THE SIDES OF A 1-MIL ANGLE ARE EXTENDED TO 1,000 YARDS THE WIDTH BETWEEN THE ENDS OF THE SIDES IS 1 YARD.



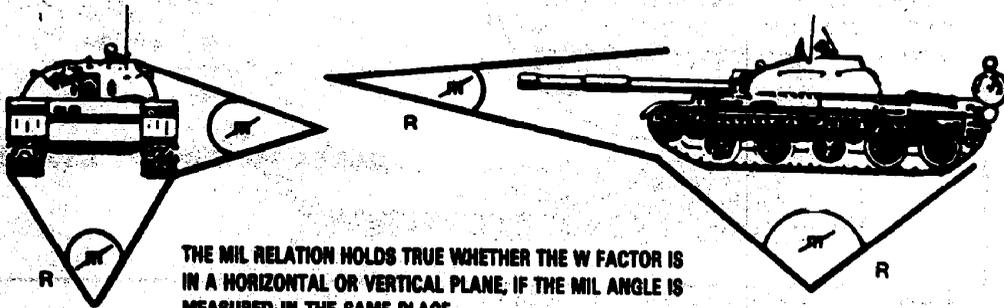
1 MIL AT 1,000 METERS EQUALS 1 METER.
1 MIL AT 2,000 METERS EQUALS 2 METERS.

2 MILS AT 1,000 METERS EQUALS 2 METERS.
2 MILS AT 2,000 METERS EQUALS 4 METERS.



BINOCULAR RETICLE

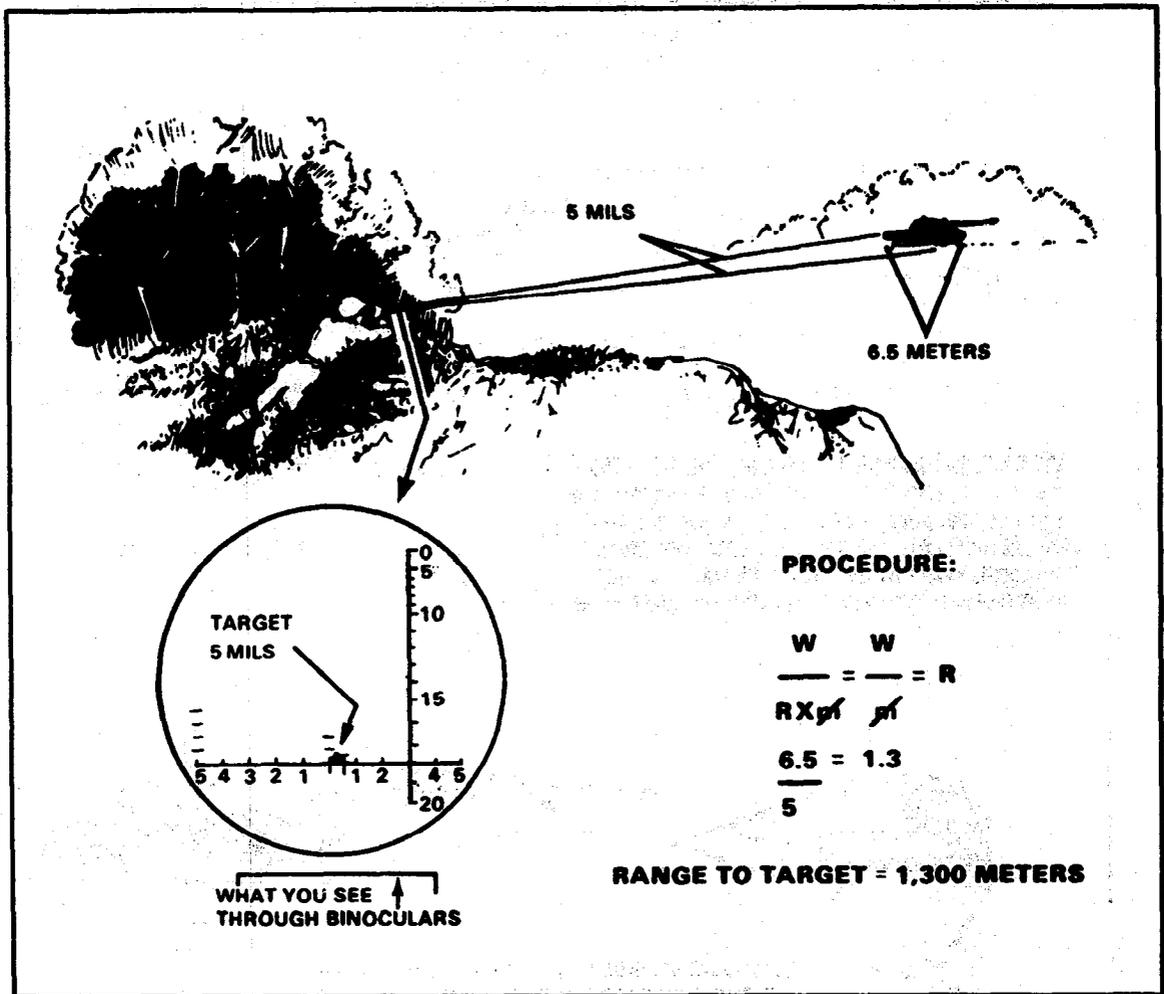
DETERMINING RANGE USING THE MIL RELATION. SINCE THE RELATIONSHIP OF THE ANGLE IN MILS (μ), THE LENGTH OF THE SIDES IN THOUSANDS (R), AND THE WIDTH BETWEEN THE ENDS OF THE SIDES (W) IS CONSTANT, WIDTH OF THE TARGET, RANGE TO THE TARGET, OR MIL VALUE OF THE TARGET CAN BE DETERMINED IF THE OTHER TWO ARE KNOWN.



THE MIL RELATION HOLDS TRUE WHETHER THE W FACTOR IS IN A HORIZONTAL OR VERTICAL PLANE, IF THE MIL ANGLE IS MEASURED IN THE SAME PLACE.

AS A MEMORY AID USE THE WORD "WORM" WHICH STANDS FOR:

W	WIDTH	IN METERS	$\frac{W}{R \times \mu}$
O	OVER		
R	RANGE		
M	MILS	IN THOUSANDS	
T	TIMES		



NOTE: Express increments of 50 meters to the even 100 meters. For example if you calculate an estimated range of 1750 meters, express as 1800 meters. If you calculate an estimated range of 1850 meters, express as 1800 meters.

Target; BMD, Length is: $\frac{7 \text{ meters}}{4 \text{ mils}}$

Range = $\frac{\text{Width (Length)}}{\text{mils}} = \frac{7 \text{ meters}}{4 \text{ mils}} = 1.75$

$1.75 \times 1000 = 1750 \approx 1800 \text{ meters}$

Using the known width, length, or height in meters and measured mil value, you can determine the range to a target by using the formula $R = M \div \theta$. Table 1 shows the computations for targets at various ranges.

MIL ANGLE MEASUREMENT		1	2	3	4	5	6	7	8	9	10
THREAT MEDIUM TANK	LENGTH: 6.5 METERS	6,500	3,300	2,200	1,600	1,300	1,100	900	800	700	700
	WIDTH: 3.5 METERS	3,500	1,800	1,200	900	700	600	500	400	400	400
		R A N G E									
THREAT HEAVY TANK	LENGTH: 7.5 METERS	7,500	3,800	2,500	1,900	1,500	1,300	1,100	900	800	800
	WIDTH: 3.5 METERS	3,500	1,800	1,200	900	700	600	500	400	400	400

b. Practice Exercise.

The following exercise is designed to allow you to practice estimating distance to a target using the appearance of objects method and the mil relation formula. The target vehicle length/width and mil deviation will be given in each question. You will be required to respond to ten multiple choice questions, there is only one correct response for each question.

- (1) Target: Tank, Length 6.5 meters
Mil Deviation: 3 mils

The estimated distance to the target is:

- a. 2200 meters c. 2300 meters
b. 2250 meters d. 2350 meters

- (2) Target: Tank, Length 9 meters
Mil Deviation: 3 mils

The estimated distance to the target is:

- a. 500 meters c. 2500 meters
b. 3000 meters d. 3500 meters

- (3) Target: Tank, Length 7.5 meters
Mil Deviation: 3 mils

The estimated distance to the target is:

- a. 2450 meters c. 2550 meters
b. 2500 meters d. 2600 meters

- (4) Target: BMP, Length 7 meters
Mil Deviation: 3 mils

The estimated distance to the target is:

- a. 2330 meters c. 2430 meters
b. 2300 meters d. 2600 meters

- (5) Target: Tank, Length 9 meters
Mil Deviation: 4 mils

The estimated distance to the target is:

- a. 2350 meters c. 2250 meters
b. 2300 meters d. 2200 meters

- (6) Target: Tank, Length 7 meters
Mil Deviation: 2 mils

The estimated distance to the target is:

- a. 3800 meters c. 3600 meters
b. 3750 meters d. 3500 meters

- (7) Target: BMP, Length 7 meters
Mil Deviation: 4 mils

The estimated distance to the target is:

- a. 1900 meters c. 1700 meters
b. 1800 meters d. 1650 meters

- (8) Target: Tank, Width 3.5 meters
Mil Deviation: 3 mils

The estimated distance to the target is:

- a. 1200 meters c. 1150 meters
b. 1160 meters d. 1100 meters

- (9) Target: Tank, Length 9 meters
Mil Deviation: 5 mils

The estimated distance to the target is:

- a. 1650 meters c. 1750 meters
b. 1700 meters d. 1800 meters

- (10) Target: Tank, Width 3.5 meters
Mil Deviation: 4 mils

- a. 875 meters c. 970 meters
b. 900 meters d. 1000 meters

c. Solution to Practice Exercise.

An explanation of how solutions were obtained begins on page 16, paragraph a, (1).

(1) a. 2200 meters.

(2) b. 3000 meters.

(3) b. 2500 meters.

(4) b. 2300 meters.

(5) d. 2200 meters.

(6) d. 3500 meters.

(7) b. 1800 meters.

(8) a. 1200 meters.

(9) d. 1800 meters.

(10) b. 900 meters.

3. LEARNING ACTIVITY 3

Upon completion of this learning activity, you will be able to determine the location of a target using the polar plot method.

a. Study Resources.

POLAR PLQT METHOD OF TARGET LOCATION. When the observer's location is known to the FDC, the polar plot method can be used to locate targets in the maneuver area. The observer simply determines a direction and a distance from his location to the target. This method is easy and quick. In a static situation, even for a limited period of time, this method can prove useful. The steps used in the polar plot method of target location follow:

(1) Determine the direction from your location to the target to the nearest 10 mils. Measuring the direction in relation to the reference point is the fastest and most accurate method.

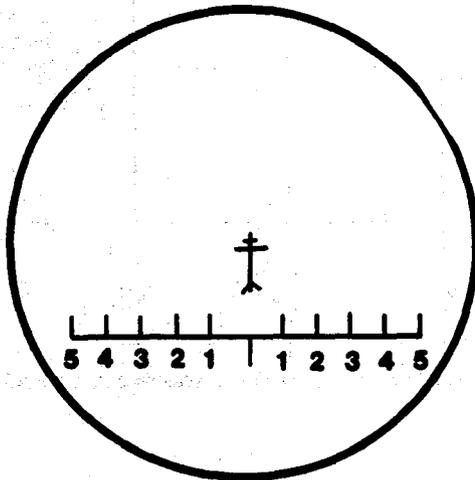
(2) Determine the distance from your location to the target to the nearest 100 meters.

(a) Apparance of objects method.

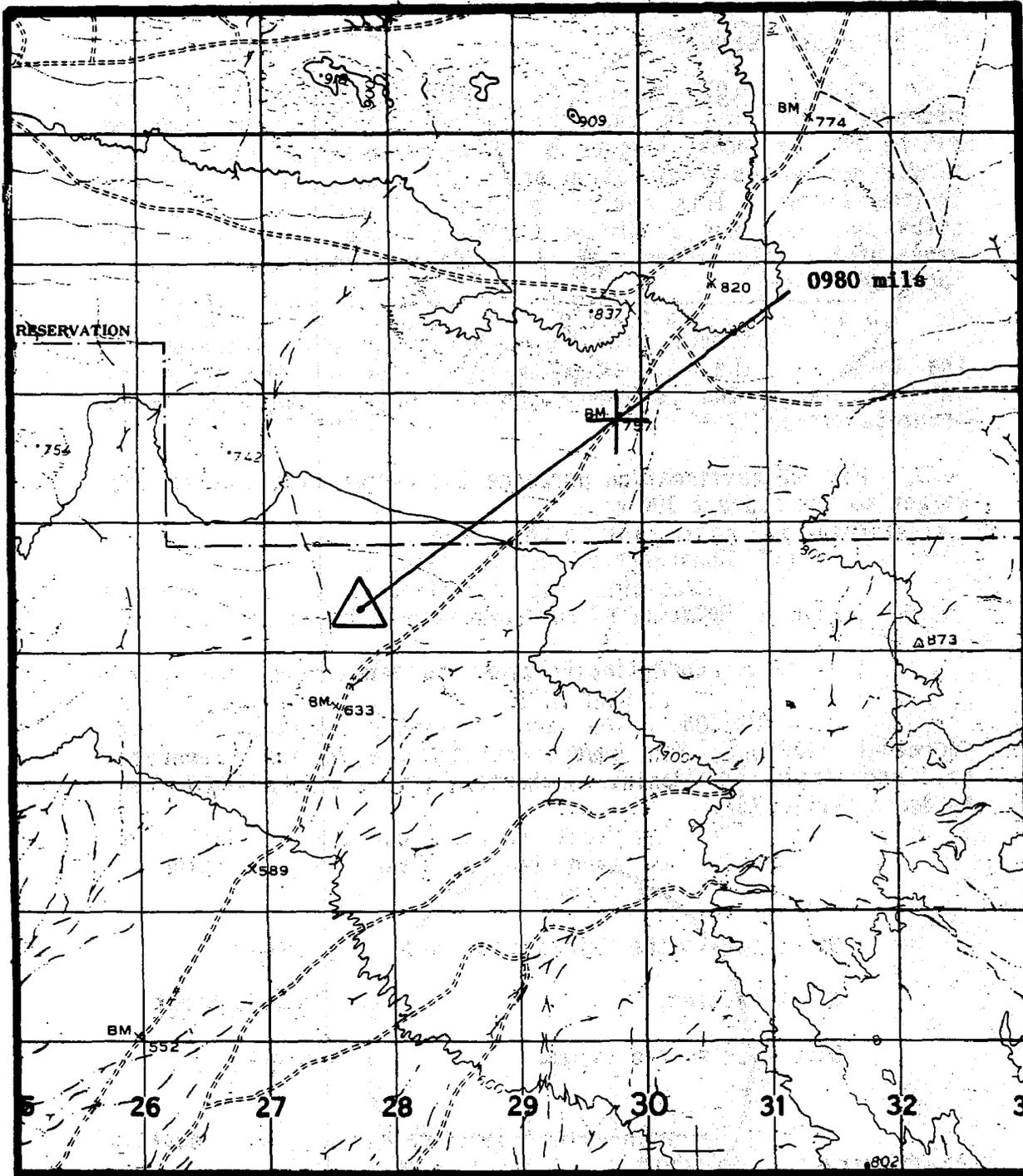
(b) Reticle/mil relation method.

(3) Target Location; Polar Plot Example:

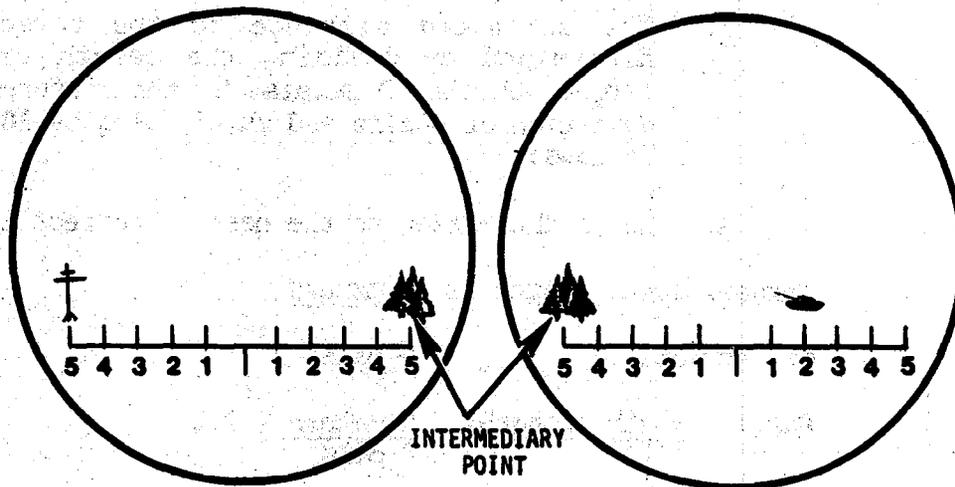
SITUATION. You are currently located at grid coordinate 278863. You have one reference point located at grid coordinate 288878. The reference point can be identified as Bench Marker 757.



You have determined the direction from your location to the reference point using a map and protractor to be 0980 mils.



The FIST informed you prior to the operation that your current location would be reported to the Field Artillery Fire Direction Center. This has been confirmed. The following target appears in the vicinity of the reference point. You observe the target with your binoculars as shown:



NOTE: For range estimation purposes the target is not to scale.

To determine the polar plot to the target:

(a) Determine the direction from your location to the target in relation to the reference point as follows:

1. The direction to the reference point is **0980 mils**.
2. The mil deviation from the reference point to the target is **170 mils Right**.
3. The Right Add Left Subtract rule (RALS) is used to calculate the direction to the target:

Direction to the Reference Point: **0980 mils**

Mil Deviation: **170 mils Right**

Direction to the target: **1150 mils**

(b) Determine the distance from your location to the target as follows:

1. The target vehicle is a tank and the length is known to be approximately **9 meters**.

2. The measured mil deviation from the front to back of the target is 4 mils.
3. The estimated distance to the target is determined by dividing the length of the target vehicle, 9 meters, by the measured mil deviation of 4 mils and multiplying by 1000 as follows:
4. Round the answer to the nearest correct 100.

Target; Tank, Length is 9 meters

Mil Deviation: 4 mils

$$\text{Range} = \frac{\text{Width (Length)}}{\text{mils}} \quad \frac{9 \text{ meters}}{4 \text{ mils}} = 2.2$$

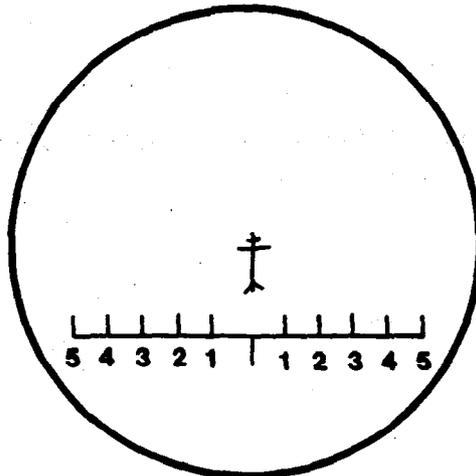
$$2.2 \times 1000 = 2,200 \text{ meters}$$

(c) The polar plot to the target is:

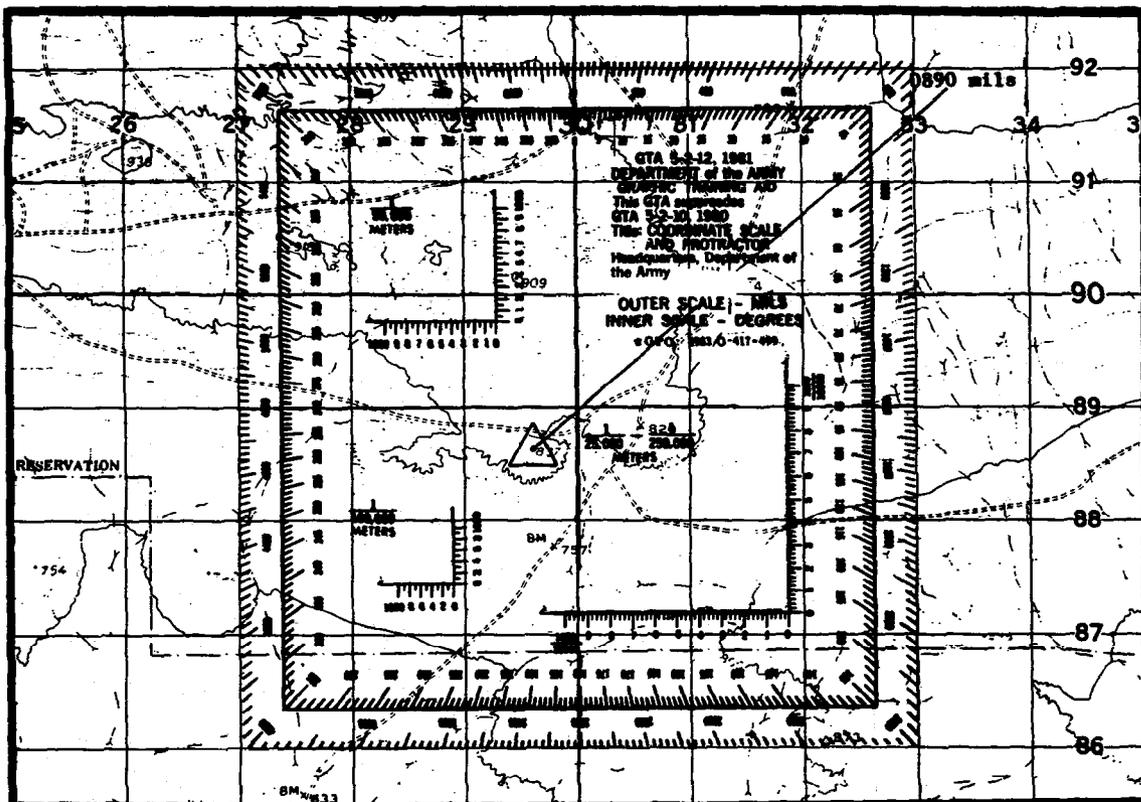
Direction 1150 mils
Distance 2200 meter

b. Practice Exercise.

SITUATION. You are currently located at grid coordinate 296886. You have one reference point located at grid coordinate 314901. The reference point can be identified as Bench Marker 774.

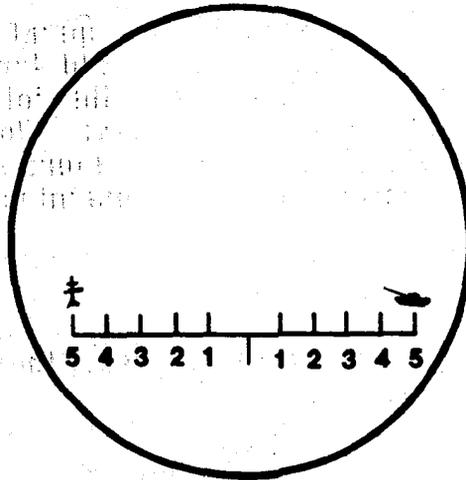


You have determined the direction from your location to the reference point using a map and protractor to be 0890 mils.



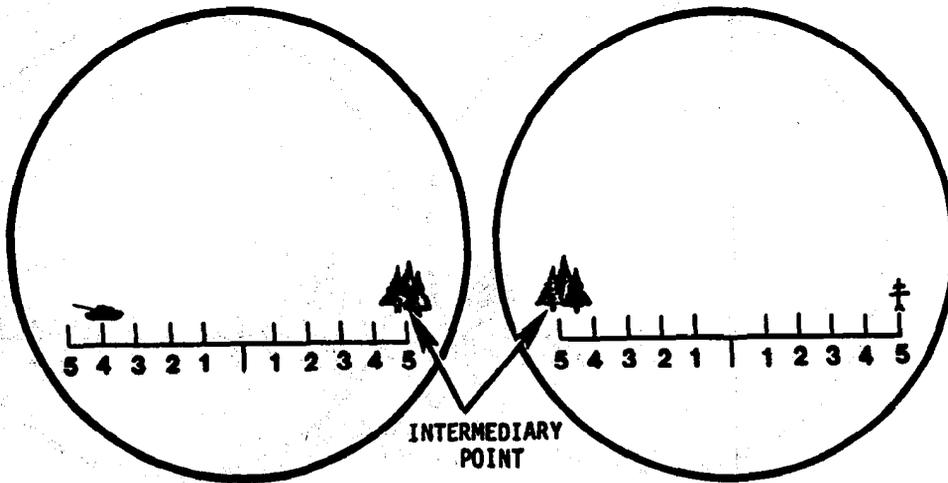
The FIST informed you prior to the operation that your current location would be reported to the Field Artillery Fire Direction Center. This has been confirmed. The following targets appear in the vicinity of the reference point. You observe the targets with your binoculars as shown in exercises (1) through (8). Using the information provided determine the polar plot to each target.

NOTE: For range estimation purposes the target vehicles are not to scale.



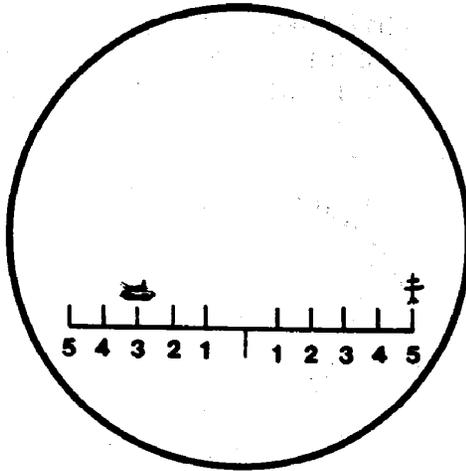
(1) Direction to the Reference Point: 0890 mils
 Target; Tank, Length: 7.5 meters
 Mil Deviation: 2 mils

- | | |
|--|--|
| a. Direction 0990 mils
Distance 3750 meters | c. Direction 0790 mils
Distance 3750 meters |
| b. Direction 0790 mils
Distance 3800 meters | d. Direction 0990 mils
Distance 3800 meters |



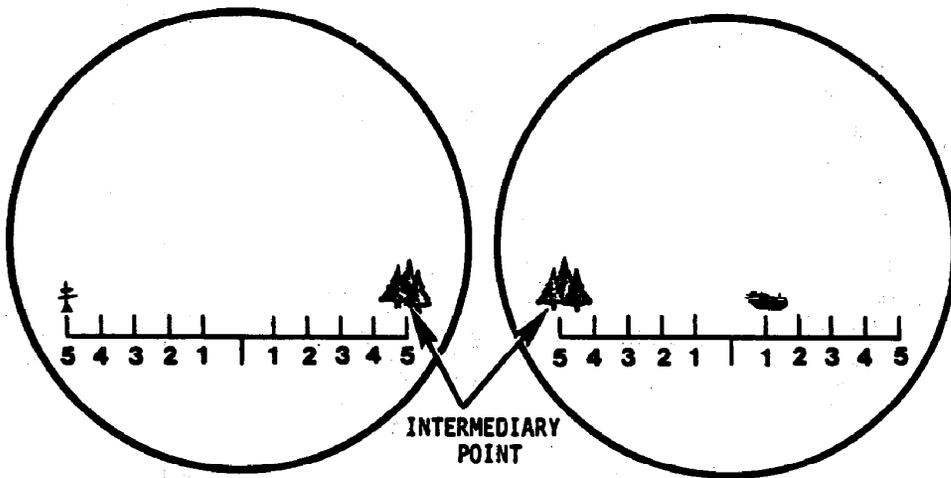
(2) Direction to the Reference Point: 0890 mils
 Target; Tank, Length: 6.5 meters
 Mil Deviation: 2 mils

- | | |
|--|--|
| a. Direction 0700 mils
Distance 3250 meters | c. Direction 1080 mils
Distance 3250 meters |
| b. Direction 1080 mils
Distance 3200 meters | d. Direction 0700 mils
Distance 3200 meters |



(3) Direction to the Reference Point: 0890 mils
 Target; ZSU 23-4, Length, 7 meters
 Mil Deviation: 3 mils

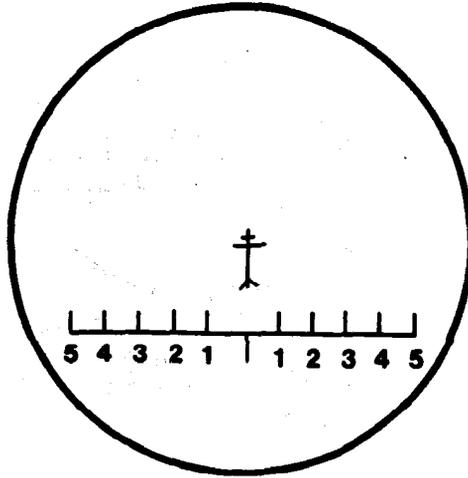
- | | |
|--|--|
| a. Direction 0810 mils
Distance 2300 meters | c. Direction 0810 mils
Distance 2330 meters |
| b. Direction 0970 mils
Distance 2330 meters | d. Direction 0970 mils
Distance 2300 meters |



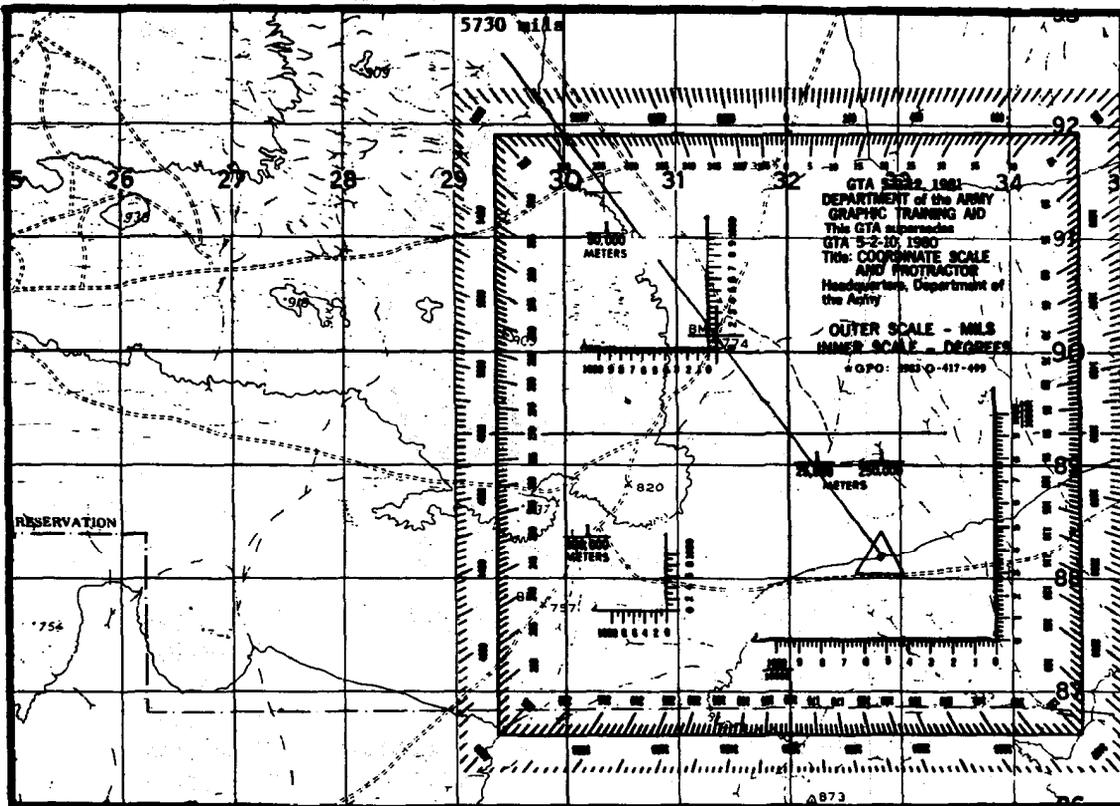
(4) Direction to the Reference Point: 0890 mils
 Target; BMD, Length 7 meters
 Mil Deviation: 2 mils

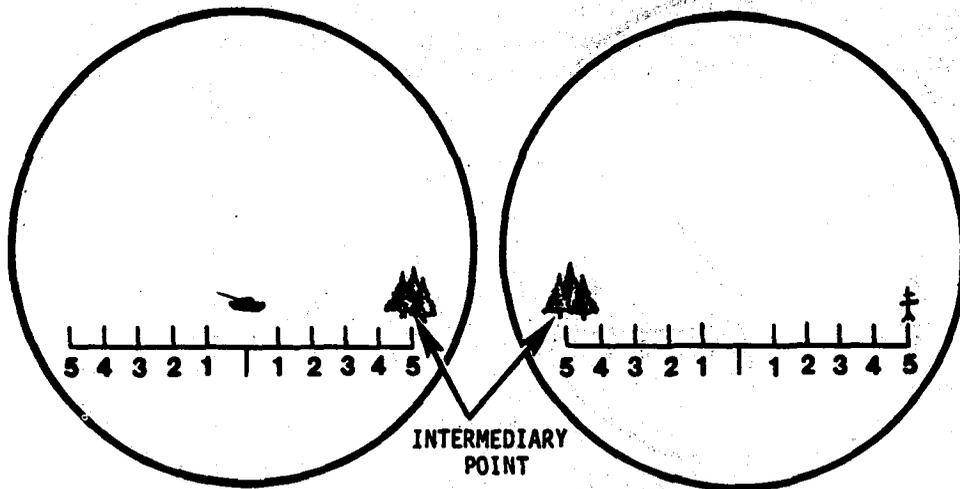
- | | |
|--|--|
| a. Direction 0730 mils
Distance 3500 meters | c. Direction 1050 mils
Distance 3500 meters |
| b. Direction 1050 mils
Distance 3000 meters | d. Direction 0730 mils
Distance 4000 meters |

SITUATION CONTINUED. You are now located at grid coordinate 329882. You have one reference point located at grid coordinate 314901. The reference point can be identified as Bench Marker 774.



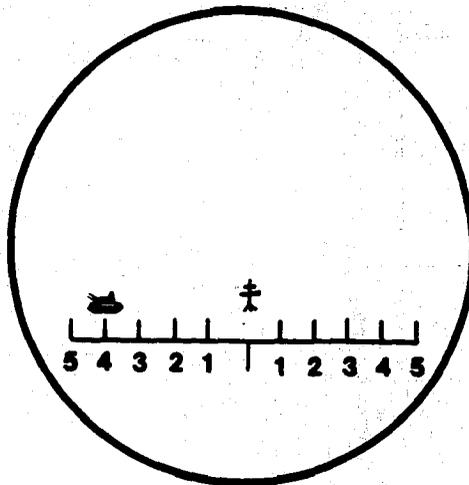
You have determined the direction from your location to the reference point using a map and protractor to be 5730 mils.





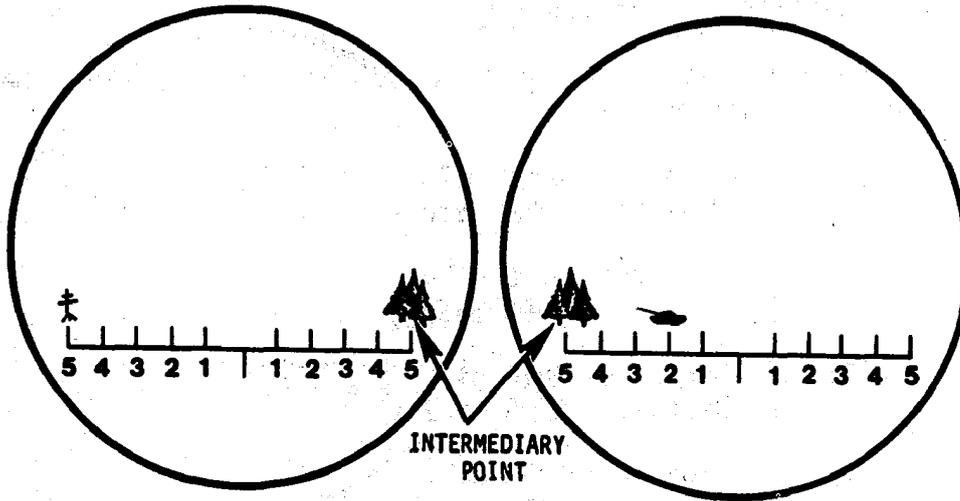
(5) Direction to the Reference Point: 5730 mils
 Target; Tank, Length: 9 meters
 Mil Deviation: 4 mils

- | | |
|--|--|
| a. Direction 5880 mils
Distance 2250 meters | c. Direction 5880 mils
Distance 2300 meters |
| b. Direction 5580 mils
Distance 2200 meters | d. Direction 5580 mils
Distance 2250 meters |



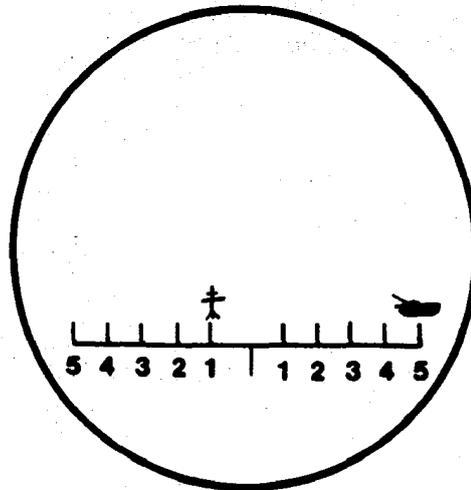
(6) Direction to the Reference Point: 5730 mils
 Target; ZSU 23-4, Length: 7 meters
 Mil Deviation: 2 mils

- | | |
|--|--|
| a. Direction 5690 mils
Distance 3500 meters | c. Direction 5770 mils
Distance 3450 meters |
| b. Direction 5770 mils
Distance 3600 meters | d. Direction 5690 mils
Distance 3600 meters |



(7) Direction to the Reference Point: 5730 mils
 Target; Tank, Length: 9 meters
 Mil Deviation: 3 mils

- a. Direction 5830 mils
Distance 3000 meters
- b. Direction 5600 mils
Distance 2800 meters
- c. Direction 5600 mils
Distance 3000 meters
- d. Direction 5860 mils
Distance 3000 meters



(8) Direction to the Reference Point: 5730 mils
 Target, PT-76, Length: 6.5 meters
 Mil Deviation: 3 mils

- a. Direction 5670 mils
Distance 2160 meters
- b. Direction 5790 mils
Distance 2160 mils
- c. Direction 5790 mils
Distance 2200 meters
- d. Direction 5670 mils
Distance 2200 meters

c. Solution to Practice Exercise.

An explanation of how solutions were obtained begins on Page 23, Paragraph 3 a.

- (1) d. Direction 0990 mils
Distance 3800 meters
- (2) d. Direction 0700 mils
Distance 3200 meters
- (3) a. Direction 0810 mils
Distance 2300 meters
- (4) c. Direction 1050 mils
Distance 3500 meters
- (5) b. Direction 5580 mils
Distance 2200 meters
- (6) a. Direction 5690 mils
Distance 3500 meters
- (7) d. Direction 5860 mils
Distance 3000 meters
- (8) c. Direction 5790 mils
Distance 2200 meters

4. LEARNING ACTIVITY 4

Upon completion of this learning activity, you will be able to determine the location of a target using the grid coordinate method.

a. Study Resources.

GRID COORDINATE METHOD OF TARGET LOCATION. The grid coordinate method of target location is a natural extension of the polar plot method. The observers location is not needed by the fire direction center. The observer normally locates targets to an accuracy of 100 meters (six digit grid). This is accomplished by first determining the direction and distance to the target (polar plot) and then plotting it on the appropriate map.

(1) Determine the direction from your location to the target to the nearest 10 mils. Measuring the direction in relation to the reference point is the fastest and most accurate method.

(2) Determine the distance from your location to the target to the nearest 100 meters.

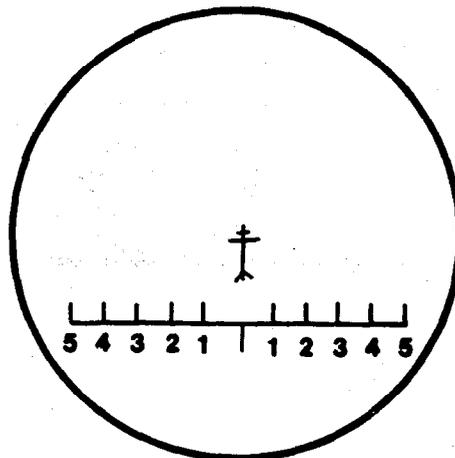
(a) Appearance of objects method.

(b) Reticule/mil relation method.

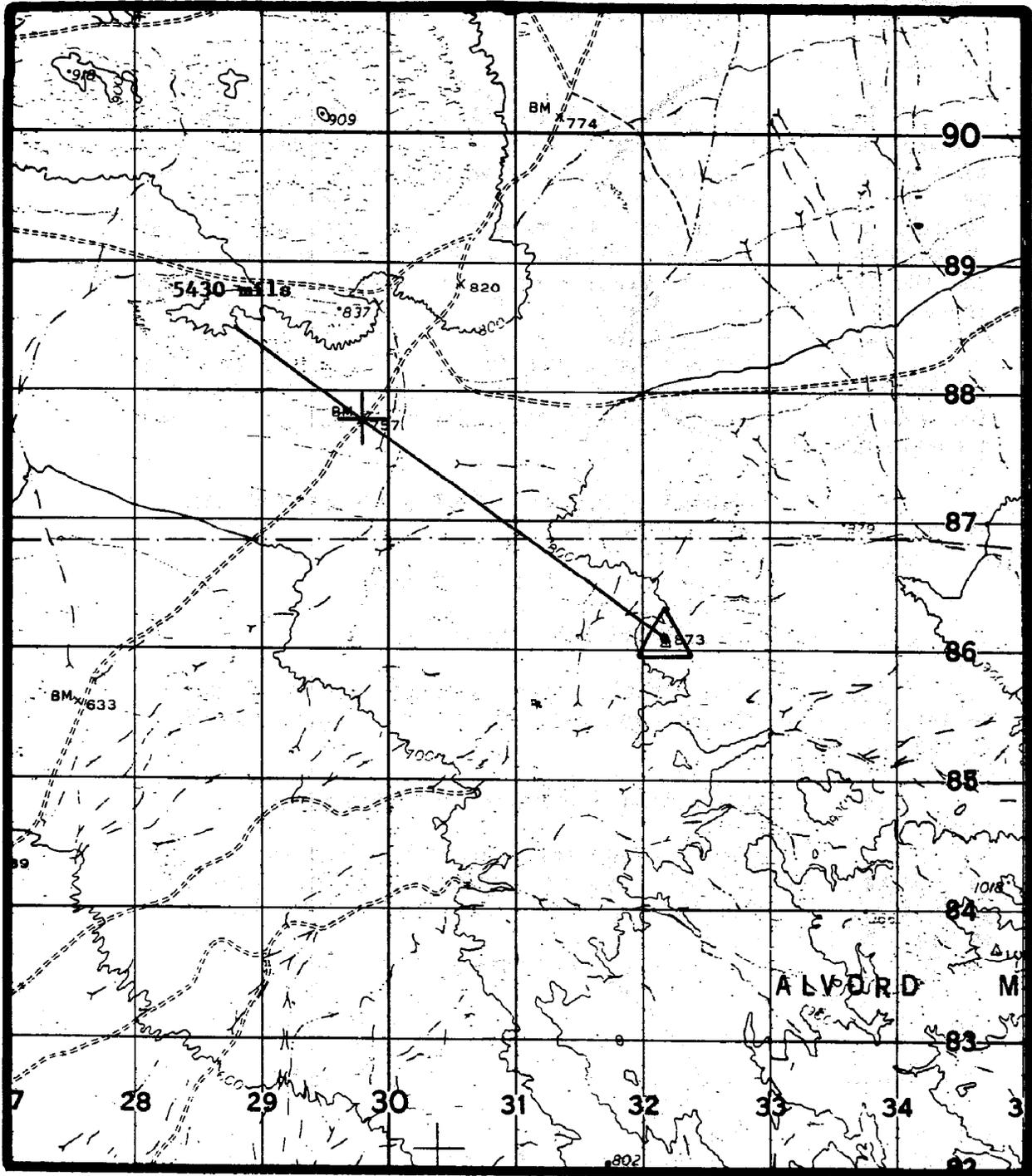
(3) Plot the direction and distance from your location to the target on the map and read the six digit grid coordinate to the target.

(4) Target Location; Grid Coordinate Example:

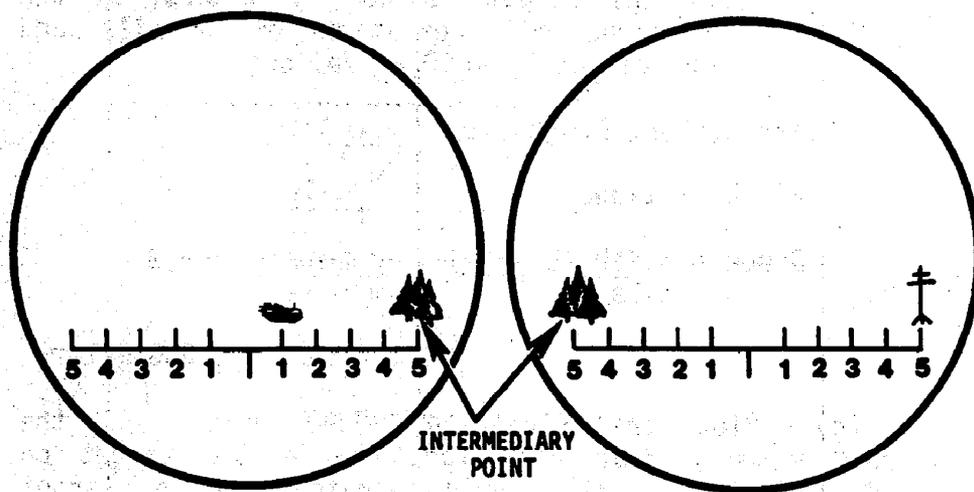
SITUATION. You are currently located at grid coordinate 322860. You have one reference point located at grid coordinate 288878. The reference point can be identified as Bench Marker 757.



You have determined the direction from your location to the reference point using a map and protractor to be 5430 mils.



The FIST informed you prior to the operation that your current location would not be reported to the Field Artillery Fire Direction Center. This has been confirmed. The following target appears in the vicinity of the reference point. You observe the target with your binoculars as shown:



NOTE: For range estimation purposes the target is not to scale.

To determine the grid coordinate to the target:

(a) Determine the direction from your location to the target in relation to the reference point as follows:

1. The direction to the reference point is **5430 mils**.
2. The mil deviation from the reference point to the target is **140 mils Left**.

3. The Right Add Left Subtract rule (RALS) is used to calculate the direction to the target:

Direction to the Reference Point:	<u>5430 mils</u>
Mil Deviation:	<u>140 mils Left</u>
Direction to the target:	<u>5290 mils</u>

(b) Determine the distance from your location to the target as follows:

1. The target vehicle is a BMP and the length is known to be approximately **7 meters**.

2. The measured mil deviation from the front to back of the target is 3 mils.

3. The estimated distance to the target is determined by dividing the length of the target vehicle, 7 meters, by the measured mil deviation of 3 mils and multiplying by 1000 as follows:

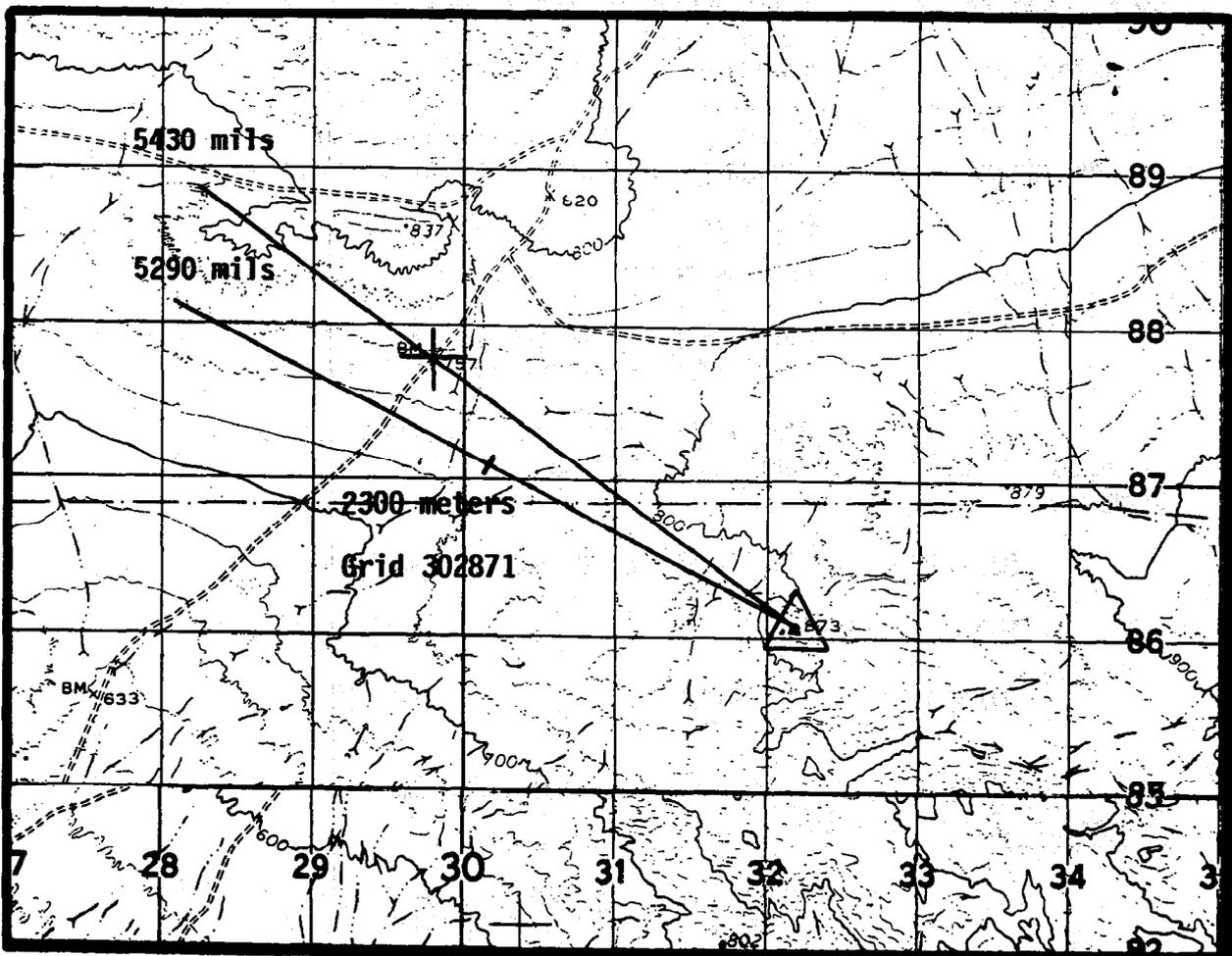
Target; BMP, Length is 7 meters

Mil Deviation: 3 mils

Range = $\frac{\text{Width (Length)}}{\text{mils}} \times \frac{7 \text{ meters}}{3 \text{ mils}} = 2.3$

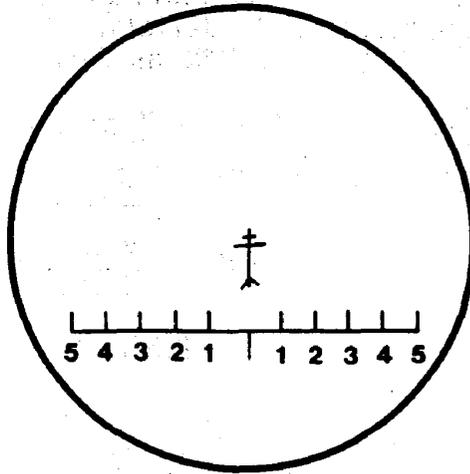
$2.3 \times 1000 = 2,300 \text{ meters}$

(c) Plot the direction, 5290 mils, and the distance, 2300 meters, from your location to the target on your map and read the six digit grid coordinate to the target of Grid 302871.

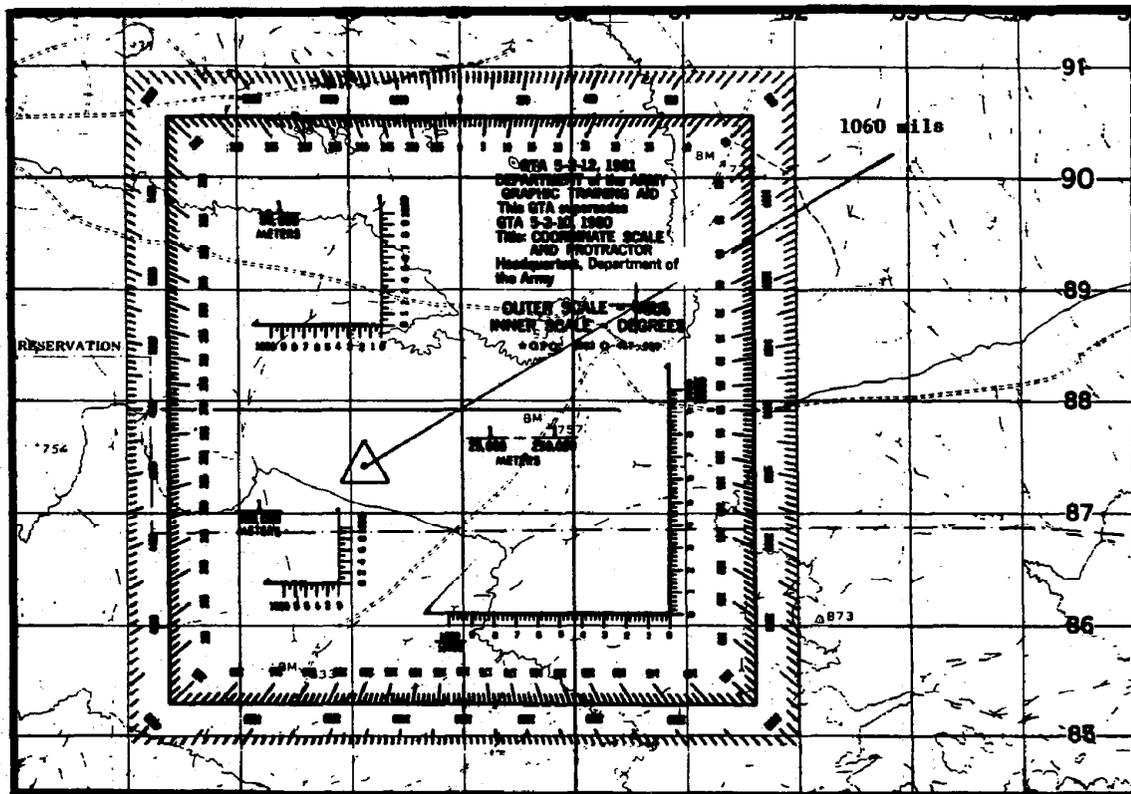


b. Practice Exercise.

SITUATION. You are currently located at grid coordinate 282874. You have one reference point located at grid coordinate 306888. The reference point can be identified as Bench Marker 820.



You have determined the direction from your location to the reference point using a map and protractor to be 1060 mils.

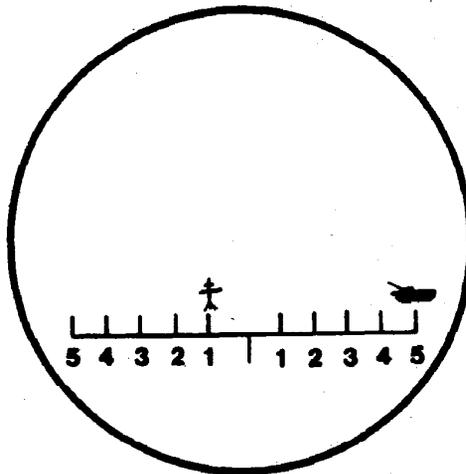


The FIST informed you prior to the operation that your current location would not be reported to the Field Artillery Fire Direction Center. This has been confirmed. The following targets appear in the vicinity of the reference point. You observe the targets with your binoculars as shown in exercises (1) through (8). Using the information provided determine the polar plot to each target.

NOTE: For range estimation purposes the target vehicles are not to scale.

1. The first part of the document is a list of names and addresses of the members of the committee. The names are listed in alphabetical order and include the following: [illegible names]

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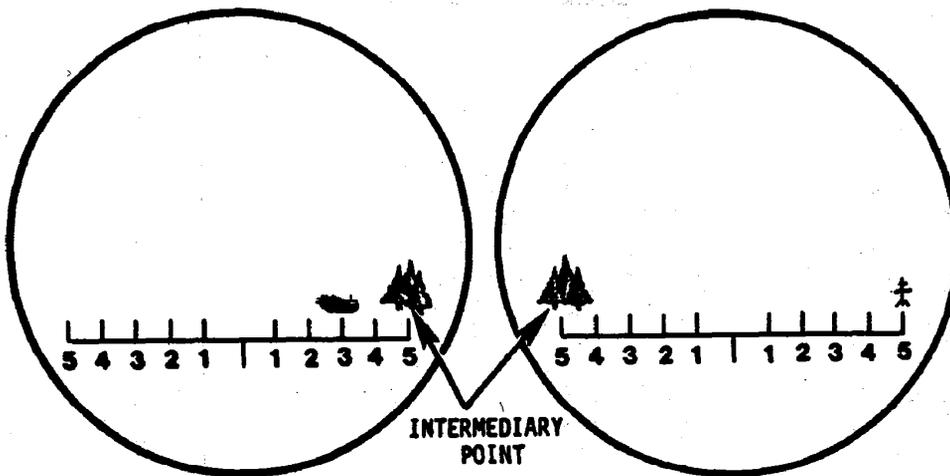
(1) Direction to the Reference Point: 1060 mils
 Target; Tank, Length: 6.5 meters
 Mil Deviation: 3 mils

a. Grid 301885

c. Grid 301889

b. Grid 304882

d. Grid 300886



(2) Direction to the Reference Point: 1060 mils
 Target; BMD, Length: 7 meters
 Mil Deviation: 3 mils

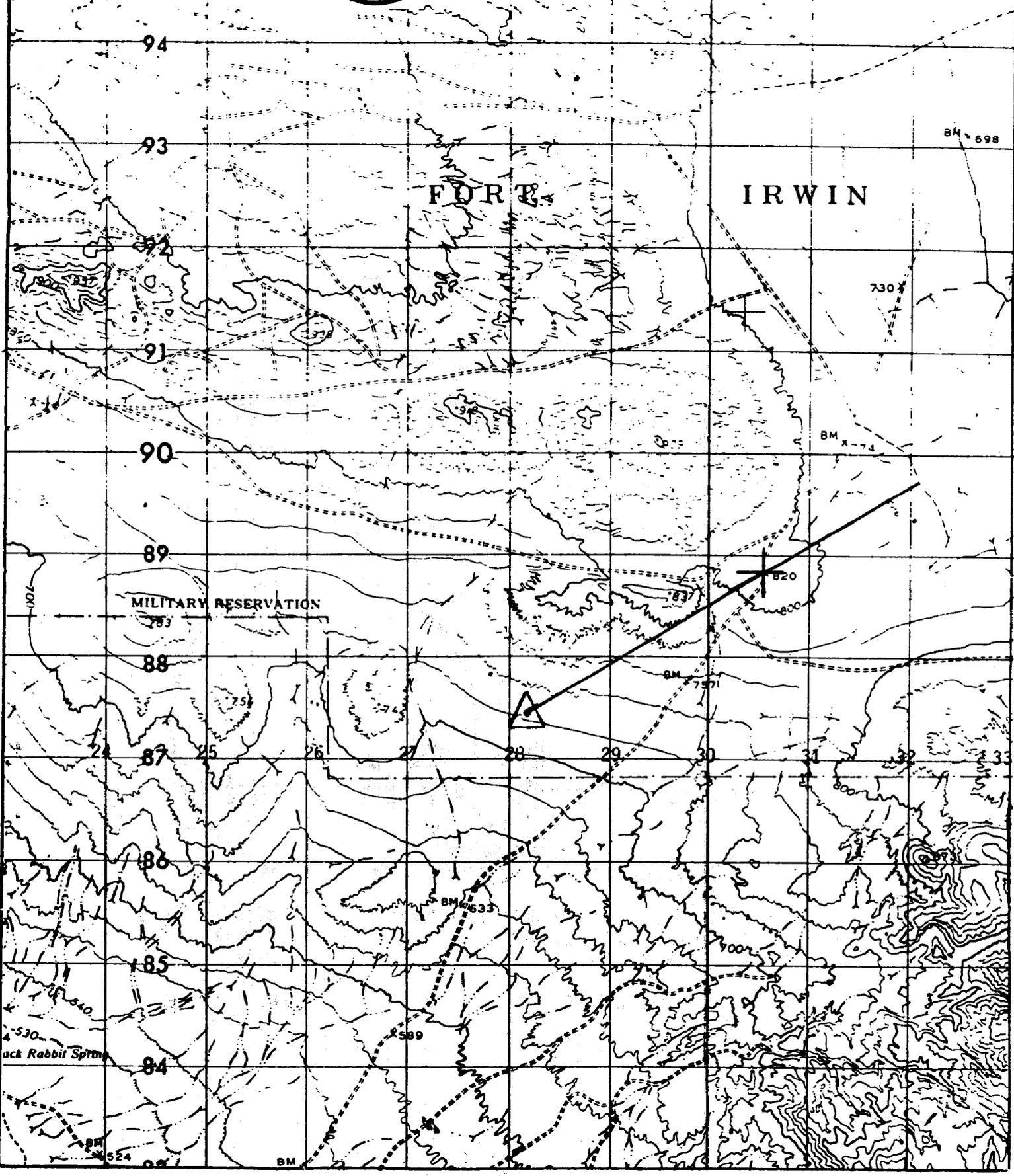
a. Grid 888300

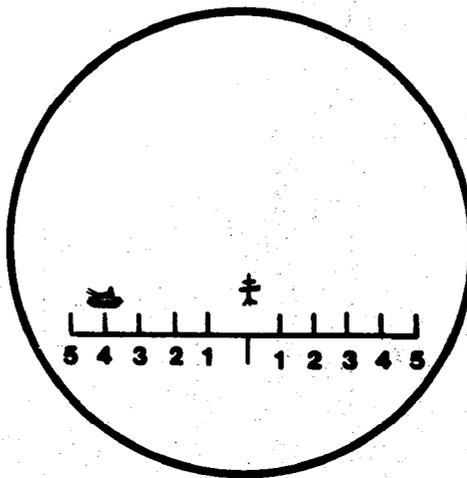
c. Grid 300878

b. Grid 302884

d. Grid 300888

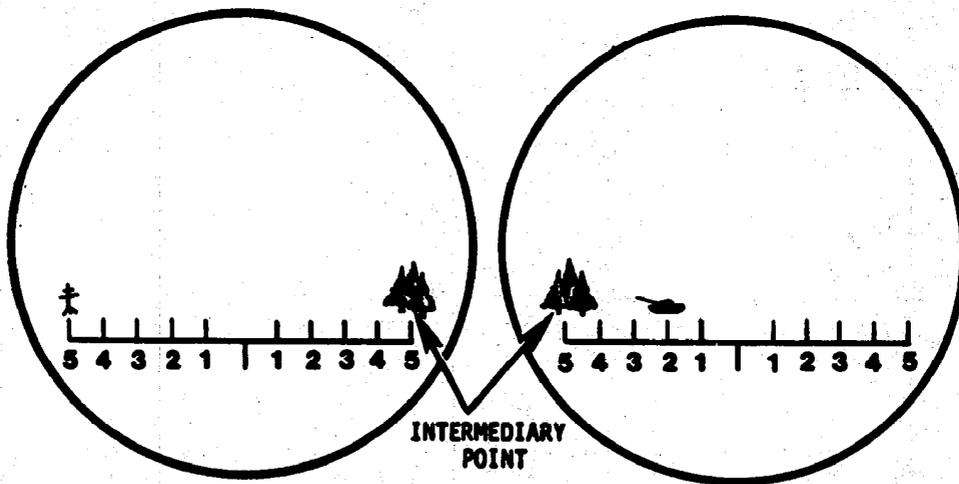
LIMITS





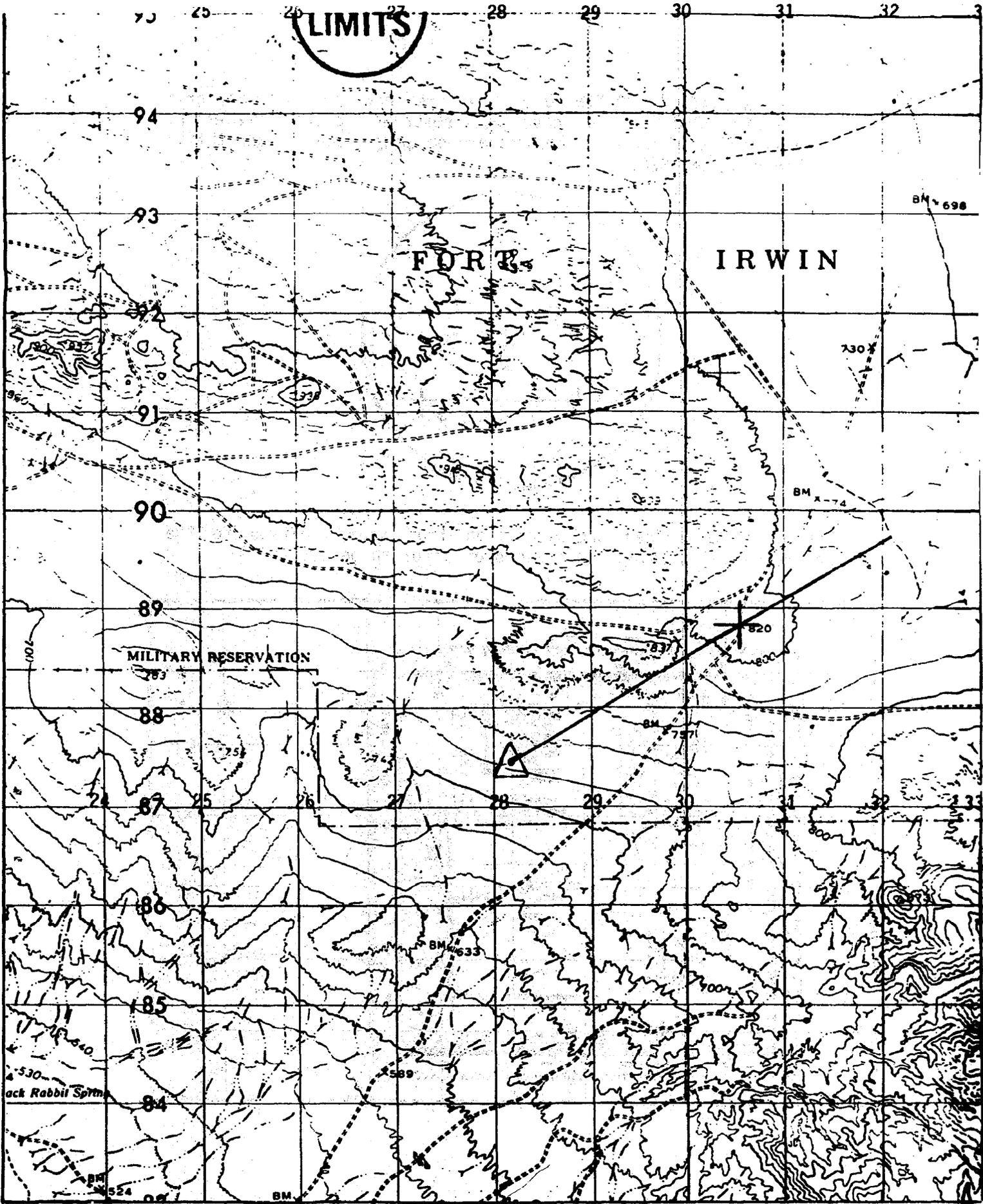
(3) Direction to the Reference Point: 1060 mils
 Target; ZSU 23-4, Length: 7 meters
 Mil Deviation: 2 mils

- a. Grid 312891
- b. Grid 311893
- c. Grid 308888
- d. Grid 307891

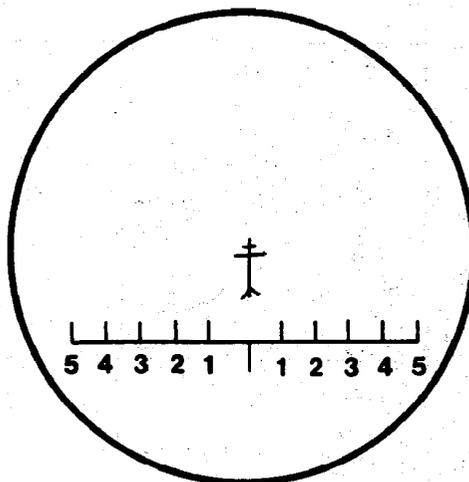


(4) Direction to the Reference Point: 1060 mils
 Target; Tank, Length: 7.5 meters
 Mil Deviation: 3 mils

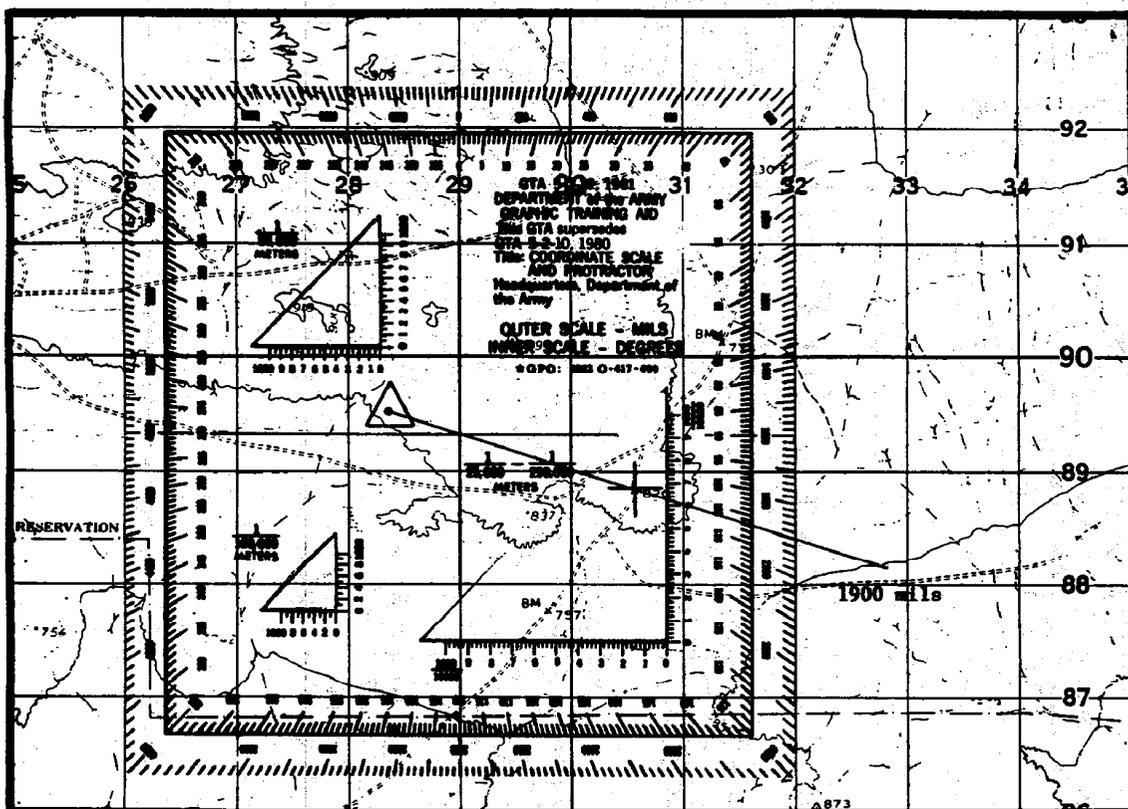
- a. Grid 302889
- b. Grid 300883
- c. Grid 305884
- d. Grid 306892



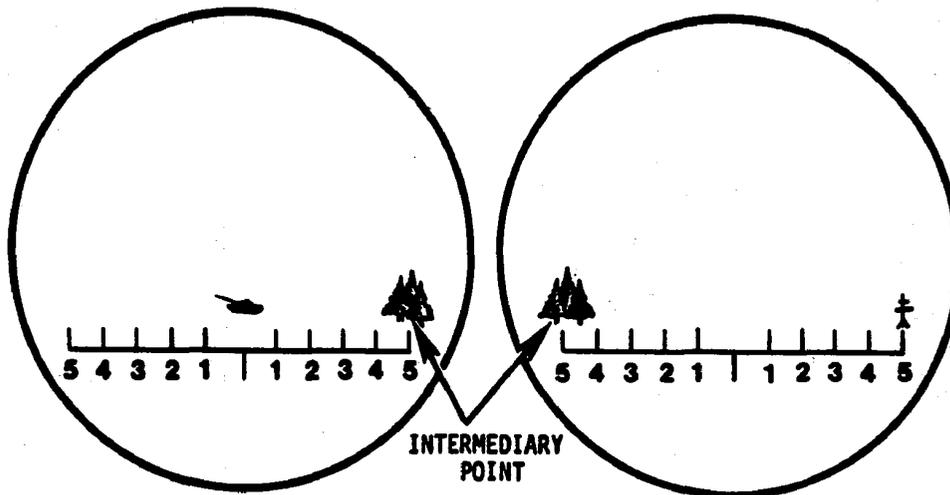
SITUATION CONTINUED. You are now located at grid coordinate 284895. You have one reference point located at grid coordinate 306888. The reference point can be identified as Bench Marker 820.



You have determined the direction from your location to the reference point using a map and protractor to be 1900 mils.

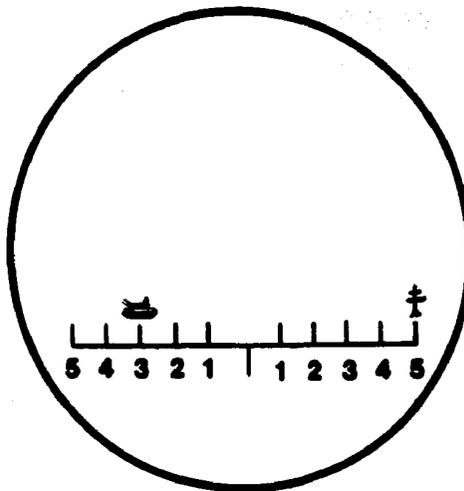


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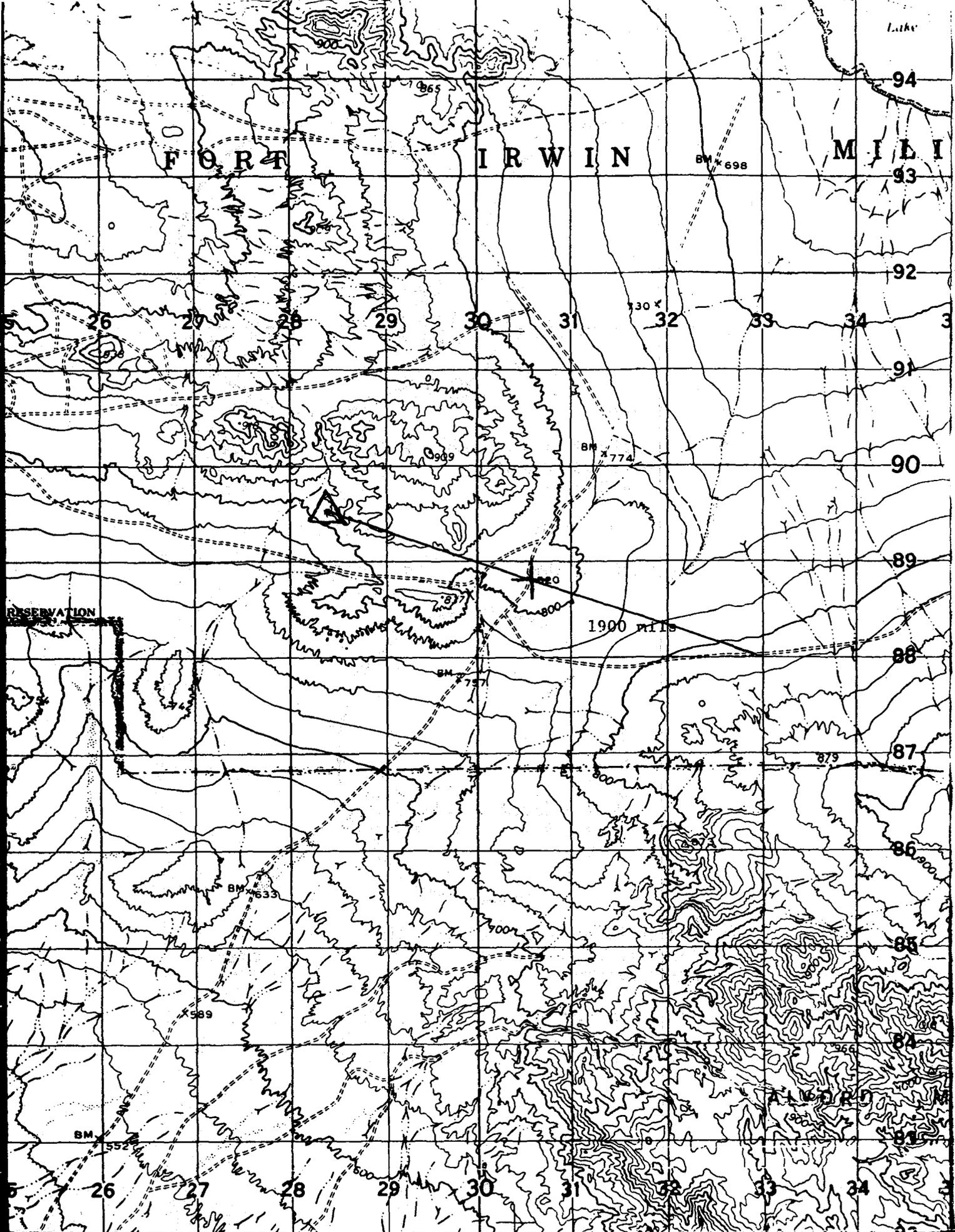
(5) Direction to the Reference Point: 1900 mils
 Target; Tank, Length: 9 meters
 Mil Deviation: 4 mils

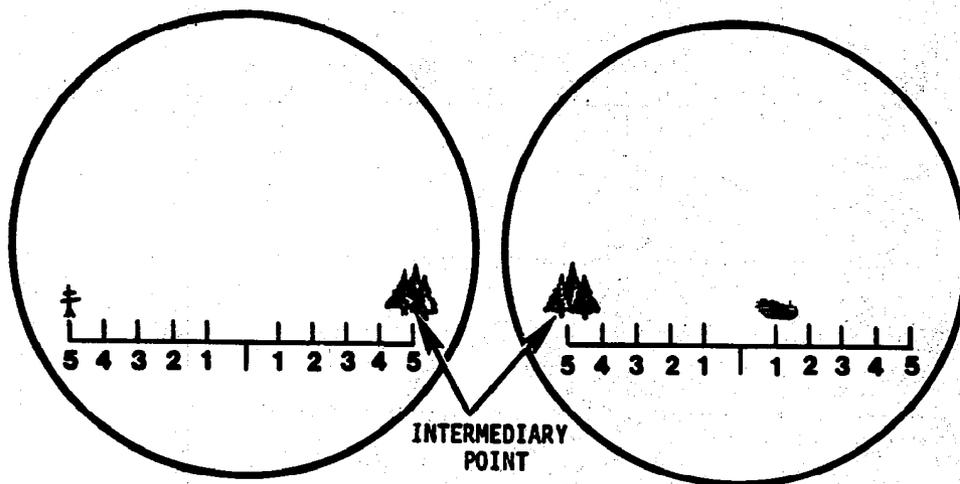
- a. Grid 306892
- b. Grid 301886
- c. Grid 303885
- d. Grid 303892



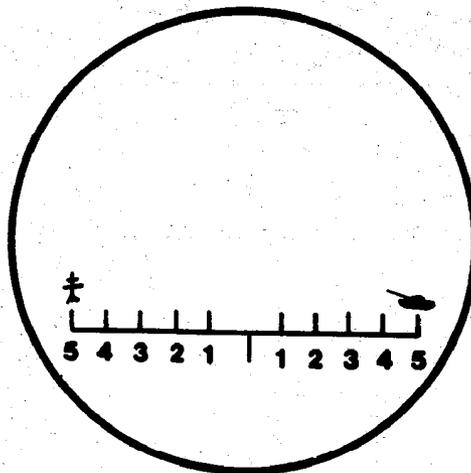
(6) Direction to the Reference Point: 1900 mils
 Target; ZSU 23-4, Length: 7 meters
 Mil Deviation: 3 mils

- a. Grid 302889
- b. Grid 305889
- c. Grid 306890
- d. Grid 303891

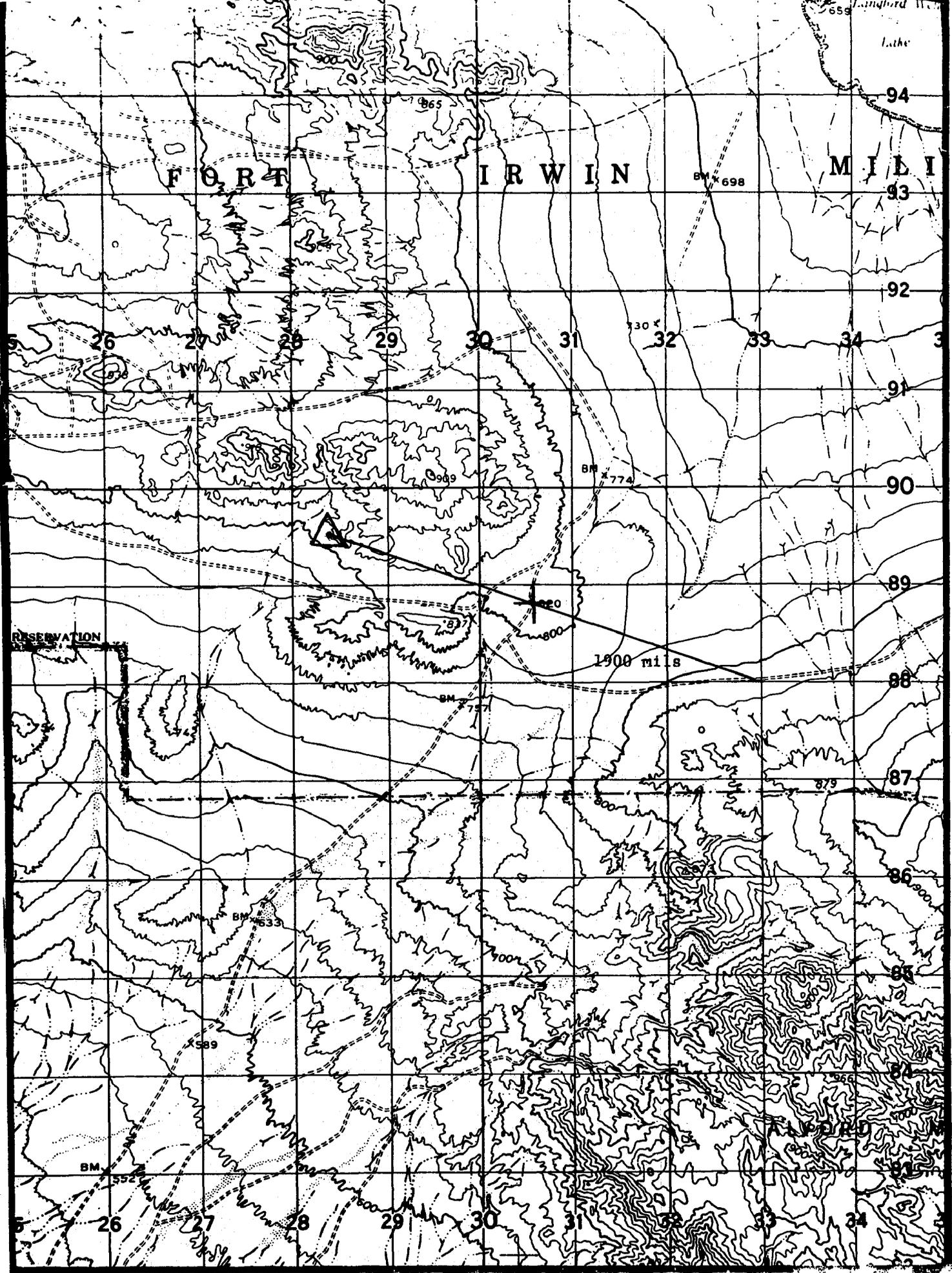




- (7) Direction to the Reference Point: 1900 mils
 Target; BMD, Length: 7 meters
 Mil Deviation: 2 mils
- a. Grid 311883 c. Grid 316881
 b. Grid 318889 d. Grid 313890



- (8) Direction to the Reference Point: 1900 mils
 Target; Tank, Length: 7.5 meters
 Mil Deviation: 4 mils
- a. Grid 304891 c. Grid 303887
 b. Grid 302891 d. Grid 301888



c. Solution to Practice Exercise.

An explanation of how solutions were obtained begins
on Page 35, Paragraph 4 a.

- (1) a. Grid 301885
- (2) d. Grid 300888
- (3) b. Grid 311893
- (4) c. Grid 305884
- (5) a. Grid 306892
- (6) c. Grid 306890
- (7) c. Grid 316881
- (8) d. Grid 301888

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5. LEARNING ACTIVITY 5

Upon completion of this learning activity you will be able to determine the location of a target using the shift from a known point method.

a. Study Resources

SHIFT FROM A KNOWN POINT METHOD OF TARGET LOCATION.

The observer should have one or more reference points that can be used as known points in his area of responsibility. Known points, like reference points, are readily identifiable points that can be identified on the ground and on a map. The difference is a known point is a point known to both the observer and the fire direction center. The observer does not need a map to use this method; he only needs a known point that he has determined a direction and distance to. This method is fast accurate and is adaptable to armor operations. The steps in locating a target by the shift from a known point method are as follows:

(1) Determine the direction from your location to the target to the nearest 10 mils. Measuring the direction in relation to the known point is the fastest and most accurate method.

(2) Determine the lateral shift from the known point to the target to the nearest 10 meters.

(a) Measure the angular deviation from the known point to the target.

(b) Compute the lateral shift using the $W=R \times M$ formula. The lateral shift (W) is equal to the range to the known point divided by 1,000 (R) times the mil angle from the known point to the target (m).

The observer knows that the distance from his location to the known point (CHURCH) is 2,500 meters. He also knows the direction is 0850 mils. With his binoculars, he measures an angular deviation of 62 mils from the church to the target. He calculates the lateral shift by use of the mil relation formula as shown

$$\frac{2500}{1000} = 2.5$$

(2500 is already expressed to the nearest 100.)

$$W = R \times m$$
$$W = 2.5 \times 62$$
$$W = 155 \text{ meters} \approx 160 \text{ meters (nearest 10 meters)}$$

LEFT 160

The diagram shows an observer at the bottom vertex of a triangle. The top-right vertex is a church, labeled 'KNOWN POINT CHURCH' with 'DIRECTION 0850' and 'DISTANCE 2500'. The top-left vertex is a target, labeled 'T'. A line connects the church and the target, with an arc between them labeled '62m ANGULAR DEVIATION'. A line connects the observer and the church. A line connects the observer and the target. A horizontal line extends from the church to the left, labeled 'LEFT 160'. Above this line is a tree line with a building, labeled 'BMP IN TREE LINE'.

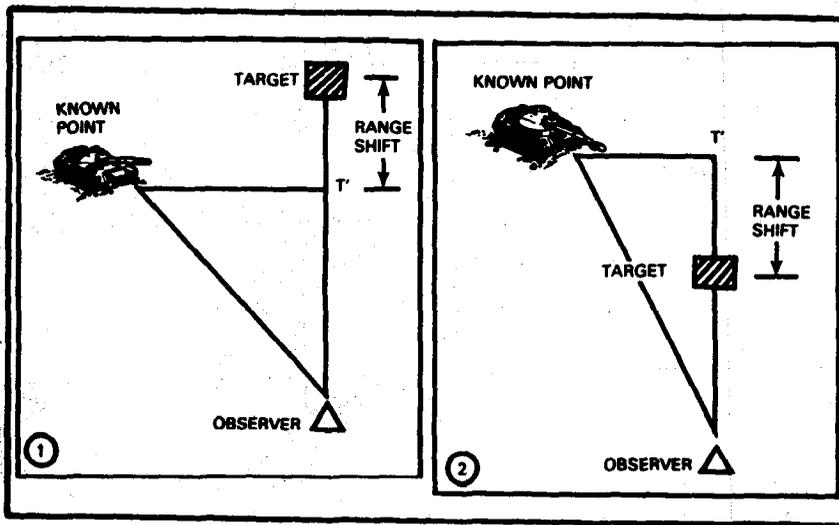
(3) Determine the range shift from the known point to the target to the nearest 100 meters.

(a) Measure or estimate the distance to the known point.

(b) Measure or estimate the distance to the target.

(c) Determine the difference between the distance to the target and the distance to the known point.

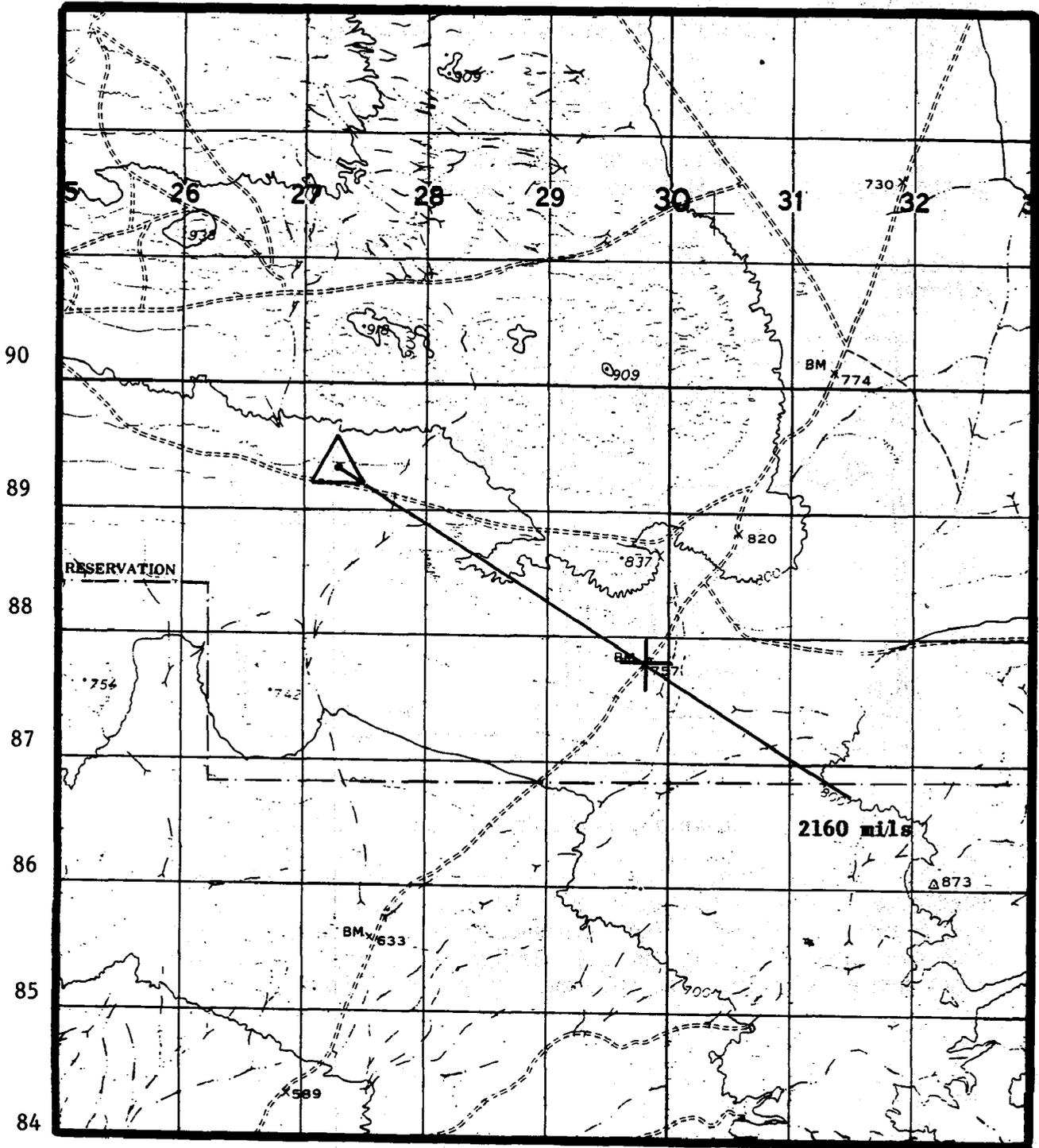
(d) If the target is at a greater range **ADD** the difference. If the target is at a lesser range **DROP** the difference.



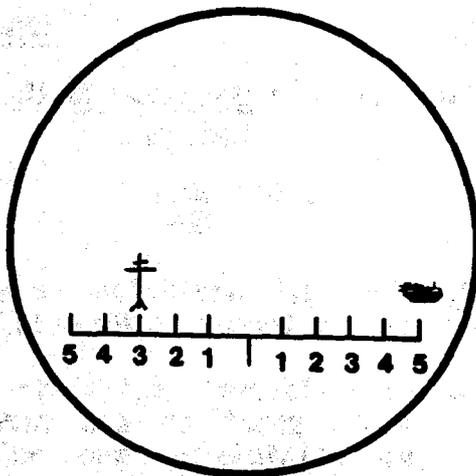
(4) Target Location; Shift From A Known Point Example.

SITUATION. You are currently located at grid coordinate 273894. You have one reference point located at grid coordinate 288878. The reference point can be identified as Bench Marker 757 and has been assigned the field artillery target number AF 8001. The reference point is a known point.

You have determined the direction from your location to the known point, AF 8001, using a map and protractor to be 2160 mils.



The FIST informed you prior to the operation that the reference point located at grid coordinate 298878 is the field artillery pre-planned target AF 8001. This has been confirmed. The following target appears in the vicinity of the known point, AF 8001. You observe the target with your binoculars as shown:



NOTE: For range estimation purposes the target is not to scale.

To determine the shift from a known point data to the target:

(a) Determine the direction from your location to the target in relation to the reference point as follows:

1. The direction to the known point is **2160 mils.**
2. The mil deviation from the known point to the target is **80 mils Right.**
3. The Right Add Left Subtract rule (RALS) is used to calculate the direction to the target:

Direction to the Known Point: 2160 mils

Mil Deviation: 80 mils Right

Direction to the target: 2240 mils

(b) Determine the lateral shift, or the distance in meters the target is to the right or left of the known point as follows:

1. The distance to the known point is 3000 meters. 3000 meters divided by 1000 equals a SHIFT FACTOR of 3.0.

Distance to the Known Point: 3000 meters

Constant: 1000

$$\text{SHIFT FACTOR} = \frac{\text{Distance to the Known Point}}{\text{Constant}}$$

$$3.0 = \frac{3000}{1000}$$

2. The mil deviation from the known point to the target is 80 mils Right.

3. The lateral shift in meters from the known point to the target is determined by multiplying the mil deviation from the known point to the target, 80 mils Right, by the SHIFT FACTOR of 3.0 as follows:

Mil Deviation: 80 mils Right

SHIFT FACTOR: 3.0

$$W = \text{Range} \times \text{mils or Right} \quad 240 = 3.0 \times 80 \text{ mils}$$

NOTE: W when used in this computation represents Lateral Shift in meters Left or Right from the known point to the target.

(c) Determine the range shift from the known point to the target by determining the difference in distance between the known point and the target. If the target is at a greater range the correction will be Add, if the target is at a lesser range the correction will be Drop.

1. Target; BMP, Length: 7 meters

Mil Deviation: 2 mils

$$\text{Range} = \frac{\text{Width}}{\text{mils}} \quad \frac{7 \text{ meters}}{2 \text{ mils}}$$

$$3.5 \times 1000 = 3500 \text{ meters}$$

NOTE: **W** when used in this computation represents the **Length, Height or Width** of the target vehicle.

2. Distance to the known point is most easily determined by measuring on a map. The distance to the known point is measured and determined to be **3000 meters**.

3. Distance to the Target: 3500 meters

Distance to the Known Point: 3000 meters

Difference: 500 meters

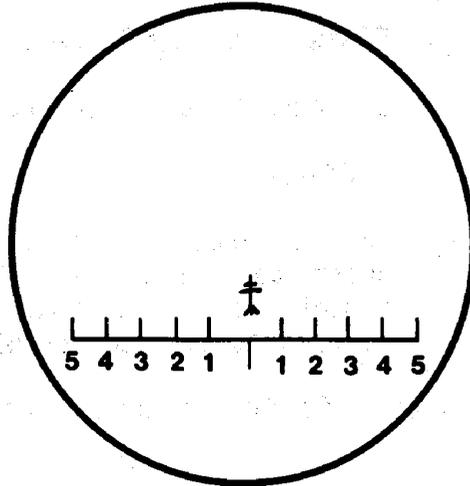
4. The difference in distance from the known point to the target is **500 meters**. The target is at a greater range so the correction will be **Add 500**.

(d) The shift from a known point target location is as follows:

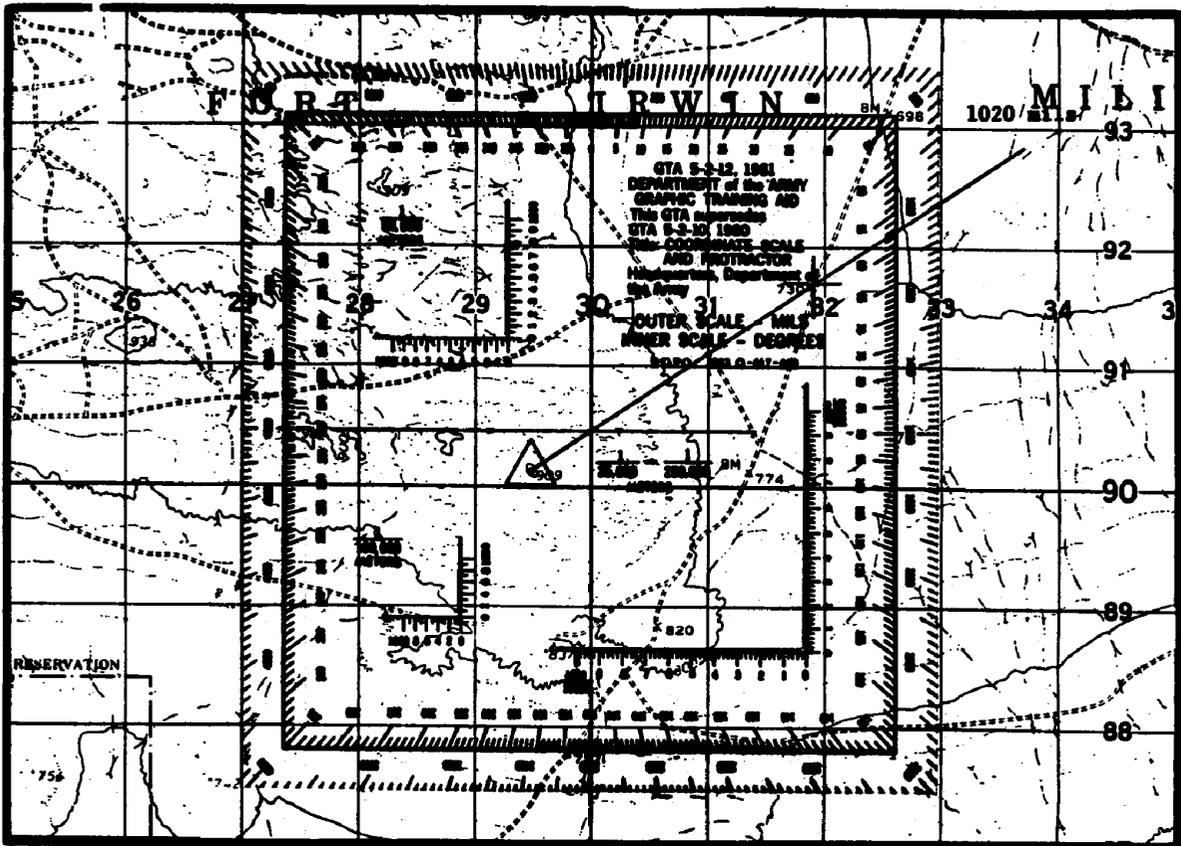
Direction 2240 mils
Right 240 meters
Add 500 meters

b. Practice Exercise.

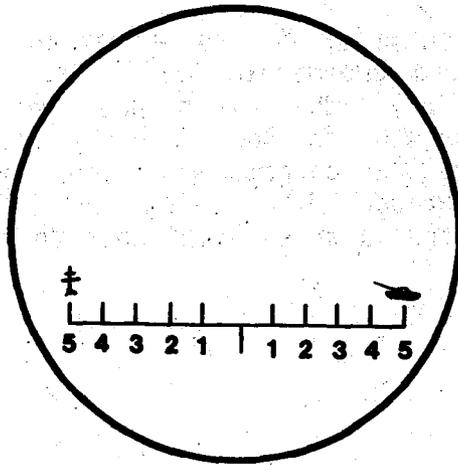
SITUATION. You are currently located at grid coordinate 295901. You have one reference point located at grid coordinate 319917. The reference point can be identified as Bench Marker 730 and has been assigned the field artillery target number BB 1130. The reference point is a known point.



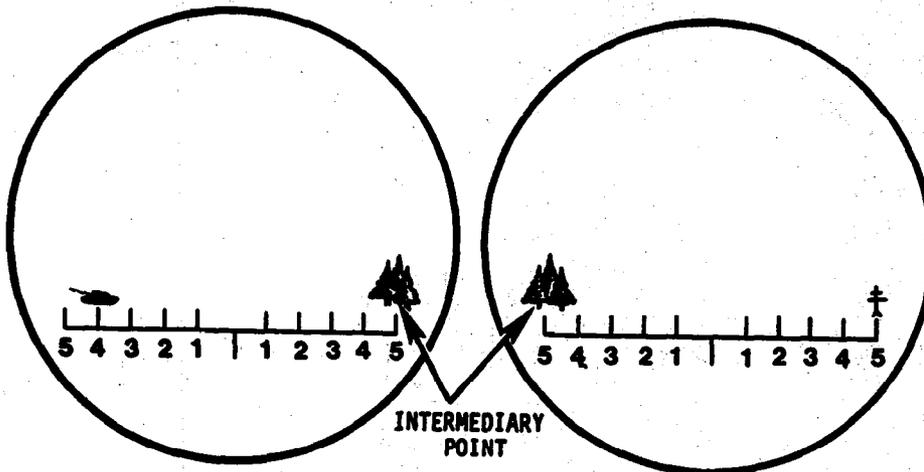
You have determined the direction from your location to the known point using a map and protractor to be 1020 mils.



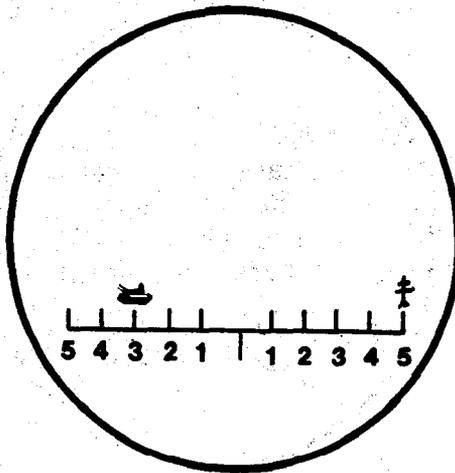
The FIST informed you prior to the operation that the reference point located at grid coordinate 319917 is the field artillery pre-planned target BB 1130. This has been confirmed. The following targets appear in the vicinity of the known point, BB1130. You observe the targets with your binoculars as shown in exercises (1) through (8). Using the information provided determine the shift from a known point data to each target.



- (1) Direction to the Reference Point: 1020 mils
 Distance to the Reference Point: 2900 meters
 Target; Tank, Length: 9 meters
 Mil Deviation: 3 mils
- Direction 1120, Left 290, Add 100
 - Direction 0920, Right 290, Add 100
 - Direction 0920, Left 300, Add 100
 - Direction 1120, Right 290, Add 100

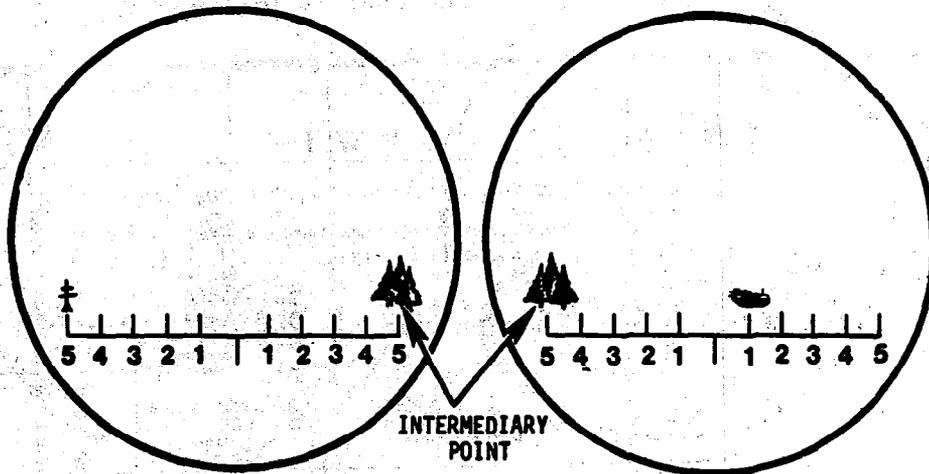


- (2) Direction to the Reference Point: 1020 mils
 Distance to the Reference Point: 2900 meters
 Target; Tank, Length: 7.5 meters
 Mil Deviation: 3 mils
- Direction 1210, Right 550, Drop 400
 - Direction 0830, Right 600, Add 400
 - Direction 0830, Left 550, Drop 400
 - Direction 1210, Left 600, Add 400



(3) Direction to the Reference Point: 1020 mils
 Distance to the Reference Point: 2900 meters
 Target; ZSU 23-4, Length: 7 meters
 Mil Deviation: 2 mils

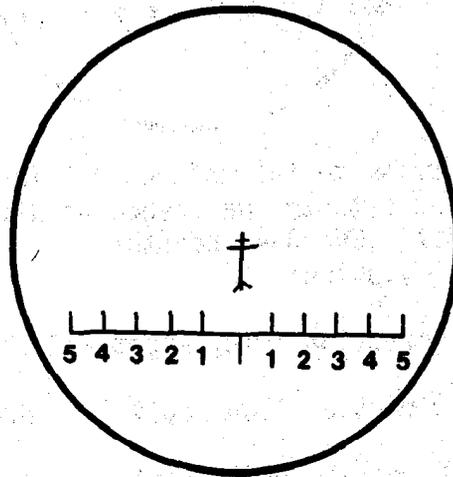
- a. Direction 0940, Right 232, Add 600
- b. Direction 1100, Left 230, Drop 600
- c. Direction 0940, Left 230, Add 600
- d. Direction 1100, Right 230, Add 600



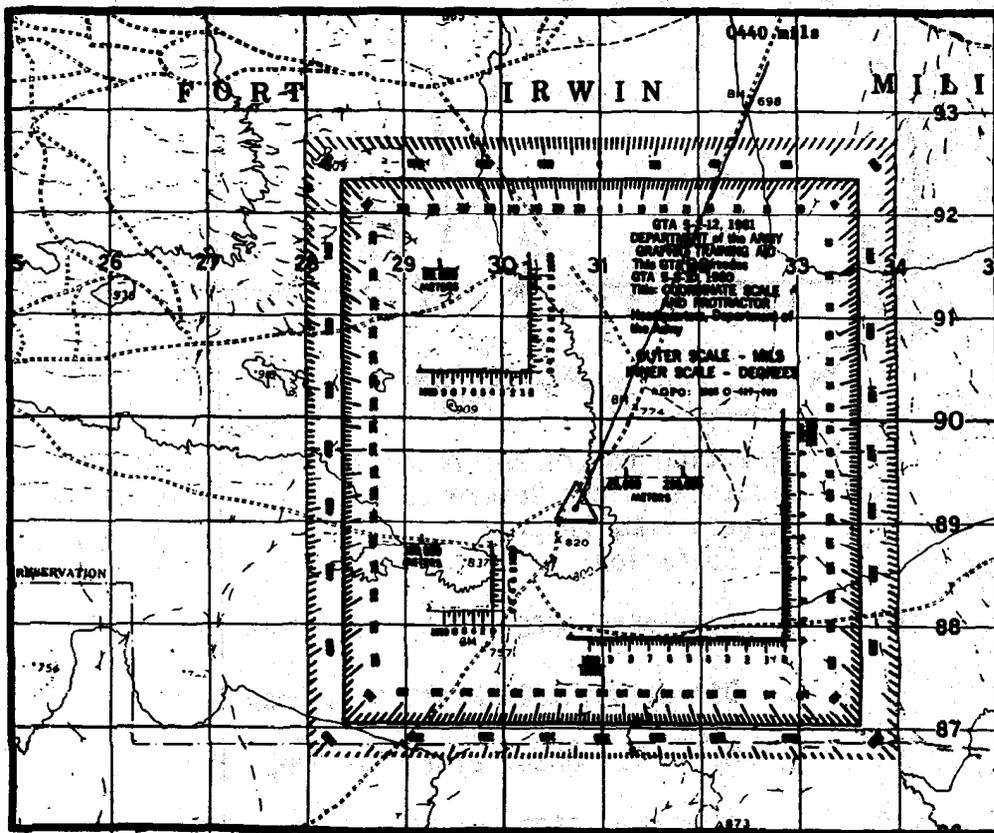
(4) Direction to the Reference Point: 1020 mils
 Distance to the Reference Point: 2900 meters
 Target; BMD, Length: 7 meters
 Mil Deviation: 4 mils

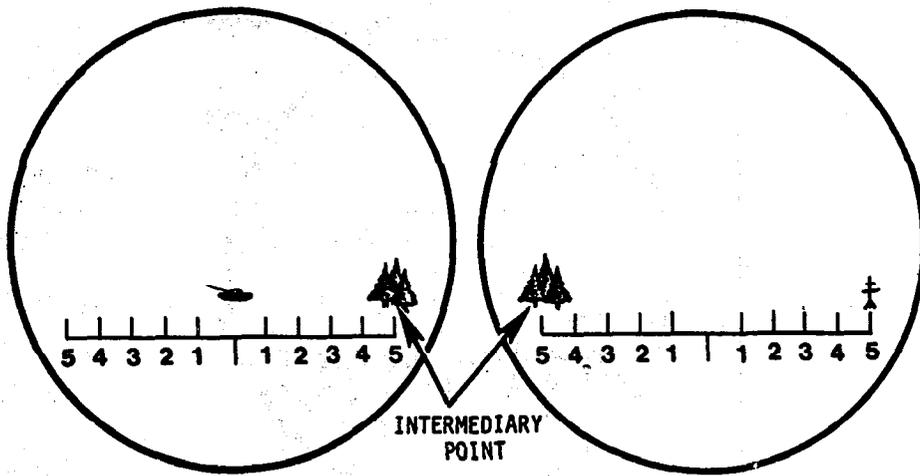
- a. Direction 0860, Right 460, Drop 1200
- b. Direction 1180, Right 460, Drop 1100
- c. Direction 0860, Left 464, Drop 1100
- d. Direction 1180, Right 460, Drop 1200

SITUATION CONTINUED. You are now located at grid coordinate 308891. You have one reference point located at grid coordinate 319917. The reference point can be identified as Bench Marker 730 and has been assigned the field artillery target number BB1130. The reference point is a known point.



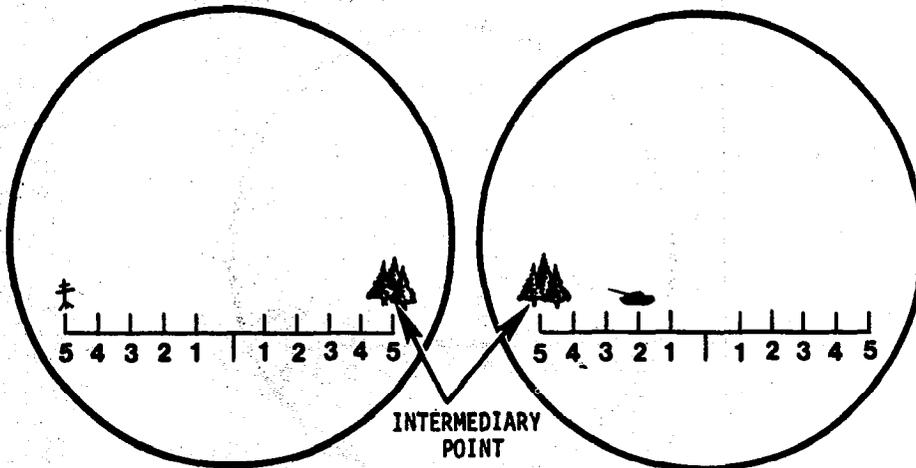
You have determined the direction from your location to the known point using a map and protractor to be 0440 mils.





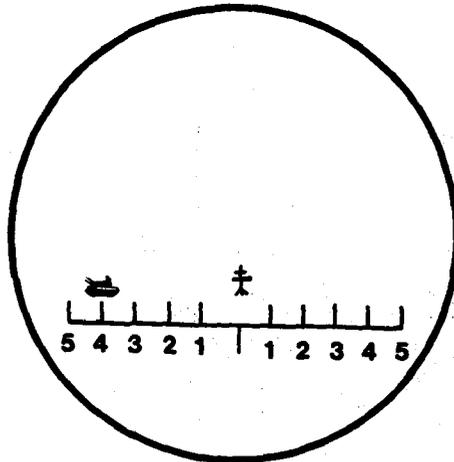
- (5) Direction to the Reference Point: 0440 mils
 Distance to the Reference Point: 3100 meters
 Target; Tank, Length: 7.5 meters
 Mil Deviation: 4 mils

- a. Direction 0290, Left 460, Drop 1200
- b. Direction 0290, Right 470, Drop 1200
- c. Direction 0290, Right 460, Drop 1200
- d. Direction 0590, Left 460, Drop 1200

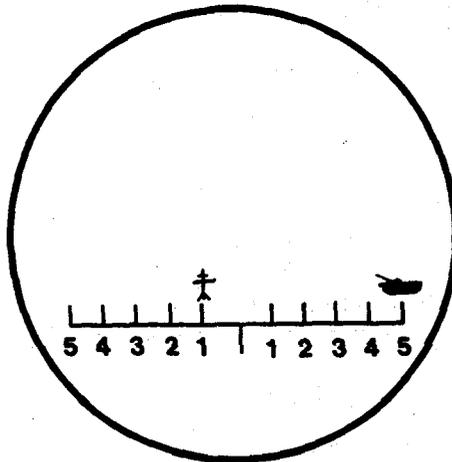


- (6) Direction to the Reference Point: 0440 mils
 Distance to the Reference Point: 3100 meters
 Target; Tank, Length: 9 meters
 Mil Deviation: 4 mils

- a. Direction 0570, Left 400, Add 900
- b. Direction 0570, Right 400, Drop 900
- c. Direction 0310, Right 400, Add 900
- d. Direction 0310, Left 400, Drop 900



- (7) Direction to the Reference Point: 0440 mils
 Distance to the Reference Point: 3100 meters
 Target; ZSU 23-4, Length: 7 meters
 Mil Deviation: 2 mils
- Direction 0480, Left 120, Drop 400
 - Direction 0400, Right 124, Add 400
 - Direction 0400, Left 120, Add 400
 - Direction 0480, Left 120, Add 400



- (8) Direction to the Reference Point: 0440 mils
 Distance to the Reference Point: 3100 meters
 Target; PT 76, Length: 7 meters
 Mil Deviation: 3 mils
- Direction 0500, Right 190, Add 800
 - Direction 0380, Left 190, Drop 800
 - Direction 0380, Right 190, Add 800
 - Direction 0500, Right 190, Drop 800

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c. Solution to Practice Exercise.

An explanation of how solutions were obtained begins on Page 47, Paragraph 5 a.

- (1) d. Direction 1120, Right 290, Add 100
- (2) c. Direction 0830, Left 550, Drop 400
- (3) c. Direction 0940, Left 230, Add 600
- (4) b. Direction 1180, Right 460, Drop 1100
- (5) a. Direction 0290, Left 460, Drop 1200
- (6) b. Direction 0570, Right 400, Drop 900
- (7) c. Direction 0400, Left 120, Add 400
- (8) d. Direction 0500, Right 190, Drop 800

LESSON TWO

- OBJECTIVE:** 061-283-6003
- TASK:** Prepare a call for fire.
- CONDITIONS:** Given complete instructional guidance and a tactical situation.
- STANDARDS:** The call for fire must state the following:
1. Observer Identification.
 2. Warning Order.
 3. Target Location.
 4. Target Description.
 5. Method of Engagement.
 6. Method of Fire and Control.
- REFERENCES:** FM 6-30, "Observed Fire Procedures".

LEARNING ACTIVITY

Upon completion of this learning activity, you will be able to prepare a call for fire consisting of three radio transmissions containing six elements given in the proper sequence.

a. Study Resources.

(1) THE CALL FOR FIRE. The call for fire is the message the observer sends to the fire direction center (FDC) to request fire on a target. It is a concise message that contains all of the information the FDC needs to compute firing data and to decide on the best method of attack. The call for fire will be transmitted in three distinct parts, with a break and readback after each transmission. The three transmissions of the call for fire contain the following six elements:

- (a) Observer Identification and Warning Order.
- (b) Target Location.
- (c) Target Description, Method of Engagement and Method of Fire and Control.

(2) OBSERVER IDENTIFICATION AND WARNING ORDER. The first radio transmission in the call for fire contains the observer identification and the warning order.

(a) OBSERVER IDENTIFICATION. The observer identification simply informs the FDC who is calling for fire and it clears the net for communication concerning the impending fire mission.

1. The entire call sign is used on the first contact of the day or when entering the radio net.

Y5A57 THIS IS R5T84, ...

2. In later transmissions the call sign suffix is used for brevity purposes.

A57 THIS IS T84, ...

(b) WARNING ORDER. The warning order alerts the FDC to the type of mission requested, the size of the element to be used, and the method used to locate the target.

1. Type Mission. The observer has the option of requesting one of two types of missions. The method selected is based on the accuracy of the initial target location.

a. Adjust Fire (AF). The adjust fire mission is fired with one gun firing one round at a time. After all adjustments are made, the battery will fire on the target. Adjusting fire prevents wasting rounds by the battery firing at an incorrect target location.

A57 THIS IS T84, ADJUST FIRE, ...

b. Fire For Effect (FFE). The observer should always seek to achieve first round fire for effect, because the enemy will be warned of an attack if adjusting rounds are fired. When you call for fire for effect, the battery will fire on the target. The success of this mission depends on the accuracy of the target location; therefore, you must be certain of the target location and that little or no adjustments will be required when requesting fire for effect.

A57 THIS IS T84, FIRE FOR EFFECT, ...

2. Size Element to Fire For Effect. The observer may request the size of the unit to fire for effect; for example, battalion. This is usually done by announcing the last letter in the battalion FDC's call sign.

A57 THIS IS T84, FIRE FOR EFFECT, ROMEO, ...

NOTE: The battalion FDC's call sign is A3R27 in the above example.

3. Method of Target Location. The method of target location used by the observer is reported in the warning order to allow the FDC to prepare to receive the targeting data.

a. Polar Plot. If the target is located by use of the polar plot method, the observer announces polar.

A57 THIS IS T84, ADJUST FIRE, POLAR, OVER

b. Grid Coordinate. No announcement is required when the grid coordinate method of target location is used.

A57 THIS IS T84, ADJUST FIRE, OVER

c. Shift From A Known Point. If the target is located by use of the shift from a known point method, the observer announces shift, followed by the known point that he is shifting from.

A57 THIS IS T84, ADJUST FIRE, SHIFT AF8001, OVER

(3) TARGET LOCATION. The observer's second transmission consists of the target location. In the first transmission, the FDC was given the method of target location. All information that is necessary to determine the gunnery solution to engage the target is sent in the second radio transmission.

(a) POLAR PLOT. To use this method, the FDC must know the observer location. The observer can then transmit the following information to the FDC:

1. The direction to the target to the nearest 10 mils.

2. The distance to the target to the nearest one hundred meters.

DIRECTION 0960, DISTANCE 3500, OVER

(b) **GRID COORDINATE.** Normally in area fire, a six place grid is all that is required. Eight place grids are needed for precision fire when the intent is to destroy a point target. The observer must transmit the grid coordinate to the target.

GRID 627198, OVER

(c) **SHIFT FROM A KNOWN POINT.** In using this method the known point from where you will make your shift has already been identified in the warning order. The observer must transmit the following information to the FDC.

1. The direction to the target to the nearest 10 mils.

2. The lateral shift from the known point to the target to the nearest 10 meters.

3. The range shift from the known point to the target to the nearest 100 meters.

DIRECTION 0960, LEFT 250, ADD 400, OVER

(4) TARGET LOCATION, METHOD OF ENGAGEMENT AND METHOD OF FIRE AND CONTROL. The third radio transmission in the call for fire consists of the target description, method of engagement and the method of fire and control.

(a) **TARGET DESCRIPTION.** The observer must describe the target in sufficient detail to enable the FDC to determine the amount and type of ammunition to use. The FDC selects different ammunition for different types of targets. The observer's description should be brief but accurate. It should contain the following information.

1. The number of the elements in the target; squad, platoon, three trucks, six tanks and so on.

2. What the target is; troops, tanks, personnel carriers, assembly area and so on.

3. The degree of protection; in the open, in a tree line, dug in and so on.

4. What the target is doing; moving, stationary, digging in and so on.

5. The target size and shape if this is significant; length, width, radius and so on.

THREE TANKS IN THE OPEN STATIONARY, ...

OR

SIX BMP's IN A TREE LINE STATIONARY, ...

OR

THREE TANKS IN THE OPEN MOVING SOUTHWEST, RADIUS 200, ...

(b) METHOD OF ENGAGEMENT. This element gives the observer the option of requesting specific methods of engaging the target. The observer has the option of selecting the type of adjustment, trajectory, ammunition and distribution of the fire for effect. If the observer does not have a specific request silence indicates the standard can be fired or the fire direction center can select an option.

1. Type of Adjustment. Two types of adjustment can be employed, precision or area. Unless precision fire is requested, area fire, the standard will be used.

a. Precision fire is conducted with one weapon on a point target. It is used to destroy a point target. If the target is to be destroyed the observer announces **DESTRUCTION**.

b. Area fire is used to attack an area target. One weapon is used in adjustment until within a specified distance of the adjusting point and then the battery fires for effect.

2. Danger Close. The term **DANGER CLOSE** is included in the method of engagement when the predicted impact of a round is within 600 meters of friendly troops for mortars and artillery.

3. Trajectory. Low angle fire is standard for the field artillery. If high angle fire is desired it is requested by announcing **HIGH ANGLE**.

4. Ammunition. Shell high explosive (HE), fuze quick (Q) is normally used in adjustment; however any type of ammunition may be requested by the observer. If a different type of ammunition or fuze action is desired during either the adjustment or the fire for effect phase, the observer requests it.

a. Projectile. Examples of requests for other than HE projectiles are ICM (Improved Conventional Munitions) and **WHITE PHOSPHORUS**.

b. Fuze. Most missions are fired with fuze quick (Q) during the adjustment phase. If fuze quick is desired or if a projectile that has only one fuze is requested, the fuze is not indicated. ICM is fuzed with a time fuze, therefore, when the observer requests ICM it is not necessary to request a fuze.

c. Volume of Fire. The observer may request the number of rounds to be fired by the weapons firing in effect. For example **3 ROUNDS** indicates that the firing unit will fire three volleys.

5. Distribution. The observer may control the pattern of bursts in the target area. This pattern of bursts is called a sheaf. Unless otherwise requested, the FDC assumes a circular target with a 100 meter radius.

a. Converged Sheaf. The converged sheaf places all rounds on a specific point and is used for small area targets. To obtain a converged sheaf announce **CONVERGED**.

b. Open Sheaf. The open sheaf separates the bursts by the maximum effective burst width of the shell fired. To obtain an open sheaf announce **OPEN**.

c. Special Sheaf. The special sheaf corresponds to the size of the target. When the target is rectangular, the length and width, in meters and the long axis, to the nearest 100 mls, should be given; for example **400 BY 200, ATTITUDE 2580**. When the target is circular the radius should be given; for example **RADIUS 200**.

(c) **METHOD OF FIRE AND CONTROL**. This element gives the observer the option of requesting the adjusting and fire for effect firing unit. The observer also has the option of requesting to take control of the mission and when the battery will fire.

1. Method of Fire. In area fire, the adjustment normally is conducted with one howitzer or with the center tube of a mortar platoon or section. If the observer determines that **PLATOON RIGHT (LEFT)** will be more appropriate, he may request it. Adjusting at extreme distances may be easier with two guns firing. The normal time interval between rounds fired by a platoon or battery right (left) is 5 seconds. If the observer wants a different interval, he can request it here.

2. Method of Control. The method of control allows the observer to take control of the mission, that is determine when the weapons will fire. This is necessary when engaging moving targets.

a. At My Command. If the observer wants to control the time of delivery of fire, he includes **AT MY COMMAND** in the method of control. When the pieces are ready to fire, the FDC announces **BATTERY IS READY**. The observer announces **FIRE** when he is ready for the weapons to fire. At My Command remains in effect throughout the mission until the observer announces **CANCEL AT MY COMMAND**.

b. Time On Target. The observer may tell the FDC when he wants the rounds to impact by requesting **TIME ON TARGET (so many) MINUTES FROM ...NOW**. The FDC will then compute the firing data and calculate when they must fire so that the rounds will impact at the appropriate time.

(5) CORRECTION OF ERRORS. Errors are sometimes made by the observer in transmitting data or by the FDC in reading back the data. If the observer realizes that he has made an error in his transmission or that the FDC has made an error in the readback, announce **CORRECTION** and transmit the correct data.

(6) MESSAGE TO OBSERVER. After receiving the call for fire, the FDC determines how the target will be attacked. That decision is announced to the observer in the form of a message to observer. The message to observer consists of the following information.

(a) Unit(s) to fire, the battery or batteries that will fire the mission. This is transmitted by using the last letter in the call sign(s) of the unit to fire for effect.

(b) Changes to the initial call for fire. Any changes to the observer's request in the call for fire.

(c) Number of rounds per weapon in the fire for effect.

(d) Target number assigned to each mission to facilitate processing of future missions.

(e) Additional information may be requested from the FDC if the observer needs additional information. A common request is the time of flight. Time of flight is sent automatically when engaging moving targets, or when the method of control, at my command is used.

(7) AUTHENTICATION. The challenge and reply authentication is considered a normal element of the initial request for indirect fire. The FDC inserts the challenge in the last readback of the fire request. The observer transmits the correct authentication reply to the FDC immediately following the challenge. Authentication replies exceeding 20 seconds are automatically suspect and a basis for rechallenge.

(8) THE ABBREVIATED CALL FOR FIRE. Two situations exist where the observer can use an abbreviated call for fire to receive more responsive fire support. The effects achieved in the target area will be in accordance with pre-planned data or battery SOP. The abbreviated call for fire is sent in one radio transmission to the FDC as follow:

(a) SUPPRESSION. To rapidly bring fire on an on call target that is not currently active the observer announces **SUPPRESS**, followed by the target number to be suppressed. The number of rounds fired is based on pre-planned data.

H18 THIS IS H24, SUPPRESS AF8001, OVER

(b) IMMEDIATE SUPPRESSION. When engaging a planned target or target of opportunity that has taken friendly maneuver elements under fire, the observer announces **IMMEDIATE SUPPRESSION**, followed by the location of the target. The number of rounds fired is based on firing element SOP. Usually two rounds would be fired.

H18 THIS IS H24, IMMEDIATE SUPPRESSION, GRID 627198, OVER

b. Practice Exercise.

The following practice exercise is designed to allow you to exercise the skills necessary to prepare a call for fire. You will be required to respond to ten multiple choice questions, there is only one correct response for each question. Call signs that will be used are; the fire direction center (FDC) is F3H18, the observer is C7H24.

(1) Select the statement below that correctly lists the six elements of the call for fire in the order in which they are sent over the radio.

- a. Observer identification; warning order; target location; method of engagement; method of fire and control; target description.
- b. Observer identification; warning order; target location; target description; method of engagement; method of fire and control.
- c. Warning order; target location; target description; method of engagement; observer identification; method of fire and control.
- d. Observer identification; target location; warning order; method of engagement; target description; method of fire and control.

(2) How many radio transmissions are used to transmit the standard call for fire.

- a. 1
- b. 3
- c. 4
- d. 6

(3) The field artillery fire direction center will challenge the observer to authenticate:

- a. Prior to acknowledging the observer.
- b. Authentication is not required.
- c. After the read back of the third radio transmission.
- d. Immediately following observer identification.

(4) Your platoon is occupying a strong point during a defensive operation. You have been engaged in battle for an hour and are awaiting reinforcements from battalion. Prior to the operation beginning, you reported your current position (Grid NA627198) to the company FIST. This has been confirmed. You now observe a motorized rifle company moving towards your position. As the enemy is at a distance of 4500 meters, you decide to engage them with indirect fires. You have checked the direction to the enemy force and have determined it to be 0960 mils. The enemy is just south of check point 2 as you begin to develop your call for fire. The proper call for fire to engage the enemy is:

- a. H18 this is H24, Immediate Suppression, Over. Direction 0960, Distance 4500, Over. Motorized rifle platoon, DPICM in effect, Over.
- b. H18 this is H24, Adjust Fire, Shift Check Point 2, Over. Direction 0960, Distance 4500, Over. Motorized rifle company in the open, DPICM in effect Over.
- c. H18 this is H24, Adjust Fire Polar, Over. Direction 0960, Distance 4500, Over. Motorized rifle company moving, DPICM in effect, Over.
- d. H18 this is H24, Suppress check point 2, Over.

(5) You are acting as the forward observer for 1st Platoon, Company A. An eight man patrol has taken position in the open at TRP 210. You check your target list and determine that TRP 210 is located at grid coordinate 641208. This is the first contact with the FDC of the day. The proper call for fire is:

- a. F3H18 this is C7H24, Fire For Effect, Over Grid 641208, Over. Eight man patrol taking positions in the open, Over.
- b. H18 this is H24, Fire For Effect Grid 641208, Over. Eight man patrol taking position in the open, Over.
- c. F3H18 this is C7H24, Adjust Fire, Over. Grid 641208, Over. Eight man patrol taking position in the open, Over.
- d. F3H18 this C7H24, Adjust Fire, Over. Grid 641208, Eight man patrol taking position in the open, DPICM, Over.

(6) You have occupied your initial overwatch position and are preparing to advance to your subsequent overwatch position when you observe three tanks and two BMP's at a direction of 1650 mils, in the vicinity of a pre-planned target, AF8001, located at grid coordinate 619274. The target is approximately 250 meters to the right and at a greater range of 600 meters. The correct call for fire would be:

- a. H18 this is H24, Adjust Fire, Over. Grid 619274, Over. Three tanks, two BMP's advancing, Over.
- b. H18 this is H24, Fire For Effect, Shift AF8001, Over. Direction 1650, Right 250, Add 600, Over. Three tanks, two BMP's advancing, DPICM, Over.
- c. H18 this is H24, Adjust Fire, Shift AF8001, Over. Direction 1650, Add 600, Right 250, Over.
- d. H18 this is H24, Adjust Fire, Shift AF8001, Over. Direction 1650, Right 250, Add 600, Over. Three tanks, two BMP's advancing, DPICM, Over.

(7) You have transmitted and authenticated the following call for fire:

H18 this is H24, Fire For Effect, Over
Grid 627198, Over
Three tanks, six BMP's with dismounted infantry, Over

The fire direction center elects to engage the target with a battery two rounds of DPICM. Select the correct Message To Observer.

- a. Hotel, DPICM, Two Rounds, AF1001, Over.
- b. Hotel, Two Rounds, DPICM, AF1001, Over.
- c. DPICM, Two Rounds, Hotel, AF1001, Over.
- d. Hotel, AF1001, DPICM, Two Rounds, Over.

(8) You have transmitted the following target location to the fire direction center (FDC); Direction 0170, Right 200, Add 400, Over. The FDC reads back the following; Direction 0170, Right 200, Add 100, Out. Your next transmission should be as follows:

- a. Correction, Add 400, Over.
- b. Correction, Direction 0170, Right 200, Add 400, Over.
- c. Check Fire, Over.
- d. Correction, Over.

(9) As you are making the final assault onto objective red, you observe the flash of an ATGM that has just fired at your platoon. The ATGM round hit and destroyed one of your tanks. You cannot return fire yourself so you decide to engage the ATGM with indirect fire in an attempt to distract the ATGM until you can maneuver for a clear shot. The ATGM is located east of target AF2001 and at grid 552137. The direction to the ATGM is 5200 mils. The distance to the ATGM is 3400 meters. The direction to AF2001 is 5050 mils. Select the correct call for fire to use in this situation.

- a. H18 this is H24, Adjust Fire, Over. Grid 552137, Over.
- b. H18 this is H24, Adjust Fire, Polar, Over. Direction 5200, Distance 3400, Over. ATGM firing, DPICM In Effect, Over.
- c. H18 this is H24, Immediate Suppression, Grid 552137, Over.
- d. H18 this is H24, Suppress Target AF2001, Over.

(10) You are preparing to make the final assault onto your objective. The FIST previously targeted an area to the Northeast of your objective, BH1050, located at grid 334924, as a likely ambush position. While making your final assault, you want to temporarily prevent the possibility of receiving fires from that area. The correct call for fire would be:

- a. H18 this is H24, Immediate Suppression, BH1050, Over.
- b. H18 this is H24, Fire For Effect, Over. BH1050, Over. Suspected ambush position, VT in effect, Over.
- c. H18 this is H24, Adjust Fire, Over. Grid 334924, Over. Suspected ambush position, Over.
- d. H18 this is H24, Suppress BH1050, Over.

c. Solution to Practice Exercise.

- (1) b. Observer identification; warning order; target location; target description; method of engagement; method of fire and control. Page 61, Paragraph a., (1).
- (2) b. 3. Page 61, Paragraph a., (1).
- (3) c. After the read back of the third radio transmission. Page 68, Paragraph a., (7).
- (4) c. H18 this is H24, Adjust Fire Polar, Over. Direction 0960, Distance 4500, Over. Motorized rifle company in the open, DPICM in effect, Over. Page 63, Paragraph a., (2), (b), 3, a.
- (5) a. F3H18 this is C7H24, Fire For Effect, Over. Grid 641208, Over. Eight man patrol taking positions in the open, Over. Page 62, Paragraph a., (2), (a), 1.
- (6) d. H18 this is H24, Adjust Fire, Shift AF8001, Over. Direction 1650, Right 250, Add 600, Over. Three tanks, two BMP's advancing, DPICM, Over. Page 63, Paragraph a., (2), (b), 3, c./Page 64, Paragraph a., (3), (c), 1, 2, 3.
- (7) a. Hotel, DPICM, Two Rounds, AF1001, Over. Page 67, Paragraph a., (6), (a), (b), (c), (d).
- (8) b. Correction, Direction 0170, Right 200, Add 400, Over.
- (9) c. H18 this is H24, Immediate Suppression, Grid 552137, Over. Page 68, Paragraph a., (8), (b).
- (10) d. H18 this is H24, Suppress BH1050, Over. Page 68, Paragraph a., (8), (a).

LESSON THREE

- OBJECTIVE:** 061-283-6003
- TASK:** Adjust indirect area fire.
- CONDITIONS:** Given complete instructional guidance, a simulated binocular reticle pattern, simulated burst and simulated target.
- STANDARDS:** Adjust indirect area fire onto the target. Express observer deviation corrections to the nearest 10 meters, observer range corrections to the nearest 50 meters and prepare surveillance and refinement data without error.
- REFERENCES:** FM 6-30, "Observed Fire Procedures".

LEARNING ACTIVITY

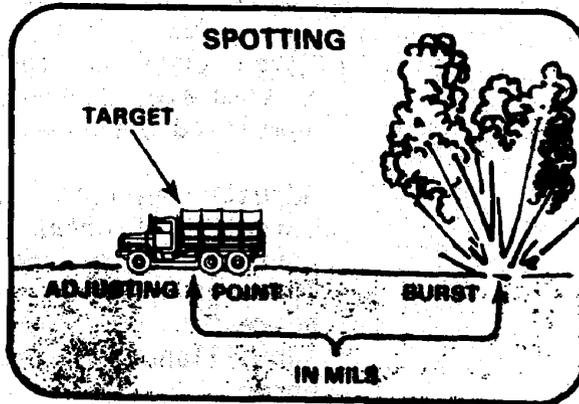
Upon completion of this learning activity, you will be able determine artillery spottings, convert the spottings into corrections to adjust a round to a target and prepare surveillance and refinement data.

a. Study Resources.

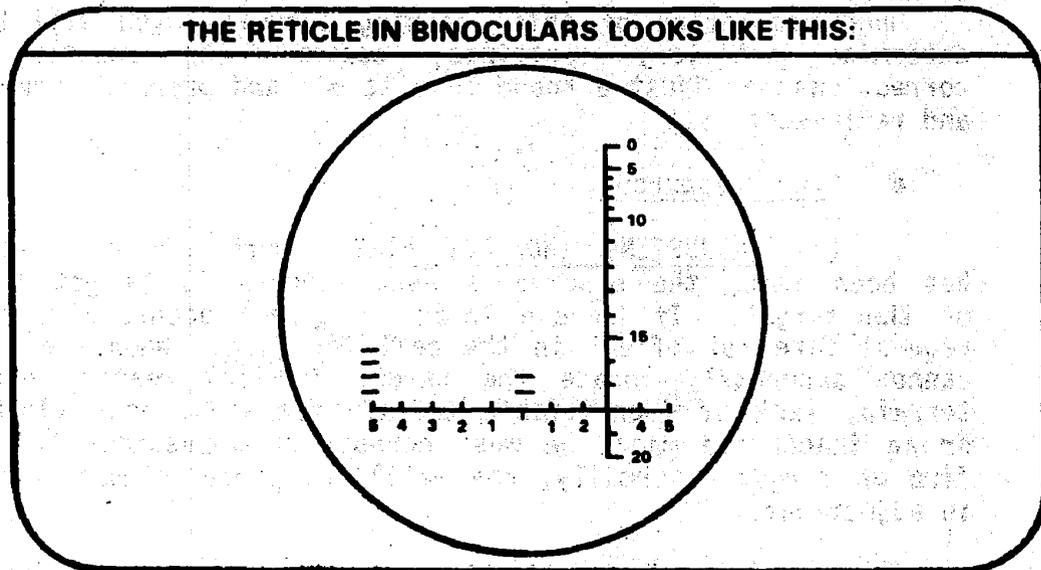
(1) ADJUSTING INDIRECT FIRE. Once the call for fire has been made, the observer's next concern is to get the fire on the target. If he can locate a target accurately, he will request fire for effect in the call for fire. When the observer cannot accurately locate the target for any reason (deceptive terrain, lack of identifiable terrain features, poor visibility, or an inaccurate map), he must conduct an adjustment to get the fire on target. Normally, one artillery piece or mortar is used in adjustment.

(a) When adjusting, the observer must first pick an adjusting point. For a destruction mission (precision fire), the target is the adjusting point. For an area target (area fire), the observer must pick a well defined adjusting point at the center mass of the target. The observer must spot the first and each successive adjusting round and convert the information into range and deviation corrections which are sent to the FDC. A spotting is the relating, by the observer, of the burst or group of bursts to the adjusting point (target).

1. **DEVIATION SPOTTING.** As applied to deviation (left or right), spotting involves measuring the horizontal angle in mils between the burst and the adjusting point. A burst to the right or left of the target is spotted as so many **MILS RIGHT (LEFT)**.

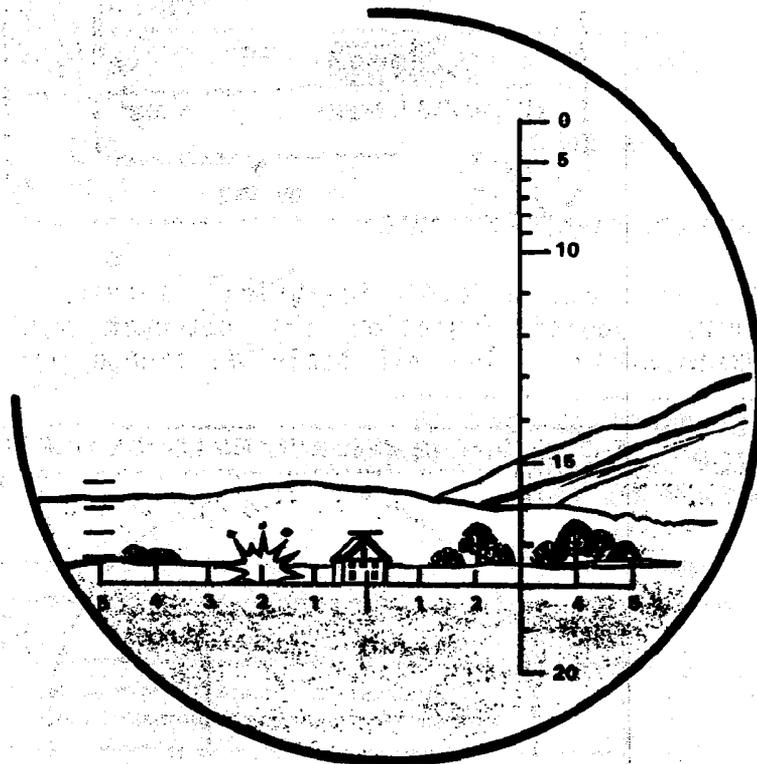


a. **Measuring Angular Deviation.** To determine angular deviation the observer must use an angle measuring device. The mil scale on binoculars is the standard means.



The horizontal scale, divided into 10 mil increments, is used for measuring horizontal angles. The vertical scales, in 5 mil increments, in the center and on the left of the reticle are used for measuring vertical angles. The scale on the right, if present, is no longer used.

b. Spotting. A burst on the OT line is spotted as **LINE**. Deviation (left or right) should be measured to the nearest 5 mils for area targets with measurements taken from the center of the burst. Deviation for a destruction mission (precision fire) is estimated to the nearest mil. In the example shown, the adjusting point is at the center of the binocular horizontal scale. The observer will spot this round for deviation as **20 LEFT** (20 mils, left).



SPOTTING: 20 LEFT

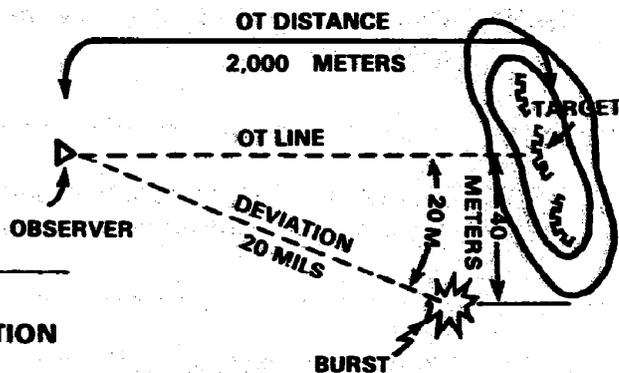
2. **DEVIATION CORRECTION.** Once the mil deviation spotting has been determined, the observer must convert it into a deviation correction in meters, which is later sent with the range correction to the FDC for the next adjusting round or when calling for fire for effect. Deviation correction, the distance in meters the burst must be moved to be on line between the observer and the target, is determined by multiplying the observed deviation in mils (deviation spotting), by the distance from the observer to the target in thousands of meters, the OT factor. The result is expressed to the nearest 10 meters.

CONVERT TO A DEVIATION CORRECTION IN (METERS)

EXAMPLE:

- OBSERVER DEVIATION 20 MILS
- OT DISTANCE 2,000 METERS
- OT FACTOR 2

**OBSERVER DEVIATION X OT
FACTOR = DEVIATION CORRECTION**
 $20 \times 2 = 40 \text{ METERS}$



**GUIDE
FOR
DETERMINING
THE
OT
FACTOR**

OT distance greater than 1,000 meters. Round to the nearest thousand, and express in thousands of meters.

Examples:

OT distance, 4,200 meters — OT factor, 4.0

OT distance, 2,700 meters — OT factor, 3.0

OT distance less than 1,000 meters. Round to nearest 100 meters, and express in thousands of meters.

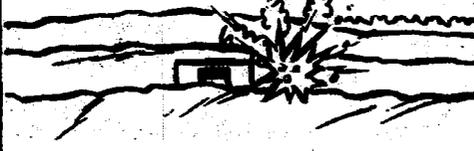
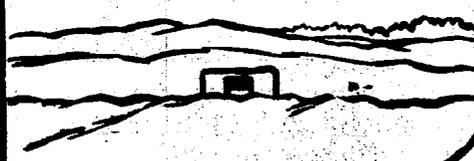
Example:

OT distance, 800 meters — OT factor, 0.8

A minor deviation correction, 10 to 20 meters, should be made in adjustment of precision fire. In adjustment of area fire, small deviation corrections, 20 meters or less, should be ignored except when such a small change is necessary to determine a definite range spotting.

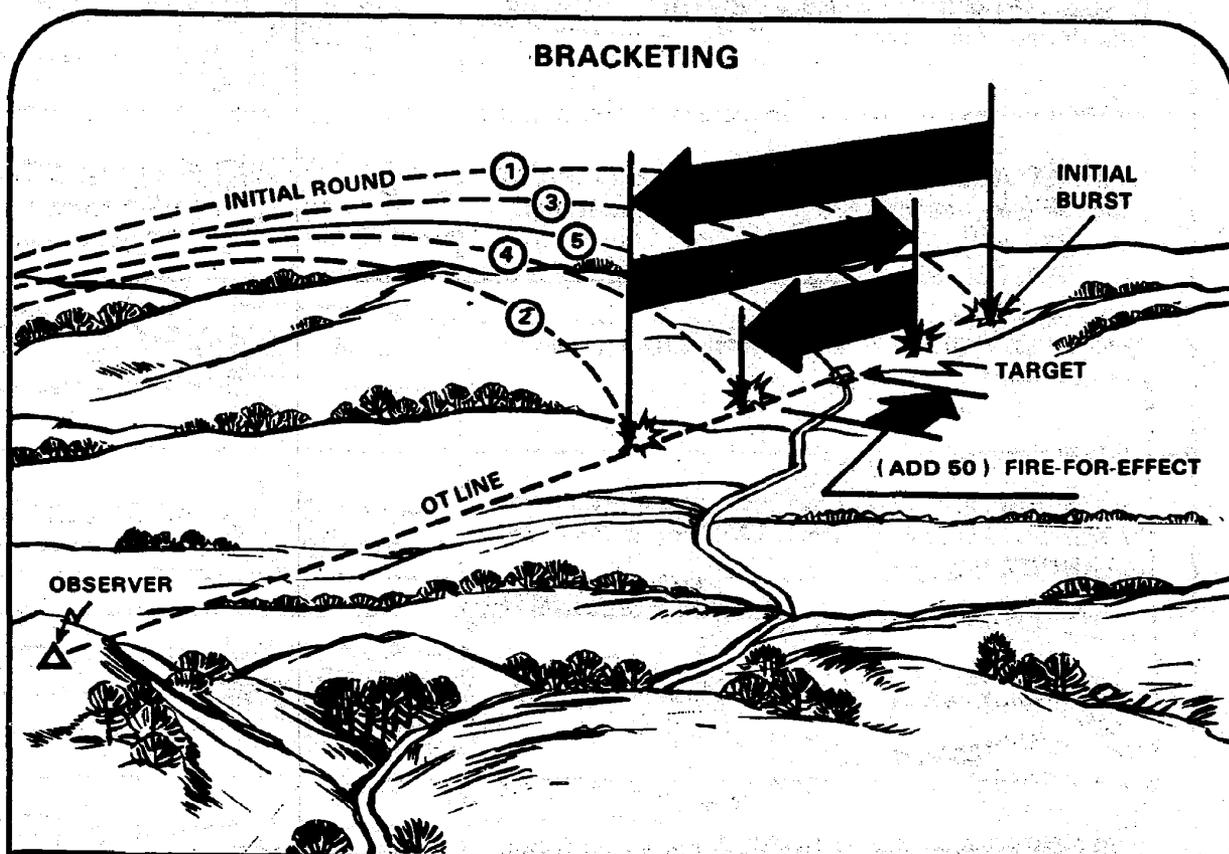
3. **RANGE SPOTTING.** Spotting, as applied to range (short or over), is required to make adjustments in range to get fire on the target. Any range spotting other than **DOUBTFUL** or **LOST** is definite. Usually, an adjusting round's burst that is on or near the OT line will give a definite range spotting.

SPOTTINGS FOR RANGE ARE:

<p>OVER. A burst that appears beyond the adjusting point.</p>	
<p>SHORT. A burst that appears between the observer and the adjusting point.</p>	
<p>TARGET. A burst that hits the target. This spotting is used only in precision fire (destruction missions).</p>	
<p>RANGE CORRECT. A burst that appears to be at the correct range.</p>	
<p>DOUBTFUL. A burst that can be observed but cannot be spotted as OVER, SHORT, TARGET, or RANGE CORRECT.</p>	
<p>LOST. A burst whose location cannot be determined.</p>	
<p>LOST OVER OR LOST SHORT. A burst that is not observed but that is definitely known to be beyond or short of the adjusting point.</p>	

A definite range spotting can be made by the observer, even though the burst is not on or near the OT line, by his knowledge of the terrain or wind, or by observing debris scattered by the explosion. If, however, the observer is not sure (**DOUBTFUL**), then his correction sent to the FDC should only be for deviation left or right. This is done to bring the burst on line to get a definite range spotting (**OVER, SHORT, or TARGET**).

4. RANGE CORRECTIONS. The observer gives range corrections so that, with each successive correction, the adjusting round intentionally lands over or short of the adjusting point, closing on the target. Fire for effect is called for when a range correction would bring the next round within 50 meters of the adjusting point. This technique is called bracketing. Bracketing is a safe technique in that it is sure to bring fire on the target.



When bracketing, the observer should use the following guide to determine the first range correction:

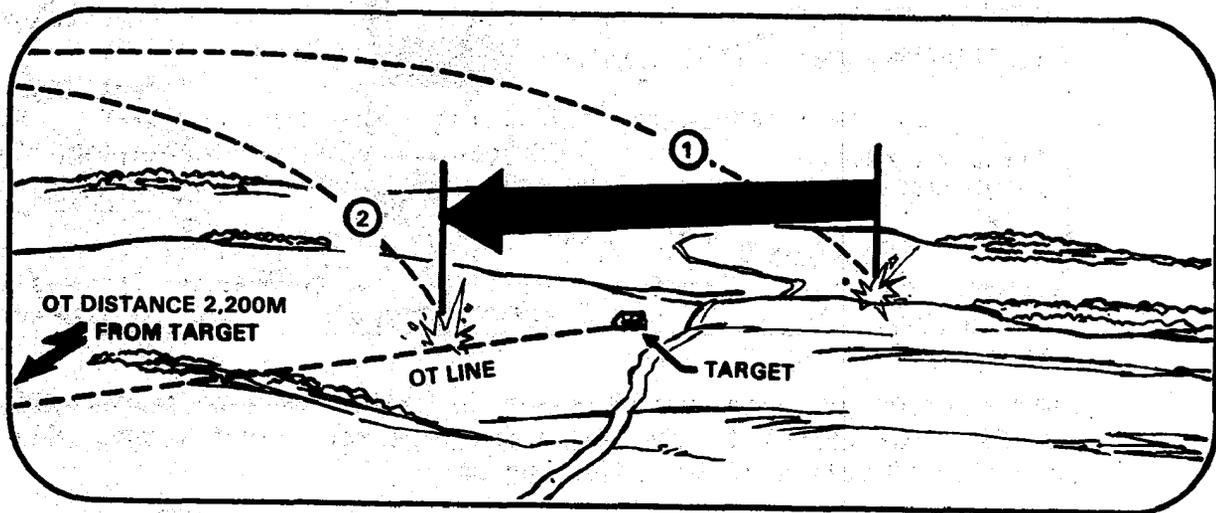
If OT range is —	Add or drop a minimum of —
1,000-2,000 meters	200 meters
Over 2,000 meters	400 meters

The observer should call for fire-for-effect when a 100-meter bracket has been split.

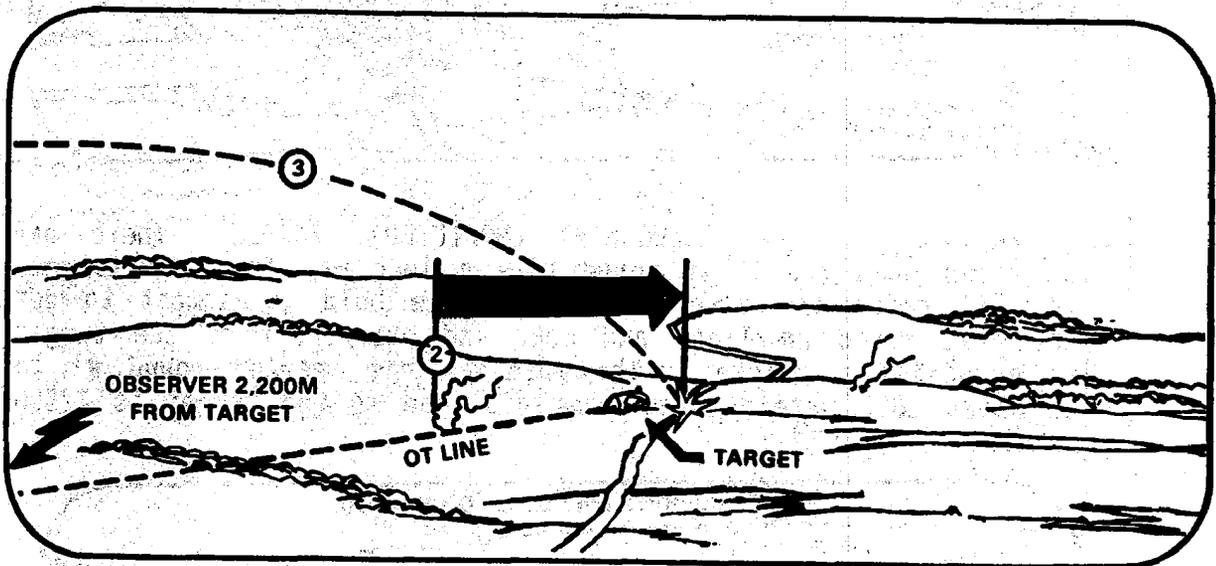
Example:

DROP 50, FIRE-FOR-EFFECT.

(b) ADJUSTMENT EXAMPLE. The observer has already sent a DROP 400 after observing his first round (#1). The next round (#2) hit short of the adjusting point (target).

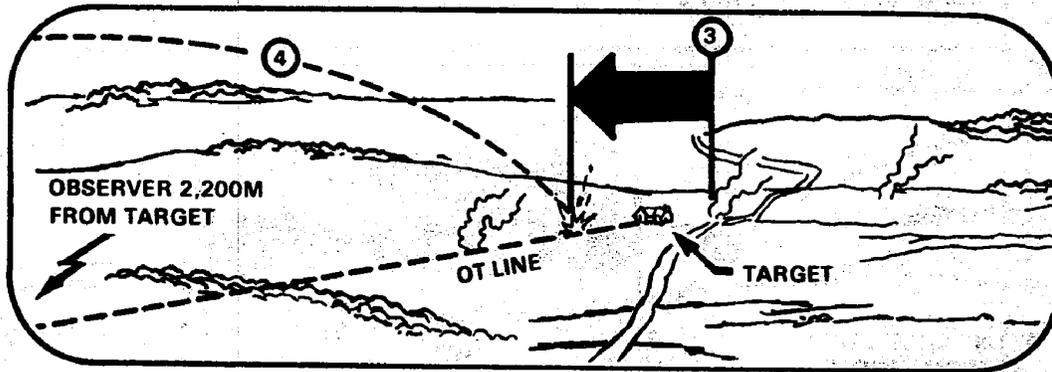


The observer has just established a range bracket in that he now has a round over and one short of the adjusting point separated by 400 meters. Using the bracketing technique, the observer now splits the bracket and sends ADD 200 to the FDC.

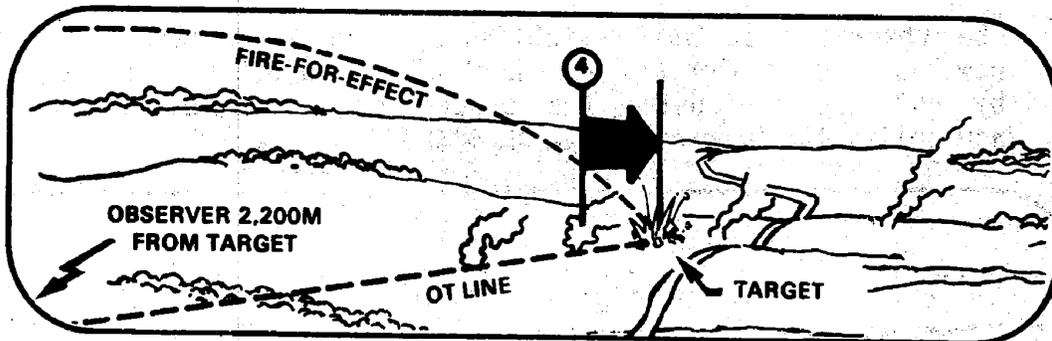


The third round (#3) burst beyond the adjusting point. The observer now has a 200 meter bracket because the #2 round was short of the adjusting point. The distance between rounds #2 and #3 is 200 meters. Splitting his bracket, the observer sends DROP 100.

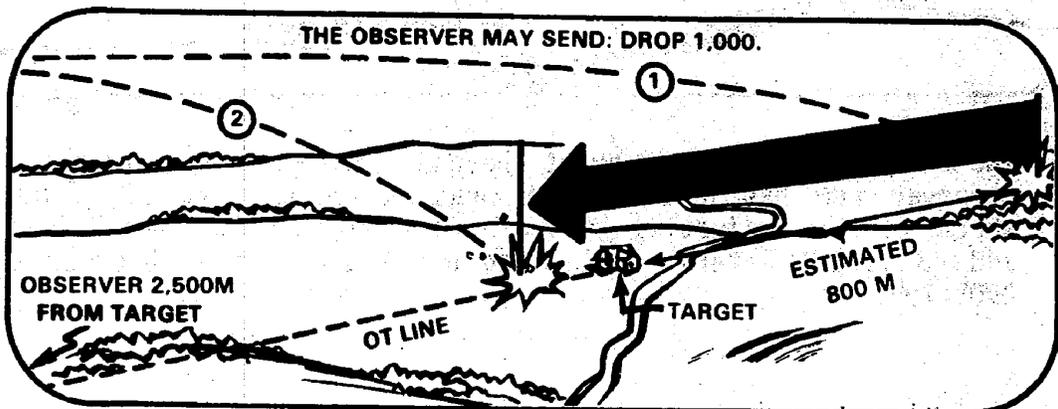
The fourth round (#4) hit short.



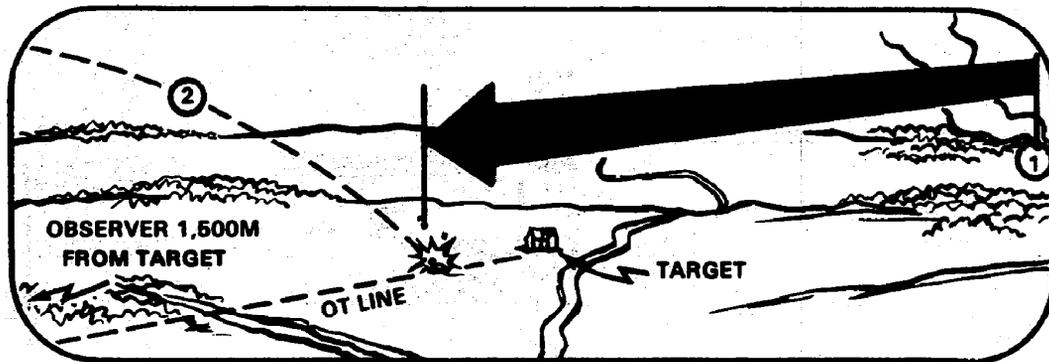
The observer now has a 100 meter bracket. He now sends, **ADD 50, FIRE FOR EFFECT** to the FDC. The fire for effect rounds will be within 50 meters of the adjusting point.



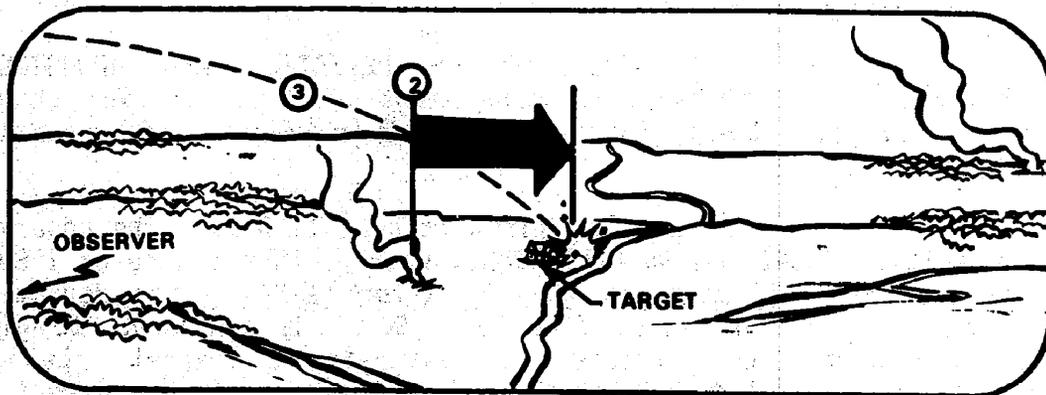
2 **ADJUSTMENT (MODIFIED) EXAMPLE.** There may be times when the first round hits a long way from the target. In that case, the observer must send a bold adjustment to get the next round on line, and near and over/short of the target to establish a bracket. The observer has spotted round #1 to be about 1000 meters over. The distance to the target is 1,500 meters.



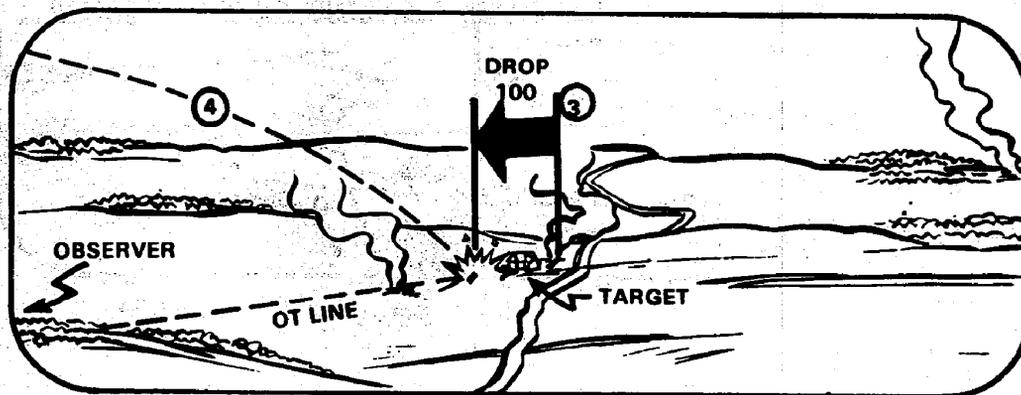
The observer knows that he has to establish a bracket. He must get the next round (#2) near and short of the target. He sends **DROP 1,200** to the FDC.



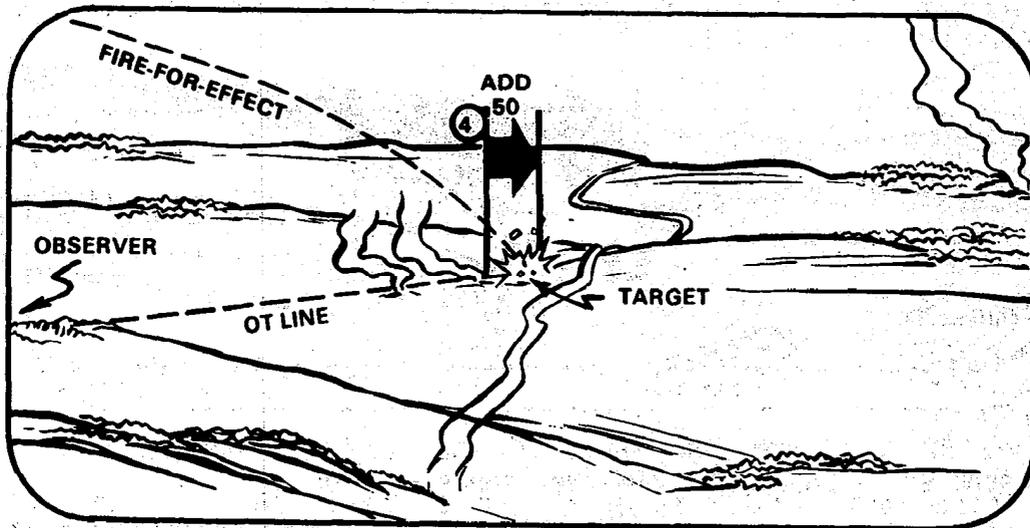
Round #2 hits near and short of the target. Because round #2 is spotted as **SHORT**, the observer sends **ADD 200**.



The third round (#3) hits over. The observer has established a 200 meter bracket with rounds #2 and #3. He now sends **DROP 100**.

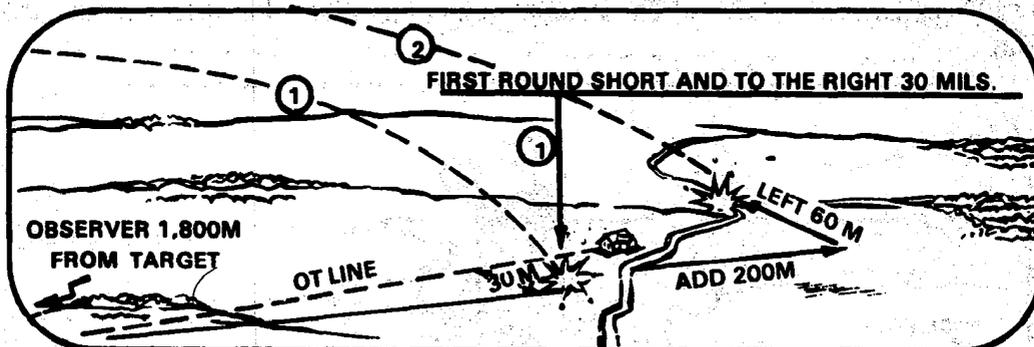


The fourth round (#4) hits short. The observer has established a 100 meter bracket, so he sends **ADD 50, FIRE FOR EFFECT**. The fire for effect rounds will be within 50 meters of the target.

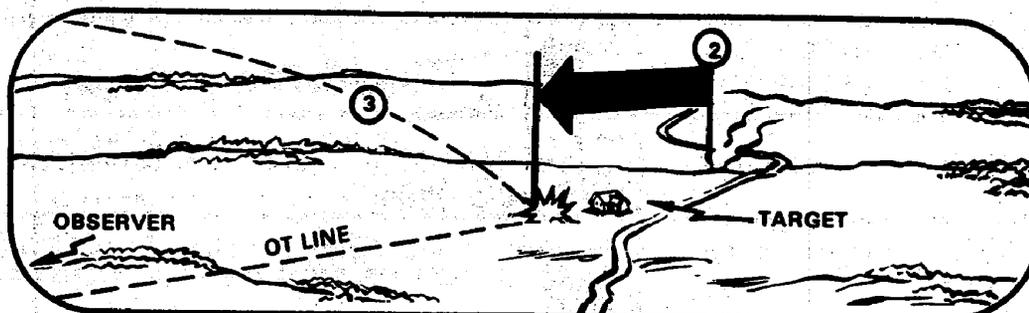


3. CORRECTION OF DEVIATION AND ADJUSTMENT OF RANGE. The following example shows what an observer should do in an adjustment that requires both range and deviation corrections.

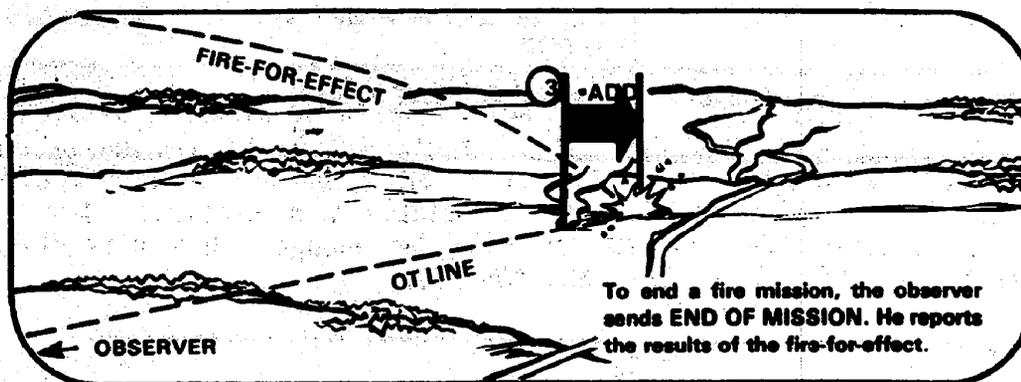
a. The first round (#1) hits. The observer spots it as **SHORT** and **30 MILS RIGHT**, with an OT distance of 1,800. The observer will multiply the OT factor (2.0) by the deviation spotting (30 mils), (i.e. $2 \times 30 = 60$). He now needs to give a range correction sufficient to establish a bracket. Let us say he decides that 200 meters will be enough. His correction sent to the FDC will be **LEFT 60, ADD 200**.



The second round (#2) hits OVER and 5 mils LEFT. The observer now sends DROP 100. He sends that correction because the OT factor (2.0) times the deviation spotting (5 mils LEFT) equals 10 meters. This is a minor deviation correction and need not be sent to the FDC. The observer sends DROP 100, because he is splitting the bracket.



The third round (#3) hits short and on-line. The observer has just established a 100 meter bracket. He now sends ADD 50, FIRE FOR EFFECT. The fire for effect rounds will be within 50 meters of the adjusting point.



(2) **REFINEMENT AND SURVEILLANCE.** Refinement and surveillance informs the artillery how the guns are shooting. The observer should note the results of the fire for effect and then take whatever action is necessary to complete the mission. The following table shows the observer's actions after the FFE rounds have been fired.

RESULTS OF FIRE FOR EFFECT	OBSERVER'S ACTIONS
Accurate and sufficient	EOM, surveillance (END OF MISSION, RPG SILENCED, OVER)
Accurate, sufficient, target replot desired	Request replot, EOM, surveillance (RECORD AS TARGET, END OF MISSION, BMP NEUTRALIZED, OVER)
Inaccurate and sufficient	Refinement, EOM, surveillance (RIGHT 20, ADD 20, END OF MISSION, RPG SILENCED, OVER)
Inaccurate, sufficient, target replot desired	Refinement, request replot, EOM, surveillance (RIGHT 10, RECORD AS TARGET, END OF MISSION, BMP NEUTRALIZED, OVER)
Inaccurate and insufficient	Refinement, repeat or reenter adjust fire (RIGHT 10, ADD 50, REPEAT or RIGHT 10, ADD 100, ADJUST FIRE, OVER)
Accurate and insufficient	Repeat (REPEAT, OVER)

b. Practice Exercise.

The following practice exercise is designed to allow you to exercise the skills necessary to adjust artillery fire. You will be required to respond to sixteen multiple choice questions, there is only one correct response for each question.

(1) The observer's observation of where a round bursts in relation to the target is called:

- a. Location.
- b. Spotting.
- c. Deviation.
- d. Range.

(2) The type of spotting made to determine how far left or right of a target a round bursts is:

- a. Doubtful.
- b. Range.
- c. Line.
- d. Deviation.

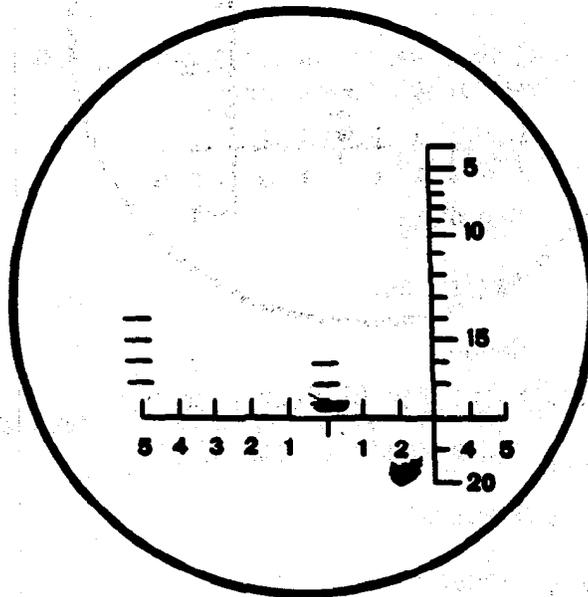
(3) The three types of range spottings considered to be definite range spottings are:

- a. Left, Right, Line.
- b. Lost, Lost Over, Lost Short.
- c. Over, Short, Range Correct.
- d. Doubtful, Target, Unobserved.

(4) Each numbered tick mark on the horizontal scale of the binocular reticle pattern is:

- a. 1 mil.
- b. 10 mils.
- c. 10 degrees.
- d. 10 meters.

SITUATION: This situation is for questions 5 and 6. You are adjusting fire on an area target with shell HE, fuze quick. The call for fire has been sent to the FDC, the initial round has been fired, and it has burst as illustrated below.



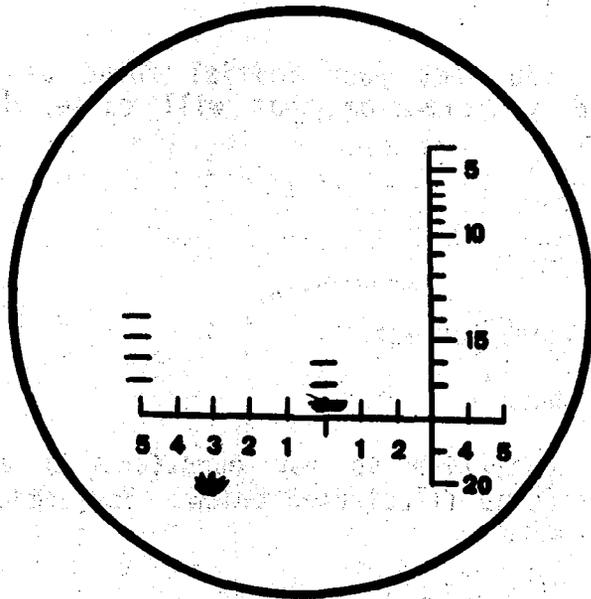
(5) The range spotting you would make for this round is:

- a. Range Correct.
- b. Over.
- c. Short.
- d. Right.

(6) The deviation spotting for this round is:

- a. 20 Right.
- b. Right 20.
- c. 2 Right.
- d. Right.

SITUATION: This situation is for questions 7 through 9. You are adjusting fires on an area target. Your initial round bursts as illustrated on the next page. You estimate the distance to the target to be 3100 meters.



(7) You determine the OT factor to be:

- a. 3.1
- b. .3
- c. 3.0
- d. 3100

(8) The correction to bring this round on line with the target would be:

- a. Left 90.
- b. Right 30.
- c. Left 30.
- d. Right 90.

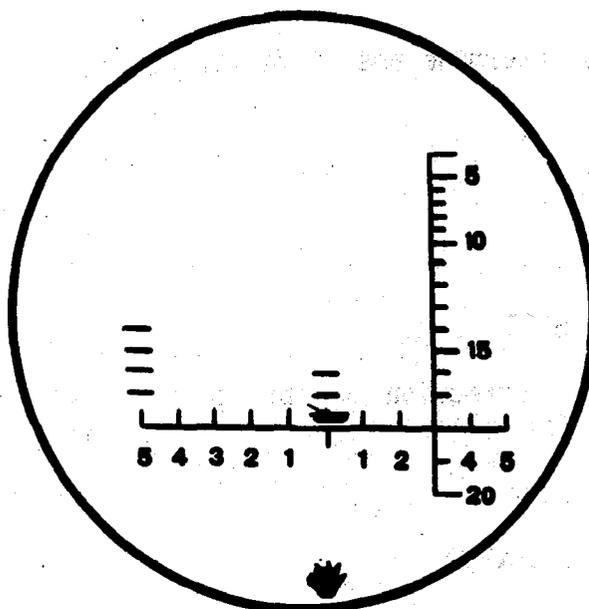
(9) The procedure of establishing a bracket over and short of the target, then splitting the bracket with following rounds is called.

- a. Creeping.
- b. Successive Bracketing.
- c. Division.
- d. Hasty Adjustment.

(10) If you spot your initial round as SHORT of the target, you send a correction that will cause the next round to be spotted as:

- a. Over.
- b. Line.
- c. Range Correct.
- d. Short.

SITUATION: This situation is for questions 11 and 12. Your initial round bursts as illustrated below. You estimate it missed the target by 450 meters.



(11) The range spotting for this round is:

- a. Doubtful.
- b. Line.
- c. Short.
- d. Over.

(12) The range correction you would send for this round to establish a bracket is:

- a. Add 800.
- b. Add 400.
- c. Add 450.
- d. Drop 800.

(13) When you have made deviation corrections to bring the rounds on line with the target, and range corrections to bring the rounds to within 50 meters of the target, you:

- a. End of Mission.
- b. Enter Fire For Effect.
- c. Split the bracket.
- d. Make Refinements.

(14) Reporting the results of your Fire For Effect rounds is called:

- a. Refinement.
- b. Spotting.
- c. Surveillance.
- d. Deviation.

(15) Making minor range and/or deviation corrections after Fire For Effect is called:

- a. Refinement.
- b. Adjusting.
- c. Surveillance.
- d. Bracketing.

(16) To terminate a mission once your target is neutralized, you tell the FDC:

- a. Target Neutralized.
- b. Repeat.
- c. Fire For Effect.
- d. End of Mission, Target Neutralized.

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c. Solution to Practice Exercise.

- (1) b. Spotting. Page 75, Paragraph a, (1), (a).
- (2) d. Deviation. Page 76, Paragraph a, (1), (a), 1, a, b.
- (3) c. Over, Short, Range Correct. Page 80, a, (1), 4.
- (4) b. 10 mils. Page 76, Paragraph a, (1), (a), 1, a.
- (5) c. Short. Page 79, Paragraph a, (1), 3.
- (6) a. 20 Right. Page 77, Paragraph a, (1), (a), 1, a, b.
- (7) c. 3.0. Page 78, Paragraph a, (1), (a), 2.
- (8) d. Right 90. Page 78, Paragraph a, (1), (a), 2.
- (9) b. Successive Bracketing. Page 80, Paragraph a, (1), (a), 4.
- (10) a. Over. Page 80, Paragraph a, (1), (a), 4.
- (11) c. Short. Page 79, Paragraph a, (1), (a), 3.
- (12) a. Add 800. Page 80, Paragraph a, (1), (a), 4.
- (13) b. Fire For Effect. Page 85, Paragraph a, (1), (b).
- (14) c. Surveillance. Page 86, Paragraph a, (2).
- (15) a. Refinement. Page 86, Paragraph a, (2).
- (16) d. End of Mission, Target Neutralized. Page 86, Paragraph a, (2).

EXAMINATION

The following examination is designed to evaluate the skills necessary to call for and adjust indirect fire. The examination consists of 25 multiple choice questions. There is only one correct response for each question. Answer each question and record your response on the Examination Answer Sheet by marking out the letter corresponding to your choice. If you need to change a response, completely erase or X out the response you want to disregard. Multiple responses to a question will be counted as incorrect. Individual work is required and the provisions of the honor code apply.

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CLASS NUMBER _____

NAME _____

SSN _____

**3RD SQUADRON, 16TH CAVALRY REGIMENT
U.S. ARMY ARMOR SCHOOL
FORT KNOX, KENTUCKY 40121-5220**

EXAMINATION ANSWER SHEET

INSTRUCTIONS: Enter your class number and roster number in the spaces provided. Mark out the letter corresponding to your choice from the examination. If you change a response completely erase or X out the response you want to disregard. There is only one correct response for each question.

- | | |
|-------------|-------------|
| 1. a b c d | 13. a b c d |
| 2. a b c d | 14. a b c d |
| 3. a b c d | 15. a b c d |
| 4. a b c d | 16. a b c d |
| 5. a b c d | 17. a b c d |
| 6. a b c d | 18. a b c d |
| 7. a b c d | 19. a b c d |
| 8. a b c d | 20. a b c d |
| 9. a b c d | 21. a b c d |
| 10. a b c d | 22. a b c d |
| 11. a b c d | 23. a b c d |
| 12. a b c d | 24. a b c d |
| | 25. a b c d |

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1. The observer must accomplish what three tasks to engage a target with indirect fire?

- a. Locate the target, initiate the mission and adjust the rounds to the target.
- b. Locate the target, initiate the mission and transmit refinement data.
- c. Prepare a call for fire, adjust the rounds to the target, and send surveillance data.
- d. Make range and deviation spottings, convert to corrections and fire for effect.

2. The observer must determine what two items of information in order to locate a target by either the polar, grid or shift from a known point method of target location?

- a. Grid Zone Designator and the Grid Coordinate.
- b. Direction and size of the target vehicle.
- c. Distance and the mil deviation from a reference point to the target.
- d. Direction and distance from the observers location to the target to be engaged.

3. The observer must accomplish what two tasks if the initial rounds fail to hit the target and adjustments are necessary?

- a. Correct the initial rounds and Fire For Effect.
- b. Spot the initial round for range and convert to a deviation correction.
- c. Spot the initial round for range and deviation and convert to a correction for deviation and range.
- d. Spot the round for deviation and adjust the round to the target.

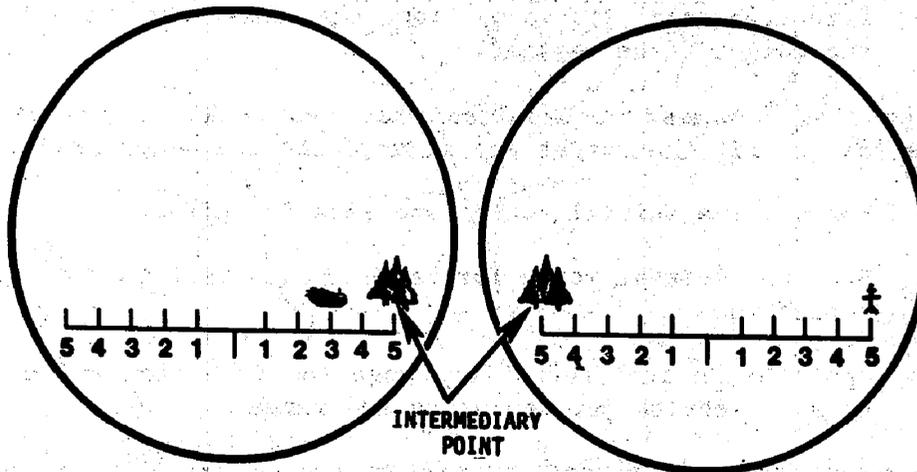
REQUIREMENT I:

SITUATION: Your platoon is currently occupying a strong point located at grid coordinate 314914. You have one reference point in your sector, Bench Marker 820, located at grid coordinate 306888.

4. Determine the direction from your location at grid coordinate 314914 to the reference point, Bench Marker 820, located at grid coordinate 306888. Direction:

- a. 3420 mils.
- b. 3480 mils.
- c. 3520 mils.
- d. 3580 mils.

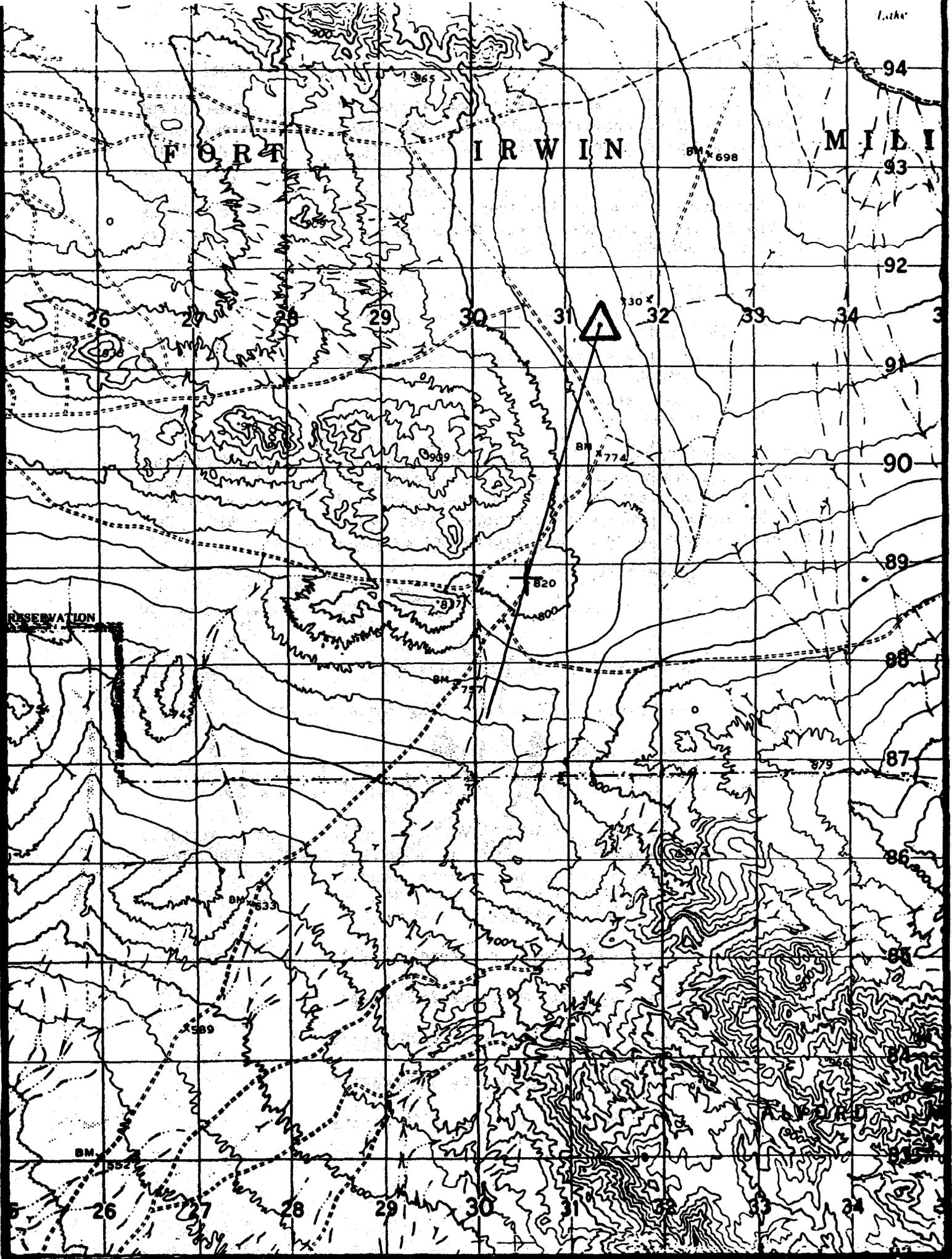
SITUATION CONTINUED: The FIST informed you prior to the operation that your current location would be reported to the field artillery fire direction center. This has been confirmed. A target appears in the vicinity of your reference point, Bench Marker 820. You observe the target with your binoculars as illustrated:



Target; BMD, Length 7 meters
Mil Deviation: 3 mils

5. Determine the polar plot to the target. Polar plot:

- a. Direction 3350 mils, Distance 2300 meters.
- b. Direction 3400 mils, Distance 2300 meters.
- c. Direction 3640 mils, Distance 2300 meters.
- d. Direction 3590 mils, Distance 2330 meters.



SITUATION CONTINUED: You have located the target described in question 5, a BMD, and are prepared to initiate your call for fire. Your call sign is M4D78, the battery fire direction center (FDC) is S8A41. This is your first contact with the FDC today.

NOTE: Target locations used in the solution to question 6 do not correspond to solutions used for question 5.

6. Your call for fire is:

- a. S8A41 this is M4D78, Adjust Fire, Over.
Polar Direction 4260, Distance 3200, Over.
One BMP, stationary in the open, Over.
- b. M4D78 this is S8A41, Adjust Fire Polar, Over.
Direction 4260, Distance 3200, Over.
One BMD, stationary in the open, Over.
- c. S8A41 this is M4D78, Adjust Fire Polar, Over.
Direction 4260, Distance 3200, Over.
One BMD, stationary in the open, Over.
- d. S8A41 this is M4D78, Adjust Fire, Polar
Direction 4260, Distance 3200, Over.
One BMD, stationary in the open, Over.

7. The fire direction center (FDC) will challenge you to authenticate:

- a. Prior to acknowledging the mission.
- b. Immediately after establishing radio contact.
- c. Authentication is not required.
- d. After the read back of the third radio transmission.

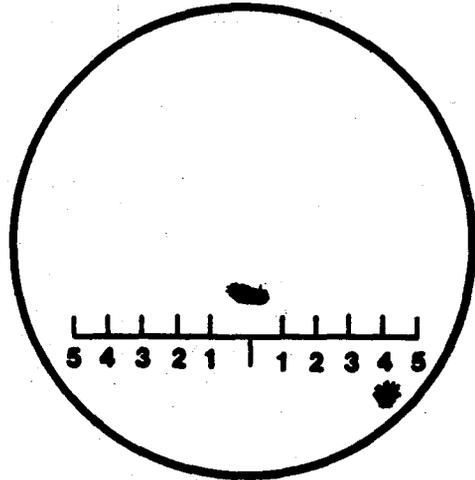
SITUATION CONTINUED: You have transmitted and properly authenticated your call for fire in question 6. The FDC elects to engage the target with a battery one round DPICM.

8. The correct Message to Observer is:

- a. Alpha, DPICM, One Round, BB1010, Over.
- b. Alpha, One Round, DPICM, BB1010, Over.
- c. DPICM, One Round Alpha, BB1010, Over.
- d. Alpha, BB1010, DPICM, One Round, Over.

SITUATION CONTINUED: Your initial round impacts as illustrated. You determine the spotting and convert it to a correction based on the estimated range to the target in question 5.

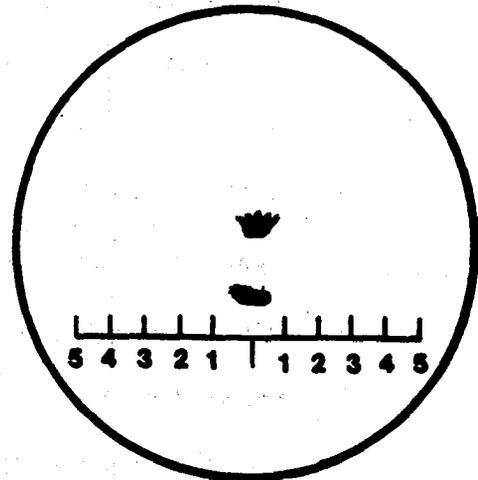
The burst from round 1 is seen through your binoculars as illustrated.



9. Correction:

- a. Left 40, Add 400.
- b. Left 80, Add 400.
- c. Right 40, Add 400.
- d. Right 80, Add 400.

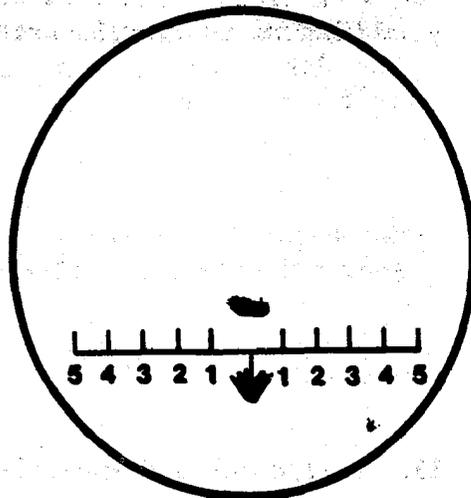
The burst from round 2 is seen through your binoculars as illustrated.



10. Correction:

- a. Drop 100.
- b. Drop 200.
- c. Add 200.
- d. Add 100.

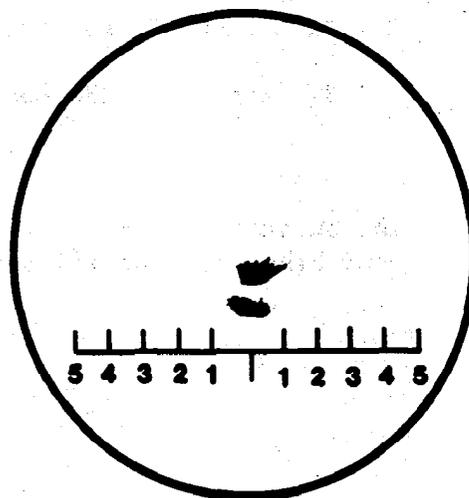
The burst from round 3 is seen through your binoculars as illustrated.



11. Correction:

- a. Drop 200.
- b. Drop 100.
- c. Add 200.
- d. Add 100.

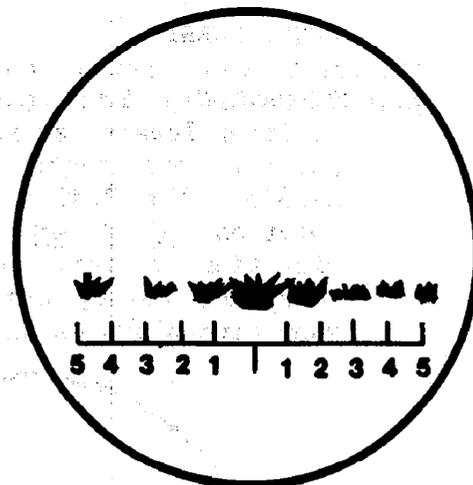
The burst from round 4 is seen through your binoculars as illustrated.



12. Correction:

- a. Drop 50, Fire For Effect.
- b. Drop 50.
- c. Add 50, Fire For Effect.
- d. Add 50.

The burst from round 5 is seen through your binoculars as illustrated.

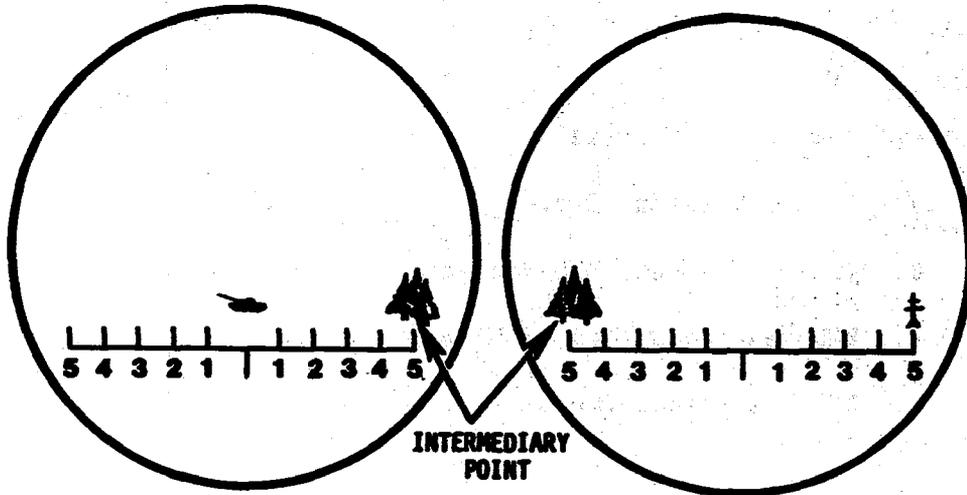


13. Refinement and Surveillance:

- a. End of Mission, Over.
- b. End of Mission, BMD destroyed, Over.
- c. BMD destroyed, End of Mission, Over.
- d. BMD destroyed, Over.

REQUIREMENT II.

SITUATION: Your platoon is currently occupying an overwatch position located at grid coordinate 322860. You have one reference point in your sector, Bench Marker 757, located at grid coordinate 298878. The FIST informed you prior to the operation that your location would not be reported the the field artillery fire direction center. A target appears in the vicinity of your reference point, Bench Marker 757. You observe the target with your binoculars as illustrated.



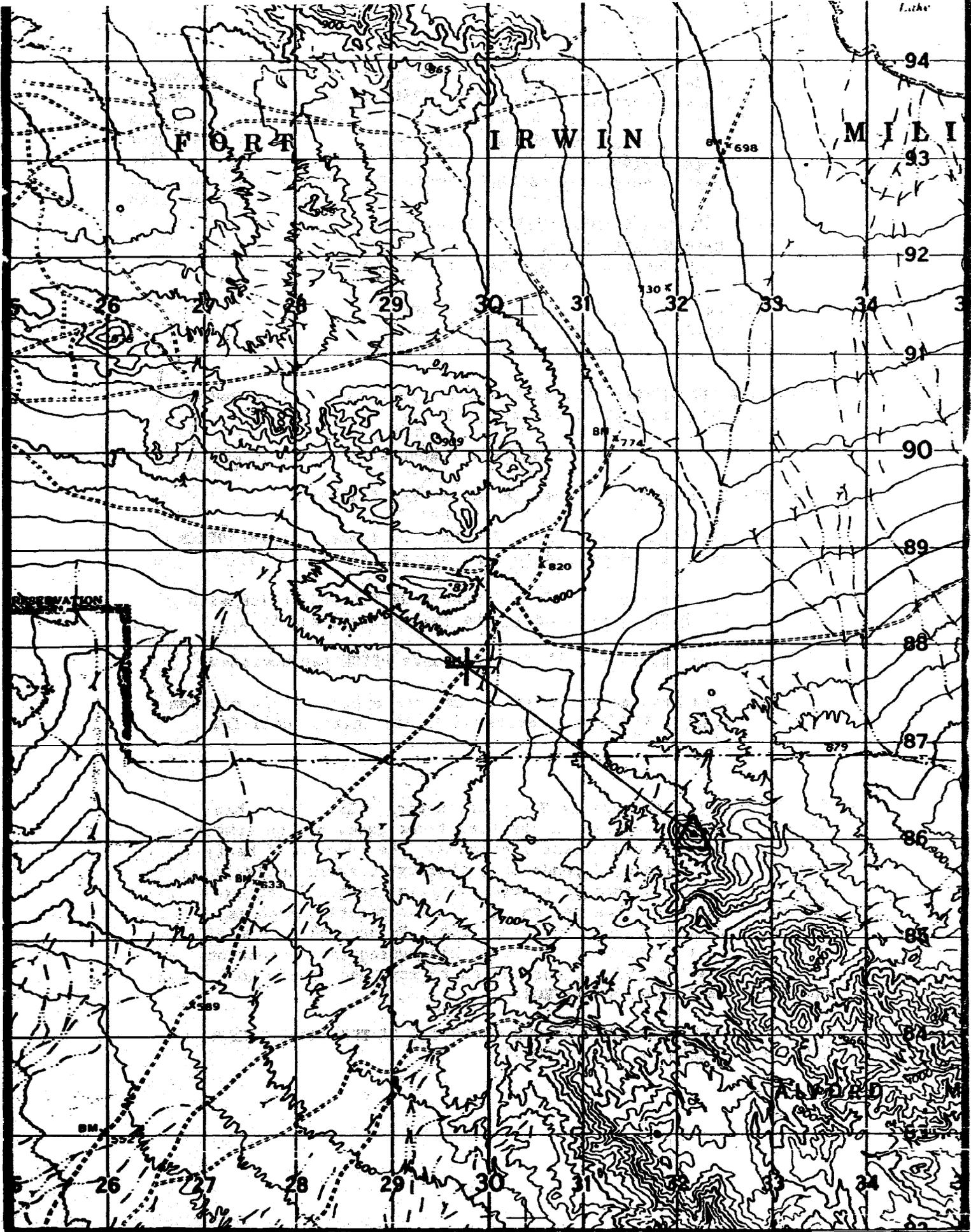
**Target; Tank, Length 9 meters.
Mil Deviation: 3 mils.**

14. Determine the 6 digit grid coordinate to the target. Grid Coordinate:

- a. Grid 874296.
- b. Grid 301881.
- c. Grid 296874.
- d. Grid 881301.

SITUATION CONTINUED: You have located the target described in question 14, a tank, and are prepared to initiate your call for fire. You have elected to engage the target with Dual Purpose Improved Conventional Munitions. Your call sign is M4D78, the battery fire direction center is S8A41.

NOTE: Target locations used in the solution to question 14 donot correspond to the solutions used in question 15.



15. Your call for fire is:

- a. A41 this D78, Adjust Fire Grid, Over.
Grid 627198, Over.
Tank, stationary in the open, DPICM, Over.
- b. A41 this is D78, Adjust Fire, Over.
Grid 627198, Over.
Tank, stationary in the open, over.
- c. A41 this is D78, Adjust Fire, Over.
Grid 627198, Over.
Tank, stationary in the open, DPICM, Over.
- d. A41 this is D78, Adjust Fire, Over.
Grid 627198, Direction 0840, Over.
Tank, stationary in the open, DPICM, Over.

SITUATION CONTINUED: You authenticate your mission and receive the following Message to Observer:

"Alpha, HE, 2 Rounds"

16. The Message to Observer indicates the following:

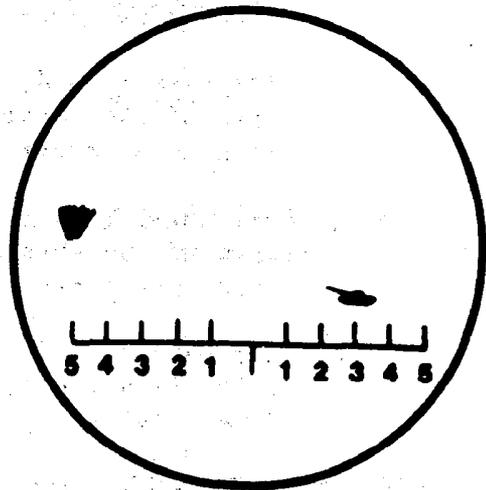
- a. The battery will fire 2 Rounds HE instead of the DPICM that was requested in the initial call for fire.
- b. The battery will fire 2 Rounds HE in conjunction with the DPICM requested in the initial call for fire.
- c. Alpha Battery will fire 2 Rounds DPICM per howitzer.
- d. This Message to Observer does not apply to this mission because DPICM was requested in the initial call for fire.

The following technique is Hasty Bracketing. Experience has shown that effectiveness on the target decreases as the number of rounds used in adjustment increases. The success of hasty bracketing adjustment depends on a thorough terrain analysis that gives the observer an accurate initial target location. The observer gets a bracket on his first correction much as in the successive bracketing technique. He uses this initial bracket as a yardstick to determine his subsequent correction. He then sends the FDC the correction to move the rounds to the target and **FIRE FOR EFFECT.**

(HOWEVER, REMEMBER ALL MISSIONS CONDUCTED AT THE ARMOR SCHOOL WILL USE SUCCESSIVE BRACKETING.)

SITUATION CONTINUED: Your initial round impacts as illustrated. You determine the spotting and convert it to a correction based on the estimated range to the target in question 14.

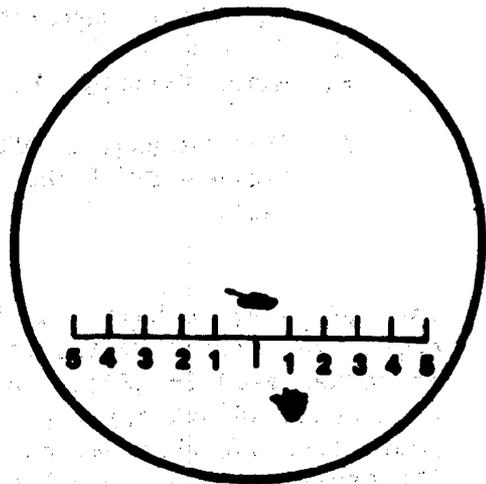
The burst from round 1 is seen through your binoculars as illustrated.



17. Correction:

- a. Left 240, Add 400.
- b. Left 80, Drop 400.
- c. Right 240, Drop 400.
- d. Right 80, Drop 200.

The burst from round 2 is seen through your binoculars as illustrated.

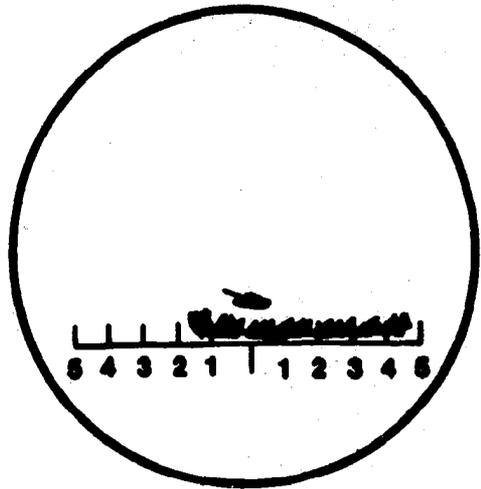


18. Correction:

- a. Right 30, Add 50 Fire For Effect.
- b. Add 50, Fire For Effect.
- c. Left 10, Add 100.
- d. Left 30, Add 50 Fire For Effect.

SITUATION CONTINUED: The center mass of the bursts appear to be short and to the right of the center mass of the adjusting point. You did not get the desired effects on target.

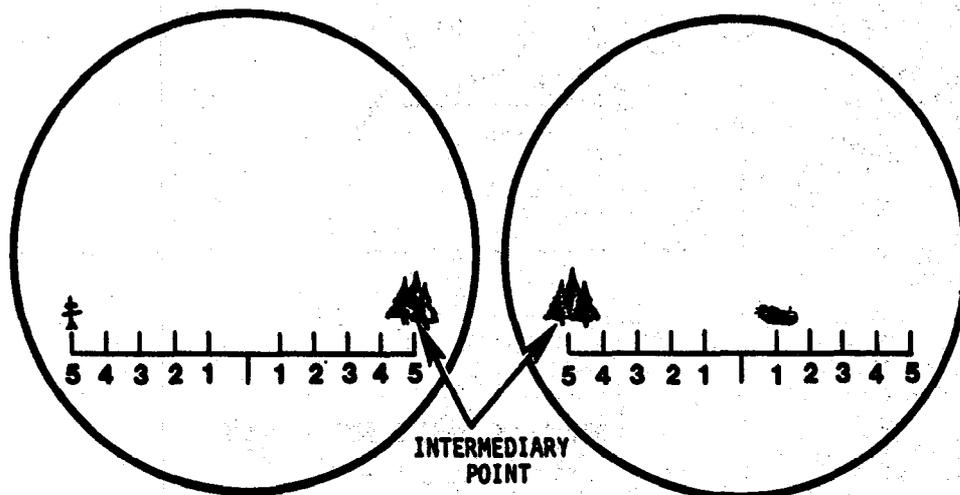
The burst from round 3 is seen through your binoculars as illustrated.



19. Your Refinement/Surveillance would be:
- a. End of Mission, Enemy dispersing, Over.
 - b. Left 30, Add 50, Repeat, Over.
 - c. Left 30, Add 25, End of Mission, Over.
 - d. Repeat, Over.

REQUIREMENT III

SITUATION: Your platoon is currently located at grid coordinate 315885. You have one reference point, Bench Marker 730, located at grid coordinate 319917. The reference point, Bench Marker 730, has been targeted by the fire direction center and assigned the field artillery target number AA1001. A target appears in the vicinity of the preplanned target AA1001. You observe the target with your binoculars as illustrated.



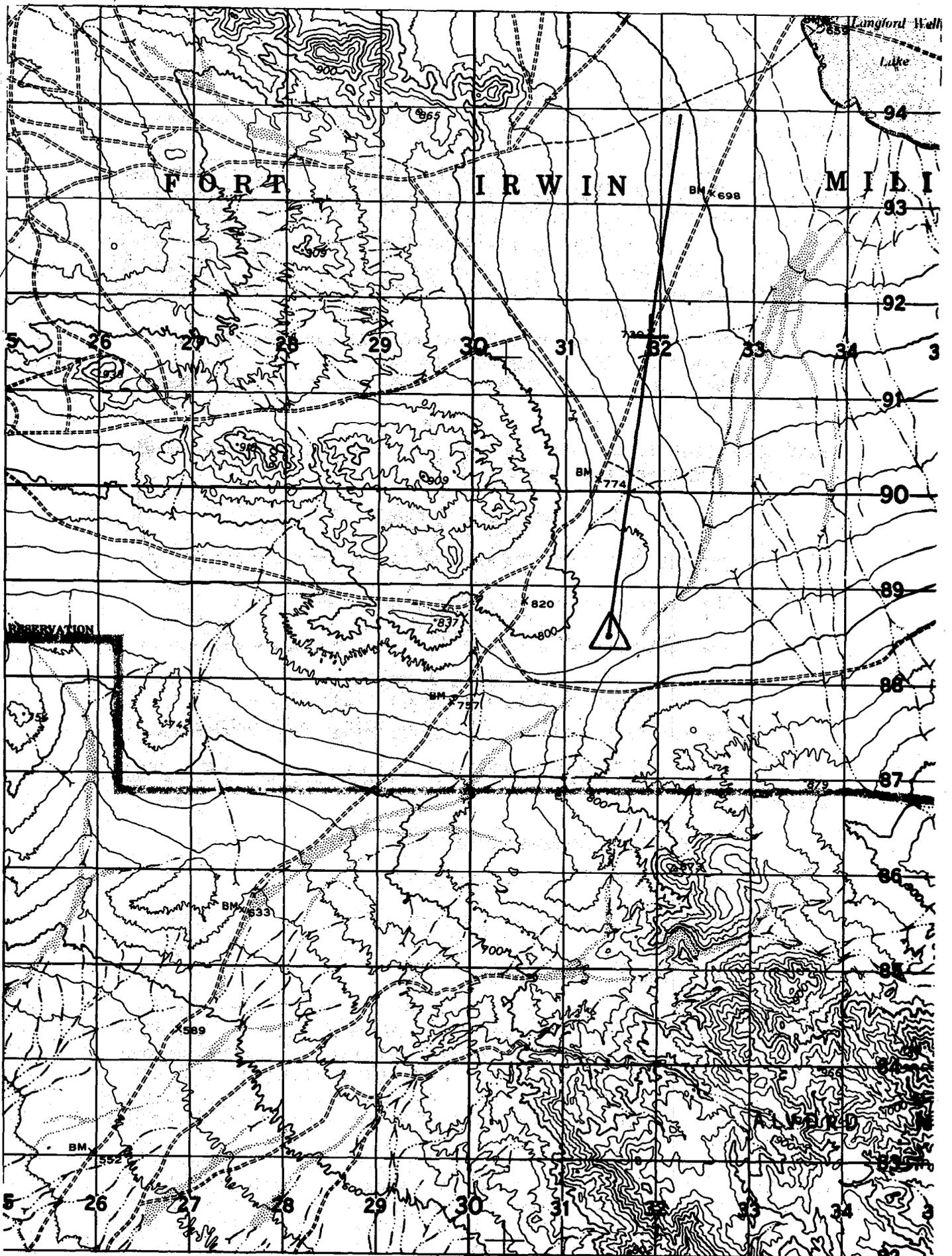
Target; BMD, Length 7 meters
Laser Range to the target, 4230 meters
Laser Range to the Known Point, 3200 meters

20. Determine the Shift From A Known Point data to the target. Shift AA1001:

- Direction 0140, Right 160, Add 1000.
- Direction 0300, Left 630, Add 1000.
- Direction 0300, Right 510, Add 1000.
- Direction 6380, Right 670, Add 1030.

SITUATION CONTINUED: You have located the target described in question 20, a BMD, and are prepared to initiate your call for fire. You have elected to engage the target with Dual Purpose Improved Conventional Munitions and you do not want the artillery to fire until you are ready for them to fire. Your call sign is M4D78, the battery fire direction center is S8A41 and the battalion fire direction center is J3W67.

NOTE: Target locations used in the solution to question 20 do not correspond to the solutions used in question 21.



21. Your call for fire is:

- a. A41 this D78, Fire For Effect Shift, Over.
Direction 6200, Right 400, Add 800, Over.
Stationary BMD in the open, DPICM, At My Command, Over.
- b. A41 this is D78, Fire For Effect Shift AA1001, Over.
Direction 6200, Right 400, Add 800, Over.
Stationary BMD in the open, LPICM, At My Command, Over.
- c. W67 this is D78, Adjust Fire Shift AA1001, Over.
Direction 6200, Right 400, Add 800, Over.
BMD stationary in the open, At My Command, DPICM, Over.
- d. A41 this is D78, Fire For Effect Shift BM 730, Over.
Direction 6200, Right 400, Add 800, Over.
One stationary BMD in the open, DPICM, At My Command,
Over

SITUATION CONTINUED: You authenticate your mission and receive the following Message to Observer.

"Whisky 2 Rounds, Time of Flight 60 Seconds"

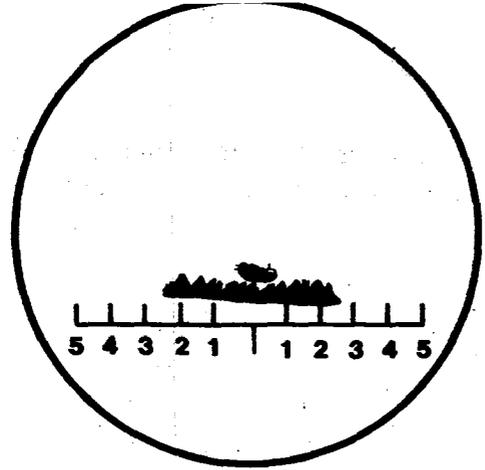
22. The Message to Observer indicates the following:

- a. The battery will fire 2 rounds DPICM when ready.
- b. The battalion will fire 2 rounds HE at your command.
- c. The battery will fire 2 rounds HE when ready.
- d. The battalion will fire 2 rounds DPICM at your command.

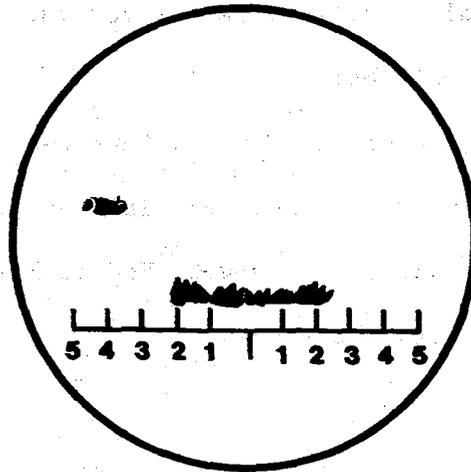
23. When you are ready for the battery/battalion to fire you announce:

- a. Cancel At My Command, Fire, Over.
- b. Fire, Over.
- c. A41 this is D78, Fire, Over.
- d. At My Command, Fire, Over.

The burst from round 1 is seen through your binoculars as illustrated.



SITUATION CONTINUED: The rounds have impacted in close proximity to the target causing it to disperse to the Northwest. The target is now positioned as illustrated.

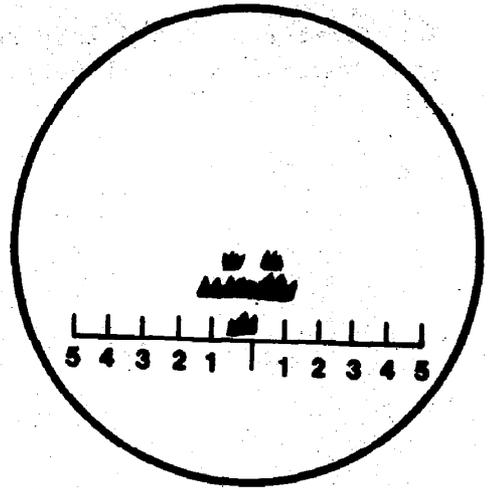


Laser Range to the target is 4410 meters

24. Correction:

- a. Cancel At My Command, Left 160, Add 200, Repeat, Over.
- b. Left 160, Add 200, Over.
- c. Cancel At My Command, Right 160, Add 200, Repeat, Fire, Over.
- d. Right 40, Drop 200, Over.

The bursts from round 3 is seen through your binoculars as illustrated.



SITUATION CONTINUED: The tank is destroyed and you want the target recorded as a field artillery target for future reference.

25. Your Surveillance would be:

- a. End of Mission, Record as Target, Tank Destroyed.
- b. Record as Target, End of Mission, Tank Destroyed.
- c. Tank Destroyed, Record as Target, End of Mission.
- d. End of Mission, Tank Destroyed.