Appendix A

Mortar Training Strategy

This appendix provides a comprehensive unit training strategy for training mortarmen. Leaders have the means to develop a program for training their mortar units to full mission proficiency. This training strategy applies to ALL mortars in ALL organizations of the US Army. Although not prescriptive in nature, mortar training strategy must adapt to a unit's mission, local training resources, commander's guidance, and unit training status.

GENERAL

A-1. The mortar training strategy helps the mortar crew become proficient and effective on the battlefield. The gunner is required to be proficient in mechanical drill and FDC when computing the fire mission from the FO.

TRAINING EVALUATION

A-2. Evaluation cannot be separated from effective training. Training evaluation occurs during the top-down analysis when planners develop the training plan. Planners use various sources of information to assess their unit's individual and collective training status. Evaluation is continuous during training. Soldiers receive feedback through coaching and after-action reviews (AARs). Leaders also assess their own training plan and the instructional skills of their subordinate leaders. After training, leaders evaluate by sampling training or reviewing AARs. Much of this evaluation is conducted informally. Formal evaluations occur under the Individual Training and Evaluation Program (ITEP) and the Army Training and Evaluation Program (ARTEP) to assess individual and collective training respectively.

INDIVIDUAL TRAINING

A-3. Individual training is a clearly defined and measurable activity accomplished by an individual.

Commander's Evaluation

A-4. The commander's evaluation is routinely conducted in units. Commanders select and evaluate individual tasks that support their unit mission and contribute to unit proficiency. The evaluation may be performed through local tests or assessments of Soldier proficiency on crucial MOS tasks or common tasks. The commander's evaluation is based on year-round, constant evaluation by the chain of command and supported by the MOS 11C Soldier's manuals, trainer's guides, and job books.

Gunner's Examination

A-5. The gunner's examination is a continuation of the mortar-based drills in which a mortarman's proficiency as a gunner is established. The examination includes situations similar to combat. The examination contained in Chapter 9 of FM 3-22.90 includes tasks, conditions, standards, and administrative procedures, while focusing on the individual qualification of the Soldier in the role of a gunner. However, the gunner's success also depends on the collective performance of his assistants. Within these limitations, evaluators should try to standardize the examination. The squad leader, gunner, and assistant gunner should pass the gunner's exam semiannually. All gunners should have a current qualification before a live-fire exercise (LFX), whether using service or subcaliber ammunition.

Fire Direction Center Certification

A-6. FDC certification allows commanders to verify that their FDC mortarmen have the knowledge and skills for their positions: squad leader, FDC computer, section sergeant, platoon sergeant, and platoon leader. Certification helps ensure that ammunition is wisely expended and that training is conducted safely and effectively. Mortarmen are certified when they receive a passing score of 90 percent and 70 percent on the two-part examination.

COLLECTIVE TRAINING

A-7. Collective training is a clearly defined and measurable activity accomplished by individuals and organizations.

External Evaluation

A-8. The commander formally determines the status of his collective training through external evaluation. The external evaluation gives the commander an objective appraisal of this status by using mortar expertise found outside the normal chain of command. The external evaluation is not a test that a unit passes or fails; it is a diagnostic tool that identifies training strengths and weaknesses. It must be emphasized that an external evaluation is not a specific training event but a means to evaluate a training event. Mortar units undergo external evaluations during an LFX or field training exercise (FTX), or a combination of both. The unit may be evaluated alone, as part of its parent unit, or with other mortar units. The mission training plan (MTP) provides guidance on planning, preparing, and conducting an external evaluation.

Evaluation of the Indirect Fire Team

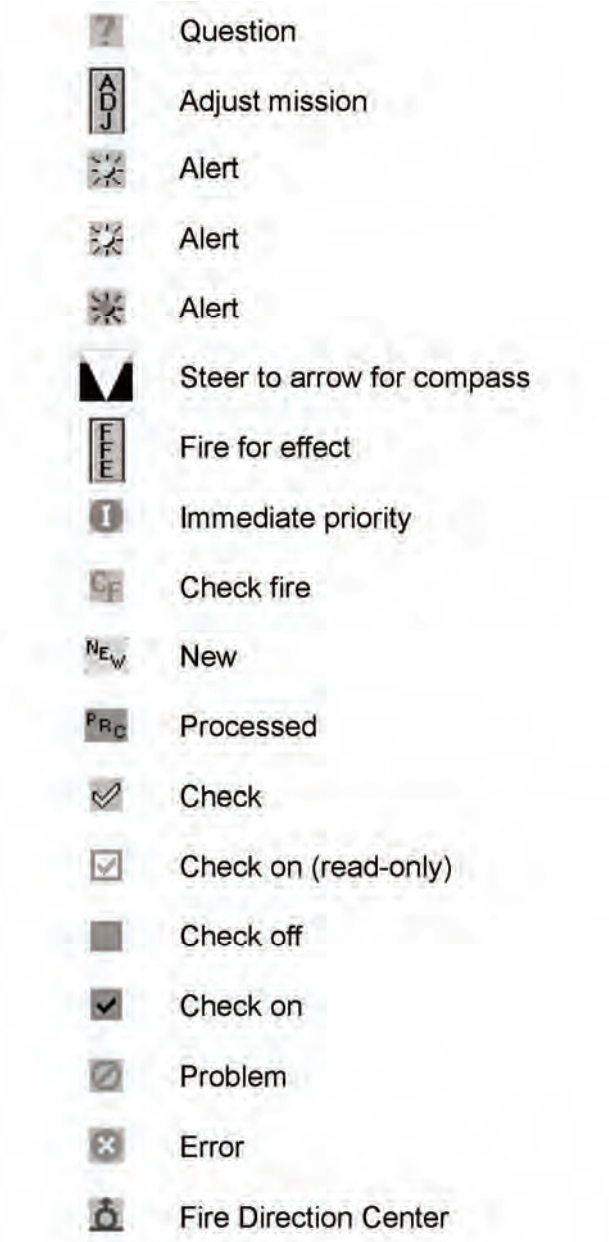
A-9. The members of the indirect fire team must train and correctly execute their respective tasks to successfully complete any fire mission. The team training event sequence should include a step to confirm that the fires have been cleared. For example, while the battalion FSO coordinates airspace clearance and friendly troop locations, the FDC confirms that the charge-shell combination does not violate any maximum ordinate restrictions or other control measures. Failure to do so should be identified as a training deficiency. However, only as a last resort should the fire mission be deleted from the evaluation. Evaluators should determine the reason why any fire mission fails to meet standards in order to determine where additional training is required. The indirect fire team should be given the opportunity to successfully complete the fire mission. This can be accomplished in the following ways:

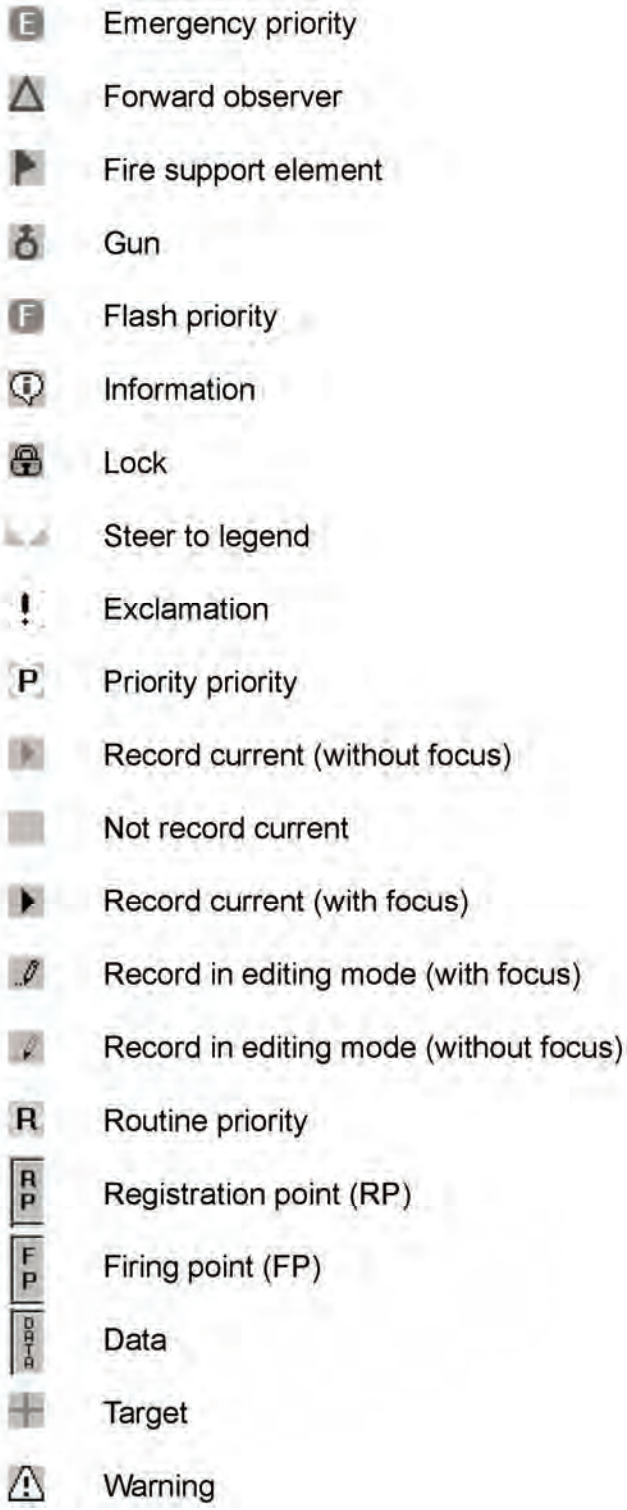
- Allow the mission to continue if the detected error will still result in the rounds impacting within the safety limits. The team must train to accomplish the mission by finding and correcting any errors based on the round's impact. The appropriate evaluator should intervene only if the team prepares to fire incorrect data that is out of the safety area or when ammunition is constrained.
- Start the fire mission over. Although ammunition constraints during live-fire may not permit this, tasks can be repeated using devices or, less preferably, dry-fire.
- The evaluator corrects the error when the mission data would result in rounds fired out of the safety area. The FO evaluator at the observation post can change the call for fire or correction to reflect proper procedures. The FDC evaluator may correct the improperly computed firing data while the mortar squad evaluator may correct improperly set data or a faulty sight picture.

Appendix B

Icons for the Mortar Fire Control System

This appendix provides a comprehensive listing of the various icons (and their meanings) that may appear on various screens while using the CI.




Emergency priority
Forward observer
Fire support element
Gun
Flash priority
Information
Lock
Steer to legend
Exclamation
Priority priority
Record current (without focus)
Not record current
Record current (with focus)
Record in editing mode (with focus)
Record in editing mode (without focus)
Routine priority
Registration point (RP)
Firing point (FP)
Data
Target
Warning

Appendix C
Safety Procedures

Minimum and maximum elevations, deflection limits, and minimum fuze settings must be computed to ensure all rounds impact or function within the designated impact area. These data are then presented in graphic form on a range safety diagram. They are also arranged in a simplified format (the safety T) for each mortar squad leader. This appendix discusses the computation of safety data using tabular and graphical data.

SURFACE DANGER ZONES

C-1. Range control personnel or the officer in charge (OIC) provides the safety officer with the precise location and size of the impact area. The impact area can either be defined by a series of grid coordinates representing the corner points or lateral azimuths and minimum and maximum distances from a fixed RP. Either method defines an area on the ground, perhaps irregularly shaped, within which all rounds fired must either impact or function. The safety officer must then compute the safety limits of this impact area and construct the safety diagram and the safety T. To compute the safety limits the safety officer must consider the following:

SECONDARY DANGER AREAS A AND B

C-2. The safety officer must first determine whether the impact area limits provided to him include secondary danger areas A and B. These areas are established by AR 385-63.

C-3. Secondary danger area A parallels the impact area laterally and is provided to contain fragments from rounds exploding on the right or left edges of the impact area (Figure C-1). Depending on the mortar being fired, secondary danger area A varies from 250 to 400 meters.

C-4. Secondary danger area B is on the downrange side of the impact area and area A. It contains fragments from rounds exploding on the far edge of the impact area. Depending on the mortar being fired, secondary danger area B varies from 300 to 500 meters (Figure C-1).

NOTE: If the designated impact area does not already consider areas A and B, it must be reduced by the appropriate amount to ensure no rounds impact within or outside of either area.

PROBABLE ERRORS IN RANGE AND DEFLECTION

C-5. The initial impact area must be reduced again to account for the normal dispersion of rounds fired. The safety officer must determine the maximum PEs for both range and deflection.

(1) The safety officer checks columns 3 and 4 of Table E in the tabular firing tables for the mortar and ammunition to be used. He checks all possible charge and elevation combinations to ensure he has found the maximum PEs at the distance to the far edge of the impact area.

(2) The safety officer then reduces the maximum range by a factor of eight times the PE_r. He also adjusts the minimum range toward the center of impact by a factor of 12 times the PE_r.

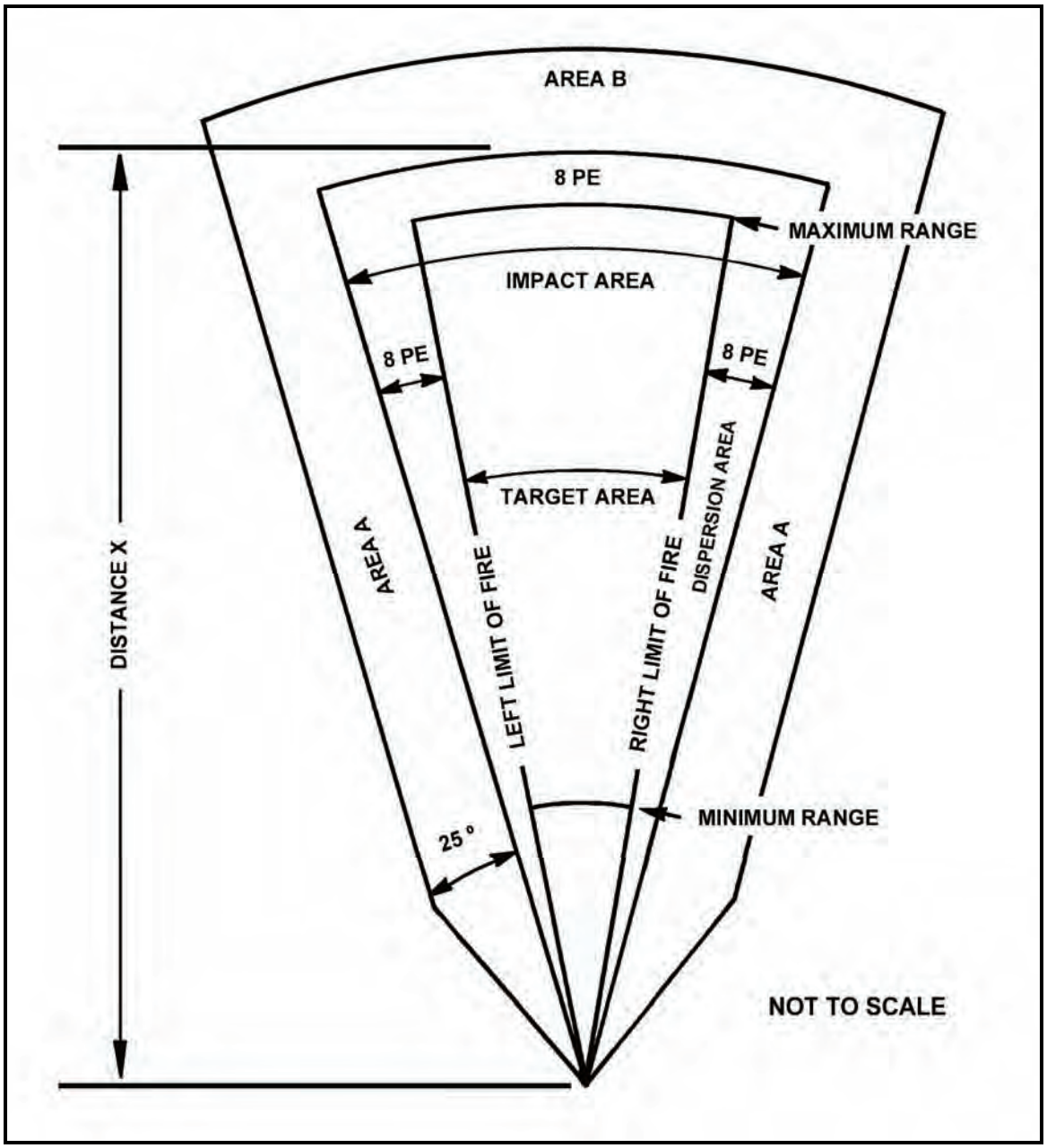


Figure C-1. Mortar surface danger zone.

(3) Once the ranges have been adjusted, the safety officer adjusts the left and right limits inward by a factor of eight times the maximum PE_d.

NOTE: The safety officer must determine whether range control personnel have already performed this computation before designating the impact area.

VERTICAL INTERVAL AND CREST CLEARANCE

C-6. The safety officer must compare the altitude of the mortar position and that of the impact area. If there are significant differences in the VI between these two areas, he must adjust the safety limits to preclude any rounds impacting short or long of the impact area (Figure C-2).

(1) The mini-max rule determines the correct VI for safety purposes. At the minimum range, the maximum altitude is selected. At the maximum range, the minimum altitude is selected. If the contour interval is in feet, it is converted to meters.

(2) The safety officer determines VI by subtracting the mortar firing position altitude from the altitude of the applicable range line. The resulting number is either positive or negative.

(3) The safety officer adds half the value of the VI determined for each applicable range line, to that line. This either increases or decreases the apparent size of the impact area, depending on whether the VI is positive or negative.

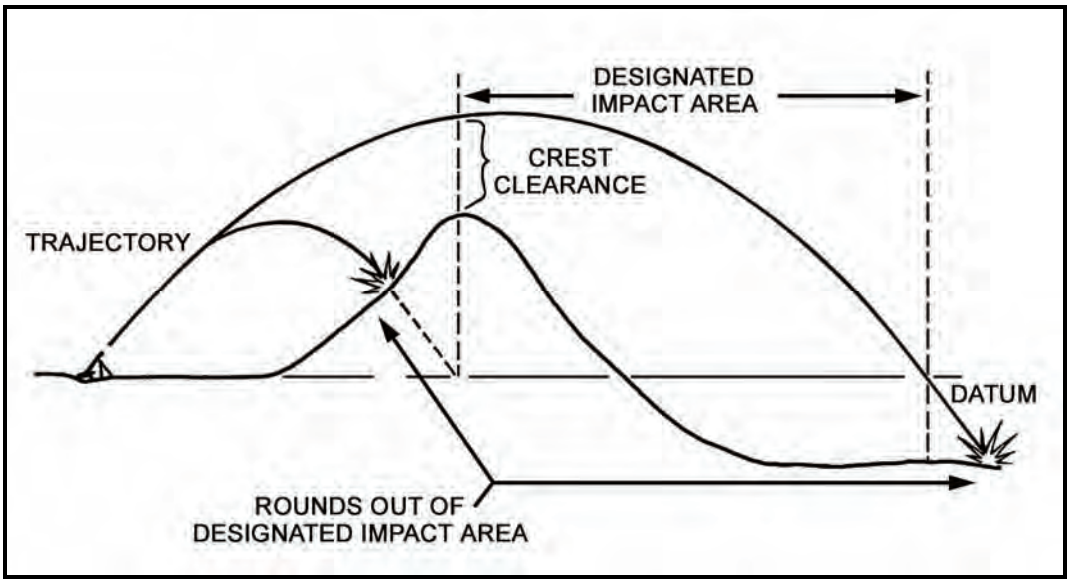


Figure C-2. Effects of vertical interval and crest clearances.

(4) The safety officer must then make a map inspection to determine the highest point between the mortar position and the edge of the impact area. He then compares this highest point with the lowest maximum ordinate value found in Table E in the tabular firing tables. As long as the maximum ordinate exceeds the VI of the highest point, no correction need be made. If not, all charge and elevation combinations that do not allow crest clearance must be noted and applied to the safety diagram.

SECTION WIDTH AND DEPTH (MANUAL PLOTTING ONLY)

C-7. If a mortar near the center of the section is used as the adjusting mortar, any mortar significantly left or right of this "base" can put rounds out of impact, unless corrections are made. If the mortars are arranged in the firing position with any significant depth, the rearward or forward mortar can put rounds short or long of the impact area unless a correction is made.

(1) The safety officer must determine the width and depth of the mortar section as it is arranged on the ground (at the firing position). He then reduces the left and right limits by half the section width.

(2) The safety officer adds half the section depth to the minimum range and subtracts half the section depth from the maximum range.

REGISTRATION AND METEOROLOGICAL CORRECTIONS

C-8. After a registration (survey chart), a reregistration, or a MET update has been conducted and corrections have been determined, the safety officer must modify the original basic safety diagram by applying the registration corrections. New elevations are determined that correspond to the minimum and maximum ranges. Deflections are modified by applying the total deflection correction to each lateral limit.

SAFETY DIAGRAM

C-9. The safety diagram graphically displays the computed safety limits. Data are logically presented and arranged for the FDC to use. Once the diagram is constructed, data from it are used to draw the safety T.

C-10. The range safety officer determines the lateral safety limits and the minimum and maximum ranges of the target area. These data must then be converted to deflections and elevations. In the case of mechanical time (illumination) and variable time (VT or PROX) fuzes, a minimum time setting must be determined. For example, assume the following limits were provided by the range safety officer:

- Left azimuth limit is 4730 mils.
- Right azimuth limit is 5450 mils.
- Minimum range (min rg) is 2,400 meters.
- Maximum range (max rg) is 5,500 meters.
- From azimuth 4730 mils to azimuth 5030 mils, the maximum range is 5,000 meters.
- Minimum range for fuze time is 2,700 meters.
- Authorized weapons and charge zones are the M252 81-mm mortar, and charges 3 and 4 (M821 HE round).
- Firing point 72 is located at grid FB60323872; altitude is 390 meters.

C-11. The basic safety diagram is constructed (Figure C-3) as follows:

(1) On a sheet of paper, draw a line representing the direction of fire for the firing unit. Label this line with its azimuth (AZ) and the referred deflection (DF) for the weapon system.

(2) Draw lines representing the lateral limits in proper relation to the line on which the section is laid. Label the lateral limits with the appropriate azimuths.

(3) Draw lines between the lateral safety limits to represent the minimum and maximum ranges. Label each line with the appropriate range. If the minimum range for fuze (FZ) time (TI) is different from the minimum range, draw a dashed line between the safety limits to represent the minimum range for FZ TI. Label the line with the appropriate range.

(4) Compute the angular measurements from the azimuth of lay to the left and right safety limits by comparing the azimuth of lay to the azimuth of each limit. On the diagram, draw arrows indicating the angular measurements and label them.

(5) Apply the angular measurements to the deflection corresponding to the azimuth of fire to determine the deflection limits (LARS).

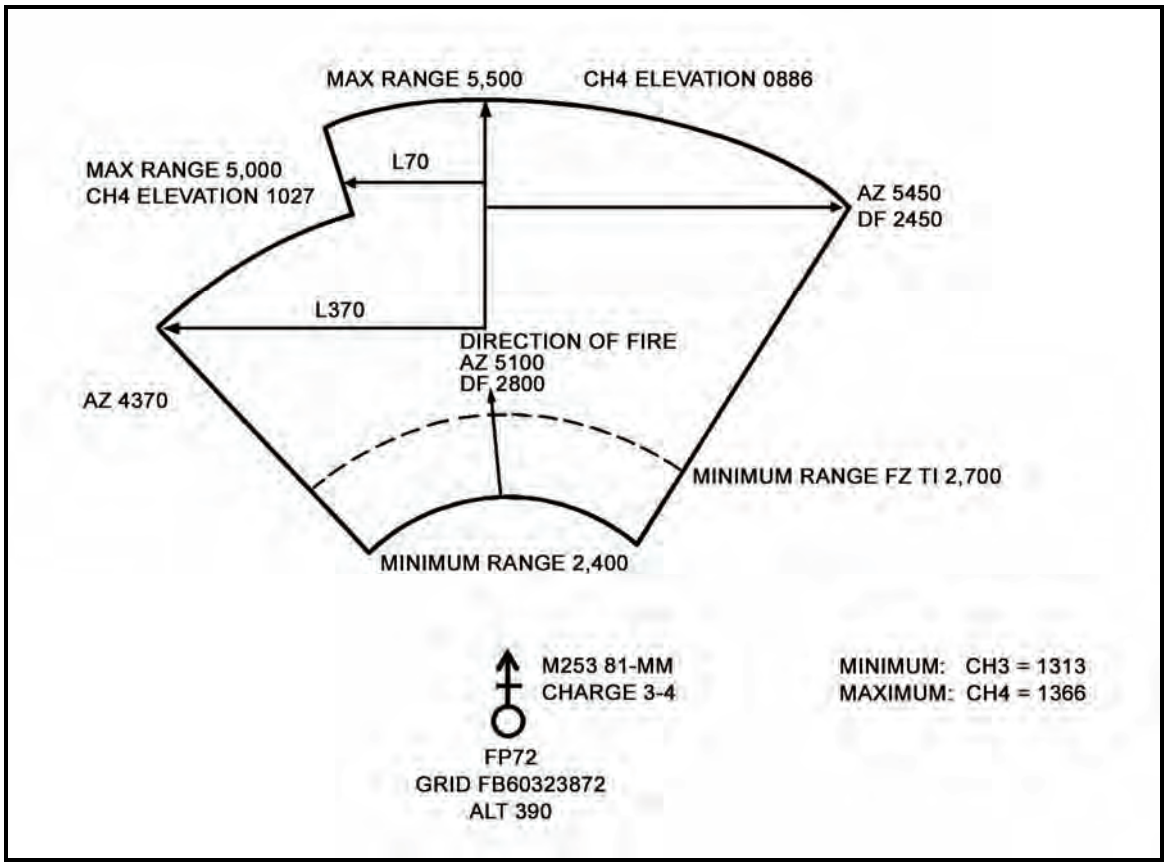


Figure C-3. Basic safety diagram.

C-12. Once the basic safety diagram is drawn, the FDC uses the tabular firing tables to determine the proper charges, elevations, and time settings. He then applies them to complete the diagram.

C-13. The safety T is a method of passing safety data on to the mortar squad leaders in a simplified form. The information needed by the squad leader is extracted from the completed safety diagram and placed on a 3- by 5-inch card or a similar form. Figure C-4 shows the safety T taken from the completed range safety diagram.

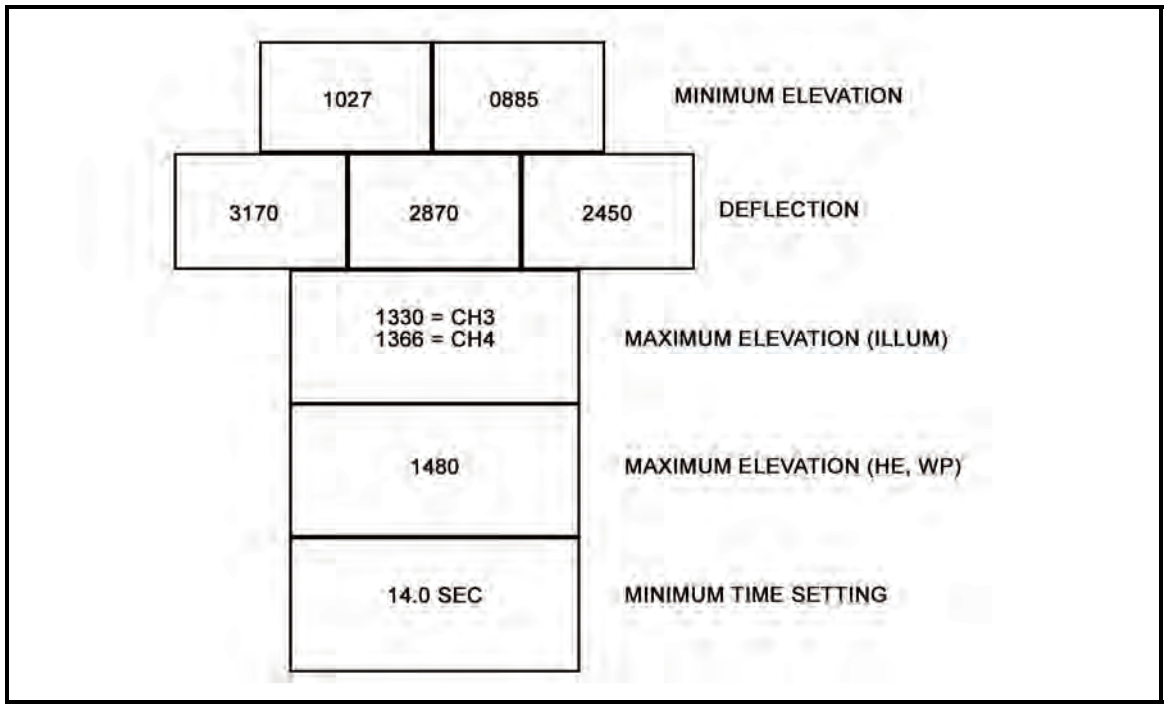


Figure C-4. Safety T.

Appendix D

Field-Expedient Survey Techniques

Surveyed locations may be provided by the artillery survey personnel. Normally, a map spot location to six-digit or eight-digit grid coordinates is estimated by the platoon supervisor that is the most qualified. With the "roving mortars" concept, new methods of position location are needed. Two such methods are described in this appendix. The mortar position should be constantly improved to include more accurate platoon center location.

GRAPHIC RESECTION

D-1. A graphic resection can be used to establish the coordinates of a point or to check the accuracy of a map spot. If the resection cannot be performed from platoon center, the platoon center coordinates can be estimated on the basis of the coordinates of the nearby resected point. The platoon may be required to locate its own roving gun (split section) and primary, alternate, or supplementary positions as accurately as possible. Often, the location of those positions can be determined by a simple map spot location. Whenever possible, a more accurate method of location should be used. Graphic resection is a simple method using the aiming circle, tracing paper, and a map. Follow these procedures:

(1) Identify three distant points that also appear on a map (Figure D-1).

(2) With an aiming circle, measure the azimuth to those points. Preferably, the angles between the points should be greater than 400 mils.

(3) On tracing paper, place a dot representing the aiming circle location.

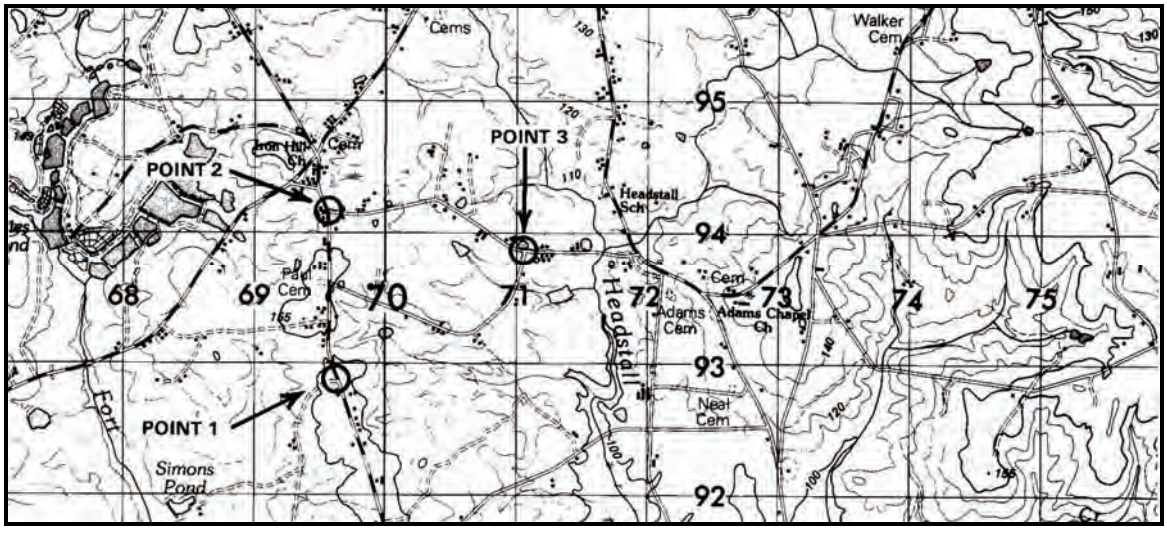


Figure D-1. Three distant points.

(4) Draw a line from this dot in any direction (Figure D-2).

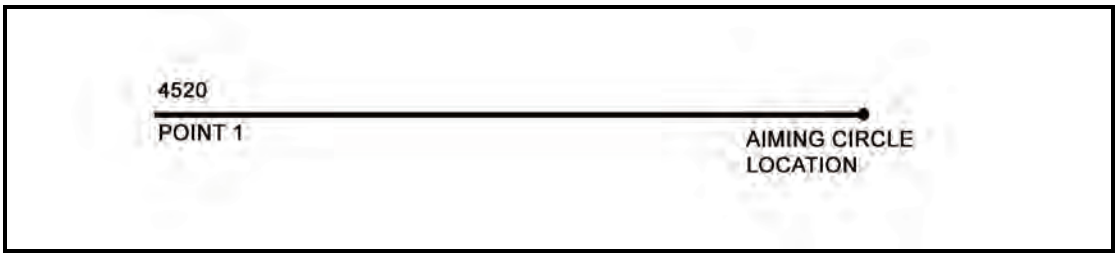


Figure D-2. Line drawn in any direction.

(5) With a protractor aligned with the correct azimuth on the line (Figure D-3), draw two lines from the dot on the measured azimuths (Figure D-4).

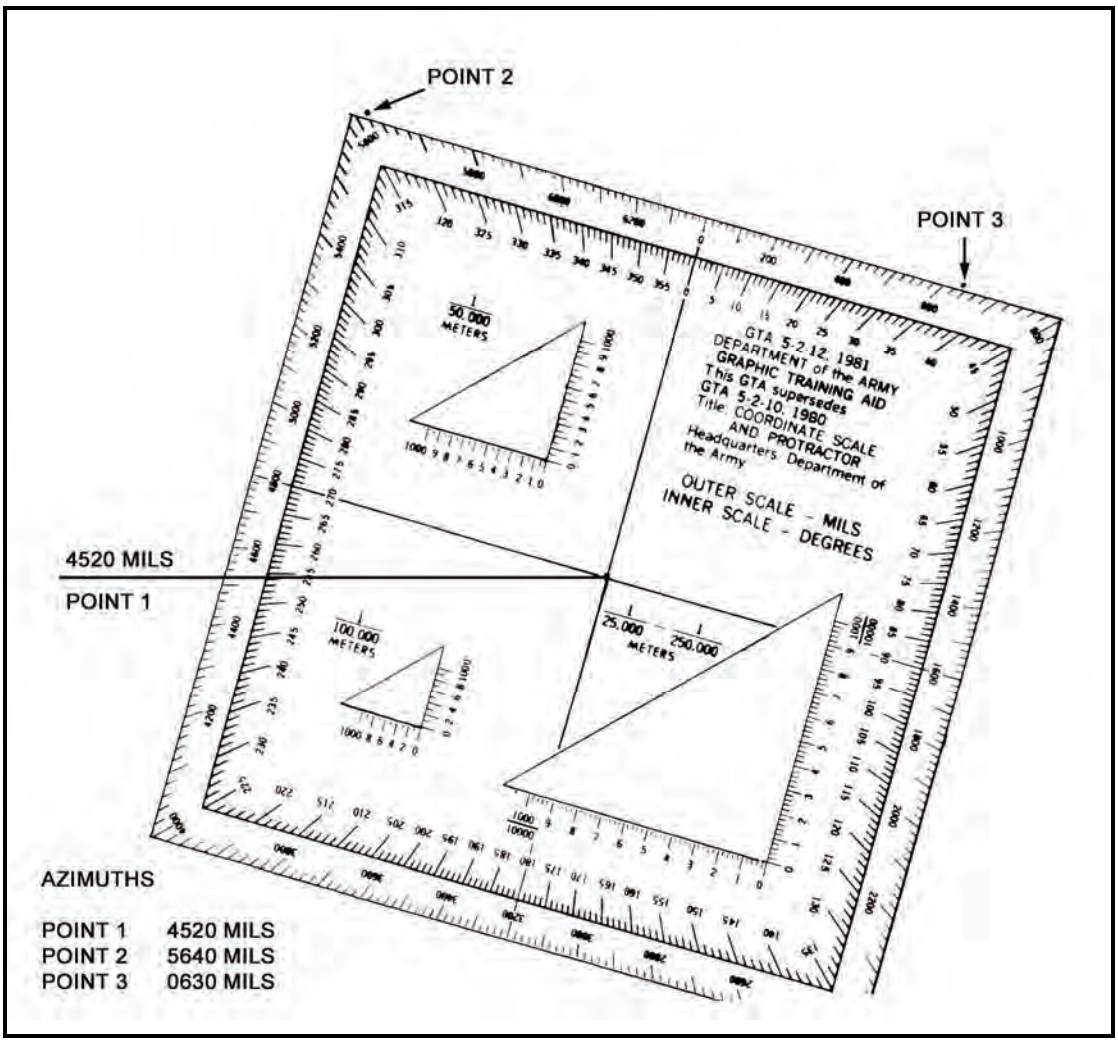


Figure D-3. Protractor aligned with correct azimuth.

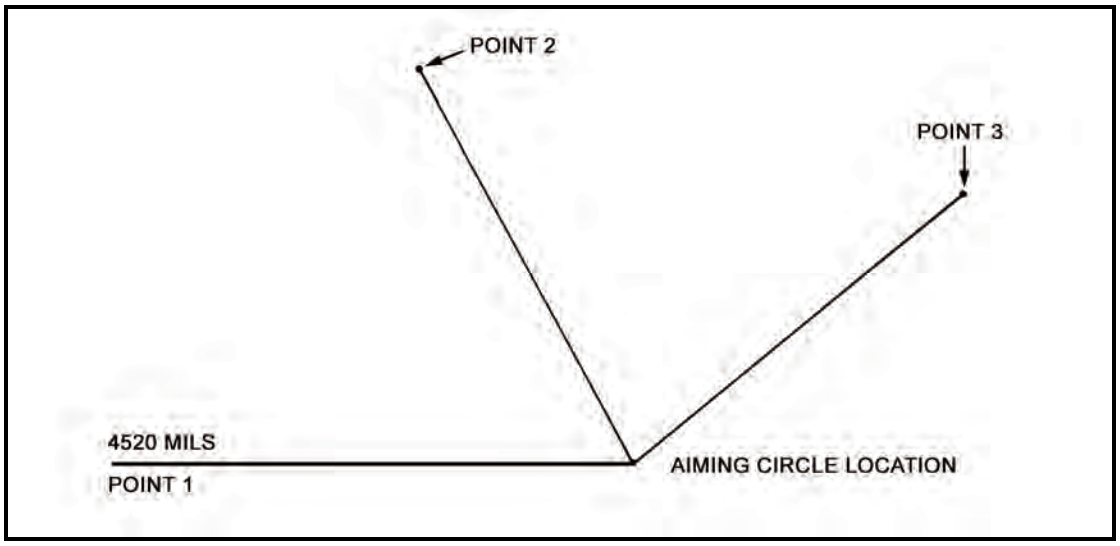


Figure D-4. Two more lines drawn from dot.

(6) Place the tracing paper over the map of the area and slide it around until it is positioned so that the three lines pass through their respective distant points (Figure D-5). The dot on the tracing paper represents the location of the aiming circle (mortar position) on the map.

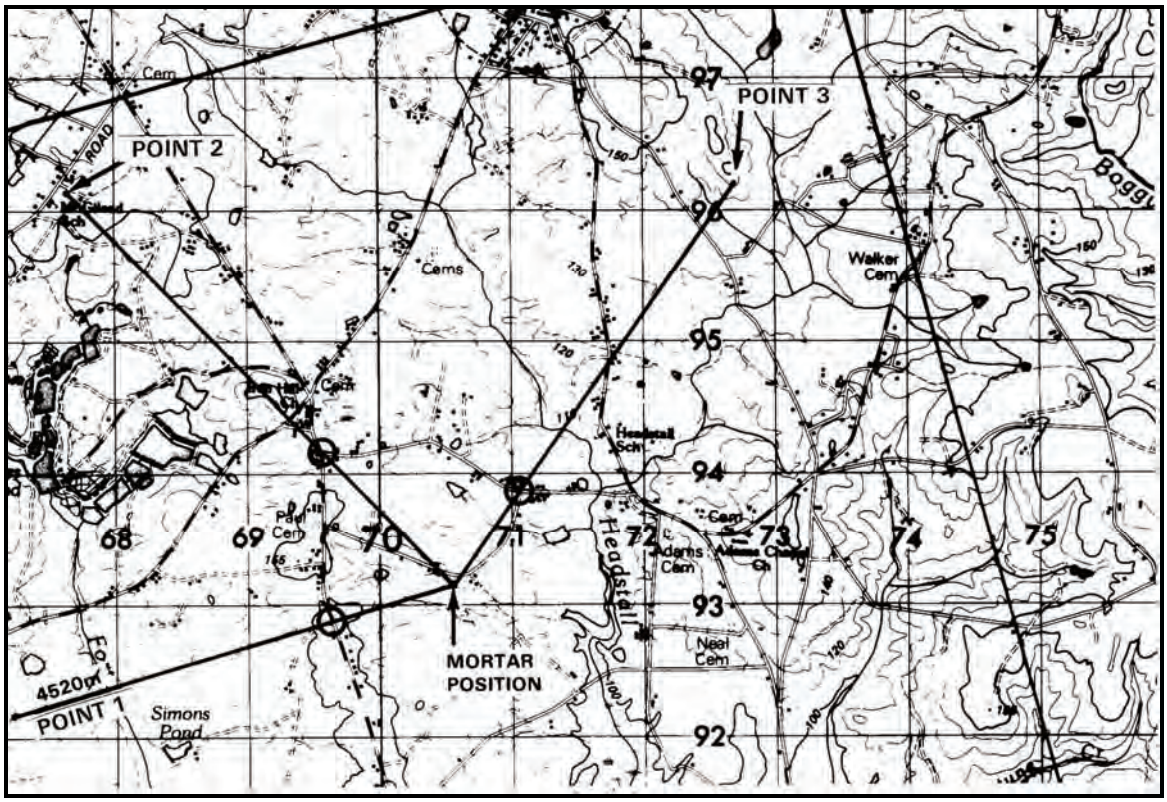


Figure D-5. Positioning of tracing paper.

(7) If the angles are plotted with a standard protractor (accurate to about 10 mils) and oriented over a 1:50,000 scale map, the resection should be accurate within 100 meters.

HASTY SURVEY

D-2. A terrain feature or man-made object is needed close to the desired mortar position for a hasty survey. This identifies the mortar position on a map by eight-digit grid coordinates. The hasty survey begins at this point, using the pivot point of the M16 plotting board to represent the selected known position (Figure D-6).

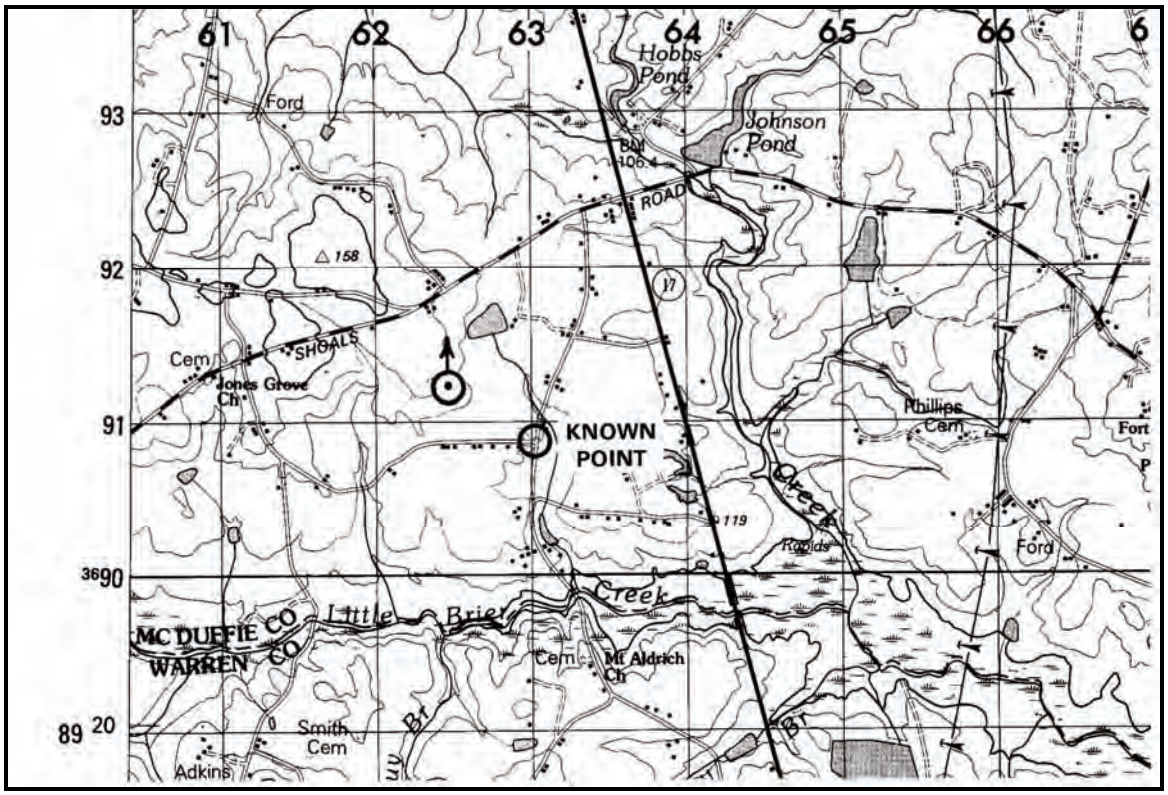


Figure D-6. Hasty survey.

(1) To begin the hasty survey, set the M2 aiming circle over the known point, level it, index the declination constant using the azimuth micrometer knob, and, with the nonrecording (lower) motion, orient the magnetic needle toward north. Now the grid azimuth can be measured.

(2) While the "circle" man is measuring the grid's azimuth, an assistant (the "post" man) moves toward the desired mortar position with the two aiming posts. Before moving, the "post" man will have joined the posts together and placed reflective or black tape strips exactly 2 meters apart on each post. Thus, the post becomes a subtense bar (Figure D-7).

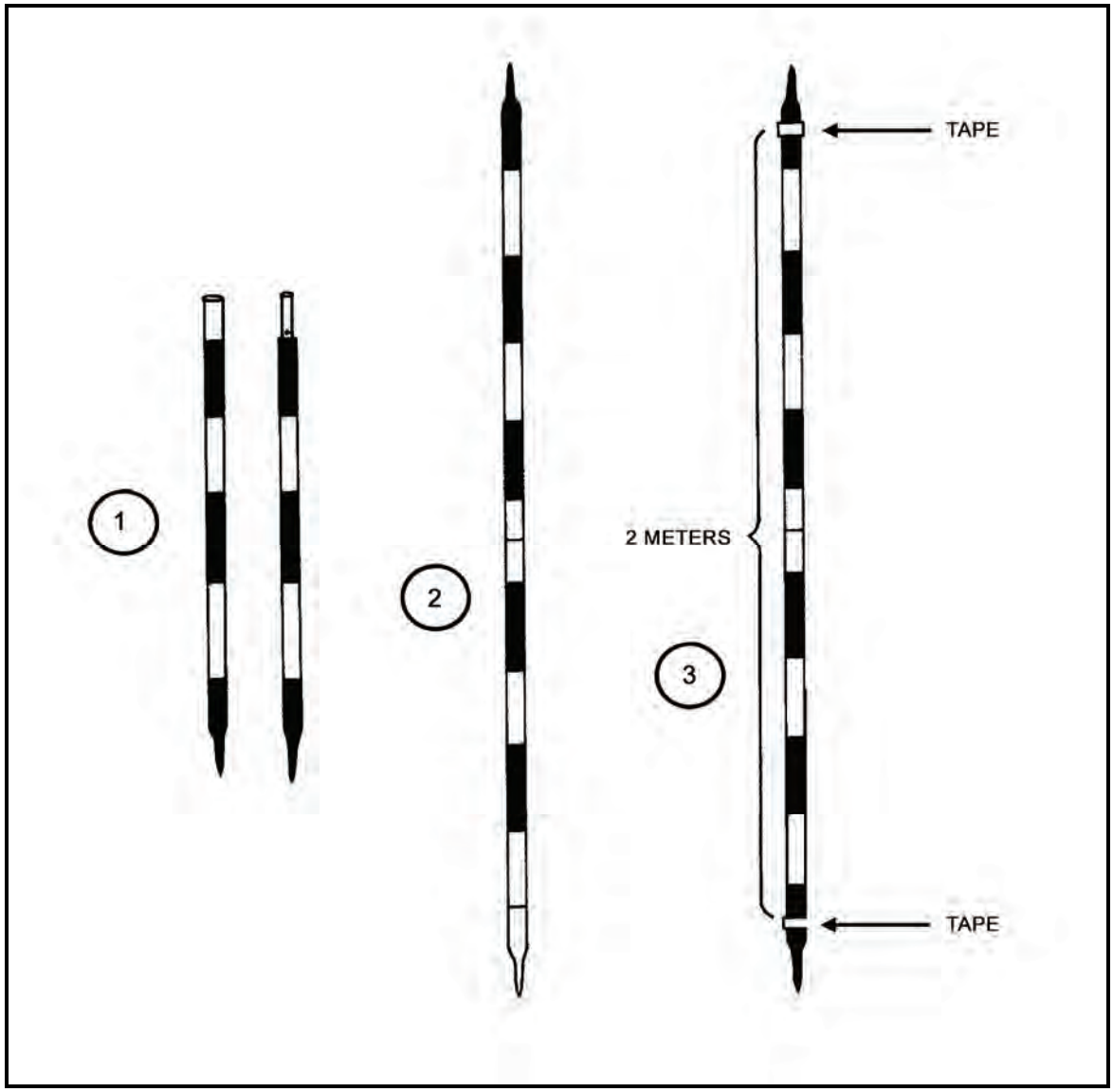


Figure D-7. Subtense bar.

(3) At this point, the first leg of the hasty survey can be done. The "circle" man directs the "post" man to move toward the desired mortar position until he is within 290 meters and to place the post into the ground. This point on the ground becomes traverse station 1 (TS-1).

(4) The "circle" man then rotates the azimuth motion (upper motion) until the vertical crossline in the telescope is on the center of the post. He records the azimuth to the post and labels it traverse leg 1 (TL-1) (Figure D-8).

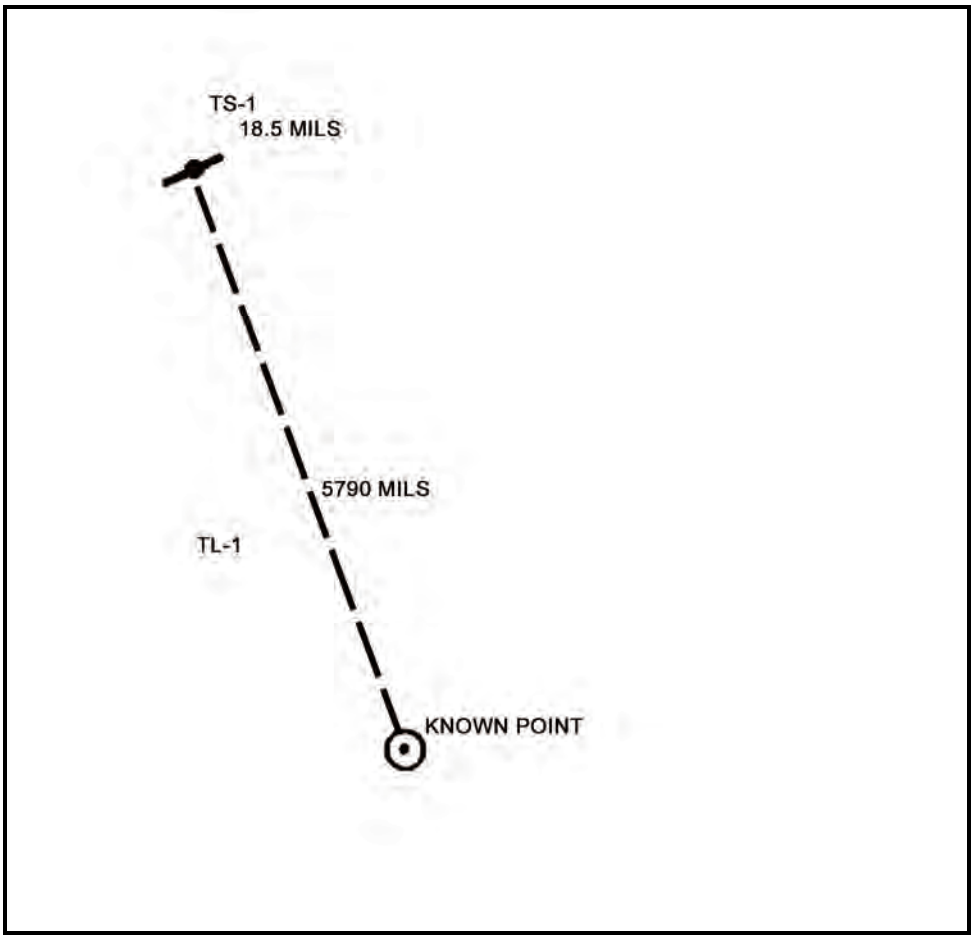


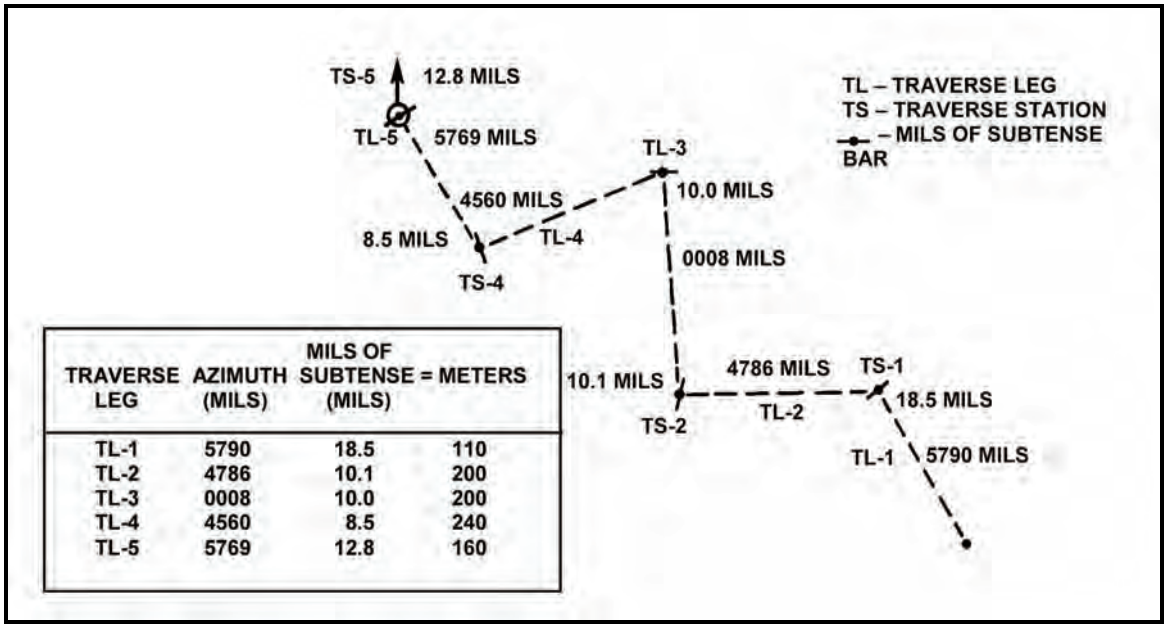
Figure D-8. Traverse leg 1.

(5) Next, the "post" man removes the post and holds it parallel to the ground, facing the aiming circle.

(6) The "circle" man measures the mil angle between the two strips of tape on the post (subtense bar) and records the mil reading along with the azimuth to TS-1 (Figure D-8).

(7) The post is then replaced into the ground and the "circle" man moves forward to this point and sets up the aiming circle directly over this point. This completes the first traverse leg.

(8) This procedure is repeated until the desired mortar position is reached. The information obtained may either be written down as an azimuth, a mil angle, and a traverse station, or a diagram may be constructed (Figure D-9). To avoid confusing others working with a hasty survey, any diagram should reflect the route of the various traverse legs and should be close to scale.



TRAVERSE LEG	AZIMUTH (MILS)	MILS OF SUBTENSE (MILS)	= METERS
TL-1	5790	18.5	110
TL-2	4786	10.1	200
TL-3	0008	10.0	200
TL-4	4560	8.5	240
TL-5	5769	12.8	160

Figure D-9. Construction of a diagram.

(9) The information recorded by the "circle" man goes to the FDC either as the traverse legs are made or after all the legs have been completed. The beginning known point is represented by the pivot point of the M16 plotting board.

(10) Starting at the pivot point, the data are applied on the board for each leg of the hasty survey. For example:

- The azimuth on the first traverse leg was 5790 mils. Index that information on the M16 plotting board.
- The distance between the two strips of tape on the aiming posts was 18.5 mils.
- Refer to the distance table (Figure D-10) for the 2-meter subtense bar width; a mil angle of 18.5 mils is equal to a distance of 110 meters. For the hasty survey, make one square on the plotting board equal to 25 meters.
- From the pivot point on the direction of 5790 mils, move 110 meters (4 2/5 squares) along the index line, place a dot, and circle it. This point, marked as TS-1, completes traverse leg 1.
- The azimuth for the second traverse leg was 4786 mils. Again, index this information on the plotting board.
- At TS-2, the mil angle measured for the 2-meter subtense bar width was 10.1 mils.
- Refer to the distance table for the 2-meter subtense bar width; 10.1 mils equals a distance of 200 meters.

Angle (mils)	Distance (meters)	Angle (mils)	Distance (meters)	Angle (mils)	Distance (meters)	Angle (mils)	Distance (meters)	Angle (mils)	Distance (meters)	Angle (mils)	Distance (meters)
7.0	291.03	14.0	145.51	21.0	97.01	28.0	72.75	35.0	58.20	42.0	48.50
.2	280.99	.2	142.96	.2	95.86	.2	72.11	.2	57.97	.2	48.21
.5	271.62	.5	140.49	.5	94.75	.5	71.48	.5	57.38	.5	47.93
.8	262.86	.8	137.65	.8	93.66	.8	70.85	.8	56.98	.8	47.65
8.0	254.65	15.0	135.81	22.0	92.60	29.0	70.24	36.0	56.58	43.0	47.37
.2	246.93	.2	133.58	.2	91.56	.2	69.64	.2	56.19	.2	47.10
.5	239.67	.5	131.42	.5	90.54	.5	69.05	.5	55.81	.5	46.82
.8	231.50	.8	129.34	.8	89.54	.8	68.47	.8	55.43	.8	46.56
9.0	226.35	16.0	127.32	23.0	88.57	30.0	67.90	37.0	55.05	44.0	46.29
.2	220.23	.2	125.36	.2	87.62	.2	67.34	.2	54.68	.2	46.08
.5	214.44	.5	123.46	.5	86.68	.5	66.79	.5	54.32	.5	45.77
.8	208.94	.8	121.62	.8	85.77	.8	66.24	.8	53.96	.8	45.47
10.0	203.72	17.0	119.83	24.0	84.88	31.0	65.71	38.0	53.60	45.0	45.26
.2	198.75	.2	118.09	.2	84.00	.2	65.18	.2	53.25		
.5	194.02	.5	116.41	.5	83.15	.5	64.67	.5	52.91		
.8	188.63	.8	114.77	.8	82.31	.8	64.16	.8	52.57		
11.0	185.20	18.0	113.17	25.0	81.48	32.0	63.66	39.0	52.23		
.2	181.08	.2	111.62	.2	80.68	.2	63.16	.2	51.90		
.5	177.14	.5	110.11	.5	79.89	.5	62.68	.5	51.57		
.8	173.38	.8	108.65	.8	79.11	.8	62.20	.8	51.24		
12.0	169.76	19.0	107.22	26.0	78.35	33.0	61.73	40.0	50.92		
.2	166.30	.2	105.82	.2	77.60	.2	61.26	.2	50.67		
.5	162.97	.5	104.47	.5	76.87	.5	60.81	.5	50.29		
.8	159.78	.8	103.15	.8	76.15	.8	60.36	.8	49.99		
13.0	156.70	20.0	101.86	27.0	75.45	34.0	59.91	41.0	49.68		
.2	153.75	.2	100.60	.2	74.75	.2	59.47	.2	49.38		
.5	150.90	.5	99.37	.5	74.07	.5	59.04	.5	49.08		
.8	148.16	.8	98.17	.8	73.41	.8	58.62	.8	48.79		
To be used with 2-meter subtense bar.											

Figure D-10. Distance table for a 2-meter subtense bar.

- With 4786 mils indexed on the plotting board, move up 200 meters from TS-1 along or parallel to a vertical line (eight squares), place a dot, and circle it.
- This point, marked TS-2, completes traverse leg 2. Repeat the same procedure for traverse legs 3, 4, and 5.
- Rotate the M16 plotting board until TS-5 (mortar position) is directly over the vertical centerline.
- Read the azimuth from the top of the plotting board; this is the direction from the known starting point to the base mortar squad's position.
- Count the number of squares along the index line between the pivot point and TS-5 (remember: each square equals 25 meters). This is the straight-line distance from the known starting point to the base mortar squad's position.
- If given data were properly applied in the example, a known starting point-base mortar squad azimuth should have been obtained of 5961 mils, and a known starting point-based mortar squad distance of 690 meters (+/-5 mils and 10 meters).
- Apply these data to the map. From the known starting point along the direction of 5961 mils, move 690 meters. The new point is the eight-digit grid coordinate for the base mortar squad's position.
- The FDC now establishes a modified-observed firing chart or, if the FO can find an eight-digit location in the target area, a surveyed firing chart.

Appendix E

Fire Direction Center Certification

FDC certification is required for all units with mortars and tests the proficiency of Soldiers to perform their duties as FDC computers and section sergeants. This appendix provides the commander with a means to verify that mortarmen are trained in FDC procedures. FDC certification tests all FDC personnel subject to certification on the M16/M19 plotting board and, depending on their equipment, either on the MBC, MFCS, or LHMBC. This appendix contains an example test for the units; units should develop their own test based on their METL. At a minimum, certification will cover the tasks listed for the primary FDC equipment, the MBC or the MFCS, and the M16/M19 plotting boards. Ninety percent of all section leaders, squad leaders, and FDC personnel will have passed the FDC exam within the past six months.

SECTION I. CONDUCT OF THE PROGRAM

The FDC certification program (FDCCP) consists of a hands-on and written test, in which commanders are responsible for the conduct and certification of the program. For the M16/M19 plotting board, MBC (both the M23 and the M31), MFCS, or LHMBC, participants prepare the equipment and, using the data provided, answer multiple-choice questions. Either component may be changed to conform to a particular mortar organization. Units with the MFCS or LHMBC take the same test on the plotting boards and must meet unit-based certification requirements that cover, as a minimum, the tasks listed in paragraphs E-7 through E-10 for the MFCS and those in paragraphs E-11 through E-14 for the LHMBC. An example of the written test, contained in this appendix, includes multiple choice questions (some of which use the Fort Benning Installation Map as a reference) for units to use as a guide in the development of their own test. The answer key is not included; units should develop their own key when they construct their test.

ELIGIBLE PERSONNEL

E-1. Soldiers should meet the following criteria to be evaluated for certification:

- FDC radiotelephone operation.
- FDC computer.
- Section sergeant.
- Squad leaders that perform FDC operations (CAV, BCT, and so on).

NOTE: All sergeants and the above personnel should be administered an FDC certification, but only personnel that perform FDC operations must certify for live-fire operations. A squad leader's failure to pass the FDC certification does not preclude his squad from firing if that squad operates under a controlling FDC.

QUALIFICATION

E-2. The FDCCP is designed to be a battalion-sponsored program that the battalion commander can use to certify FDC personnel. The goal is to certify all leaders under a standardized evaluation program.

E-3. Soldiers must receive a minimum score of 90 percent on the hands-on/written test for the M16/M19 plotting board and the MBC. Soldiers must be certified on all tasks listed for the MFCS in paragraphs E-7 through E-10 and those for the LHMBC in paragraphs E-11 through E-14. For example, the hands-

on/written test in Sections V and VI contains 20 questions on the M16/M19 plotting boards and 55 questions on the MBC; the student must correctly answer 18 and 50 questions respectively.

E-4. Soldiers may retest only once on any part of the test they have failed. Soldiers who fail the retest will not be certified and will be required to repeat the FDCCP during the next evaluation. Those who fail a second time should be considered for administrative action.

GENERAL RULES

E-5. The FDCCP should be conducted at regiment/brigade level. Battalions should provide scorers (staff sergeants and above) who are Infantry Mortar Leader's Course (IMLC)/11C or Maneuver Advanced Noncommissioned Officer Course (MANCOC) graduates. Considerable training value can be obtained by using a centralized evaluation and by obtaining the experience of several units' noncommissioned officers (NCOs). Conditions should be the same for all candidates during the certification. The examining board ensures that information obtained by a candidate during testing is not passed to another candidate.

SECTION II. CERTIFICATION

This section outlines the criteria used to test the candidate's ability to perform FDC tasks using the M16/M19 plotting boards, the MFCS, the LHMBC, and the MBC.

M16/M19 PLOTTING BOARD CERTIFICATION

E-6. The candidate analyzes the situation, and then selects the appropriate answer. A Fort Benning Installation Map 1:50,000, Edition 1-DMA, Series: V745Z is required for the example certification test. The certification consists of, but is not limited to, the following tasks:

- Prepare a plotting board for operation as an observed chart (pivot point).
- Prepare a plotting board for operation as an observed chart (below pivot point).
- Prepare a plotting board for operation as a modified-observed chart.
- Prepare a plotting board for operation as a surveyed chart.
- Process subsequent FO corrections on all charts.
- Determine data for sheaf adjustments.
- Determine data for registration, re-registration, and application of the corrections.
- Record information on DA Form 2399-R.
- Record MET data using DA Form 3675-R.
- Determine MET corrections using DA Form 2601-1-R and apply MET corrections.
- Locate and compute data for a grid mission.
- Locate and compute data for a polar plot mission.
- Locate and compute data for a shift from a known point mission.
- Compute data for open, converged, and special sheaves.
- Compute data for traversing fire.
- Compute data for searching fire (60-mm, 81-mm, and 120-mm mortars).
- Compute data for battlefield illumination.
- Compute data for a coordinated illumination/HE mission.
- Determine angle T.
- Prepare an FDC order (section sergeant).
- Locate an unknown point on a map or plotting board using intersection.
- Locate an unknown point on a map or plotting board using resection.

MORTAR FIRE CONTROL SYSTEM CERTIFICATION

E-7. This paragraph outlines the criteria used to test the candidate's ability to perform FDC tasks using the MFCS. The certification consists of, but is not limited to, the following tasks:

START AND INITIALIZE THE MORTAR FIRE CONTROL SYSTEM

E-8. Perform the following:

(1) Start up the MFCS on M577 and the M1064A4 carriers in the proper sequence.

(2) Initialize the data and configure the MFCS, which includes inputting and checking data on the following screens:

- Unit List.
- Configuration.
- Data.
- Geographical Reference.
- Position.
- Channel A.
- Channel B.

OPERATE THE MORTAR FIRE CONTROL SYSTEM

E-9. Conduct the following:

(1) Check the status of all guns assigned to the FDC, to include:

- Operational status.
- Location.

(2) Determine the overall status of the fire unit.

(3) Obtain information and update ammunition status, to include:

- Ammunition for each gun.
- Ammunition for all guns controlled by the FDC.
- Ammunition status manually updated.

(4) Obtain information and update MET data, to include:

- Accept and apply new MET data.
- Understand why MET data are highlighted due to exceeding MET trend limits.
- Manually enter or edit the new MET message.

(5) Identify targets or known points, to include:

- Designate a target after a fire mission.
- Manually enter a target or a known point.

(6) Enter and modify a safety fan.

(7) Initiate a check fire message.

(8) Send and receive a PTM.

(9) Respond to and correct alerts, to include—

- Information alerts.
- Reason for error alerts.
- Warning alerts.

CONDUCT FIRE MISSIONS

E-10. Conduct the following:

(1) Receive and transmit a digital fire mission.
(2) Receive, process, and transmit a manual fire mission.
(3) Enter, update, and store an RP.
(4) Process an illumination mission.
(5) Process a coordinated illumination mission.
(6) Initiate and process an FPF mission.
(7) Process a smoke mission.

LIGHTWEIGHT HANDHELD MORTAR BALLISTIC COMPUTER CERTIFICATION

E-11. This paragraph outlines the criteria used to test the candidate's ability to perform FDC tasks using the LHMBC. The certification consists of, but is not limited to, the following tasks:

START AND INITIALIZE THE LIGHTWEIGHT HANDHELD MORTAR BALLISTIC COMPUTER

E-12. Initialize the data and configure the LHMBC, which includes inputting and checking data on the following screens:

- Geographical Reference.
- Setup Data.
- Unit List.
- Setup Commo Parameters

OPERATE THE LIGHTWEIGHT HANDHELD MORTAR BALLISTIC COMPUTER

E-13. Conduct the following:

(1) Obtain information and update ammunition status for each gun.
(2) Obtain information and update MET data, to include:
   - Accepting and applying new MET data.
   - Understanding why MET data are highlighted (due to exceeding MET trend limits).
   - Manually entering or editing the new MET message.
(3) Identify targets or known points, to include:
   - Designating a target after a fire mission.
   - Manually entering a target or a known point.
(4) Enter and modify a safety fan.
(5) Initiate a check fire message.
(6) Send and receive a PTM.
(7) Respond to and correct alerts, to include:
   - Information alerts.
   - Reason for error alerts.
   - Warning alerts.

CONDUCT FIRE MISSIONS

E-14. Conduct the following:

(1) Receive and transmit a digital fire mission.
(2) Receive, process, and transmit a manual fire mission.
(3) Enter, update, and store an RP.
(4) Process an illumination mission.
(5) Process a coordinated illumination mission.
(6) Initiate and process an FPF mission.

MORTAR BALLISTIC COMPUTER CERTIFICATION

E-15. This paragraph outlines the criteria used to test the candidate's ability to perform FDC tasks using the M23 MBC. Units with the M31 MBC should modify this certification to conform to the capabilities of the M31. The certification consists of, but is not limited to, the following tasks:

- Prepare an MBC for operation (minimum initialization).
- Process subsequent FO corrections.
- Determine data for sheaf adjustments.
- Determine data for registration and re-registration.
- Record information on DA Form 2399-R.
- Record MET data using DA Form 2601-1-R or DA Form 2601-2-R.
- Determine MET corrections.
- Compute data for a grid mission.
- Compute data for a shift from a known point mission.
- Compute data for a polar plot mission.
- Compute data for open, converged, and special sheaves.
- Compute data for traversing fire.
- Compute data for searching fire (60-mm, 81-mm, and 120-mm mortars).
- Compute data for battlefield illumination.
- Compute data for a coordinated illumination/HE mission.
- Determine angle T.
- Prepare an FDC order (section sergeant).
- Locate an unknown point using intersection.
- Locate an unknown point using resection.

SECTION III. MORTAR BALLISTIC COMPUTER EXAMPLE TEST

The candidate analyzes the following situations, and then selects the appropriate answer. Figure E-1 shows a completed DA Form 2399-R for Situation A. This example was created using an M23 MBC; however, it may be used as a template to create FDCCP tests for the M31 MBC, M32 LHMBC, and the M95/M96 MFCS.

SITUATION A

The following takes place while operating the MBC.

TASK: Place the MBC into operation using internal or external power sources.
CONDITIONS: Given a BA 5588/U battery, power supply cable, MBC, and a variable power supply.
STANDARDS: Place the MBC into operation.

TASK: Operate the panel switches on the MBC.
CONDITIONS: Given an MBC.
STANDARDS: Operate the panel switches without error.

TASK: Perform the MBC system self-test.
CONDITIONS: Given an operating MBC.
STANDARDS: Perform the self-test without error and report any deficiencies, shortcomings, or failures to your supervisor.

TASK: Prepare an MBC with initialization data.
CONDITIONS: Given an MBC with setup, weapon, and ammunition data.
STANDARDS: Enter the setup, weapon, and ammunition data into the MBC without error.

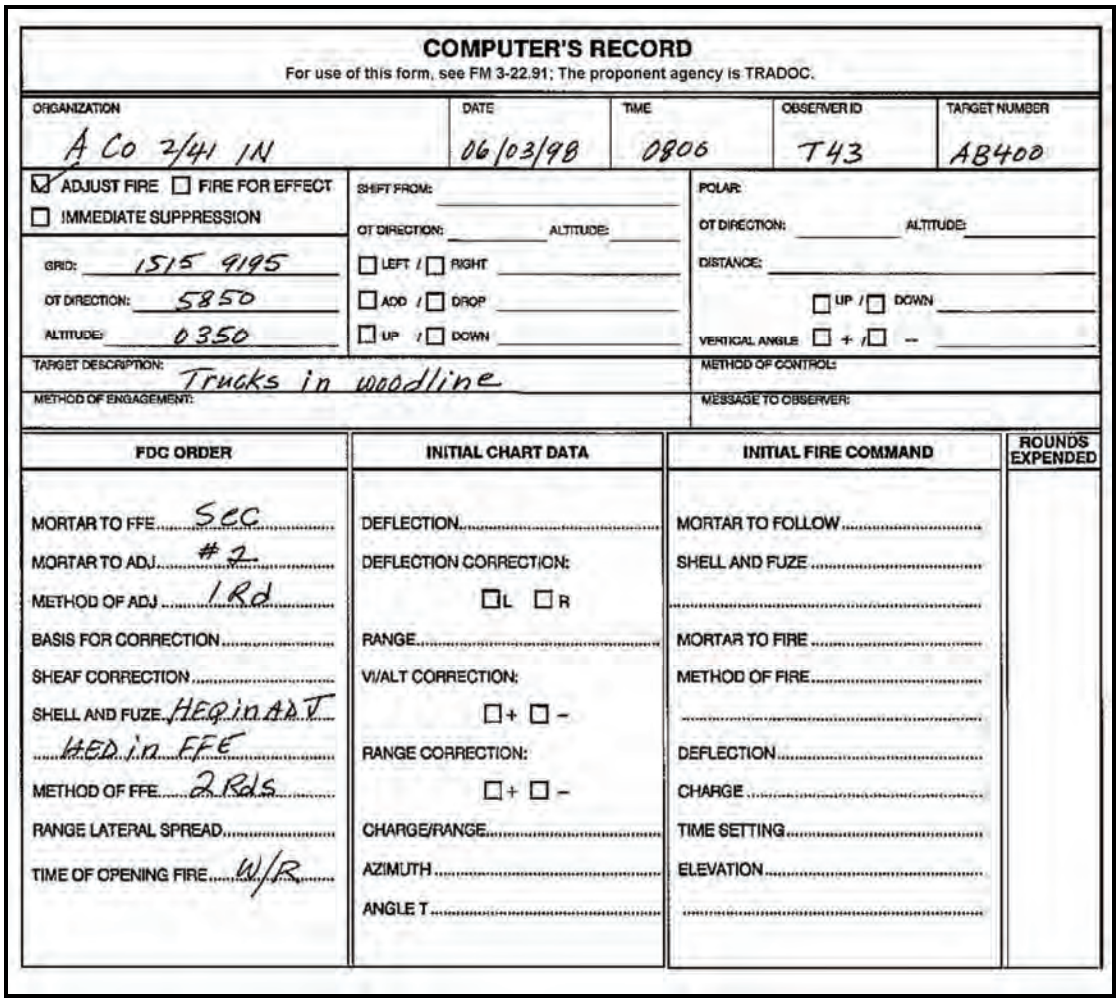
SETUP
- TIME OUT: 30
- TGT PREFIX: AB
- TN: 0400-0800
- ALARM: OFF
- MIN E: 010
- GD: E01
- LAT: +31
- LISTEN ONLY: OFF
- BIT RATE: 1200
- KEYTONE: 1.4
- BLK: SNG
- OWN ID: A

WEAPON DATA
- UNIT: A Co 2/41 IN
  81-mm (M252)
- CARRIER-MOUNTED:
NO
- BP: A2 GRID PA 15880
88950
- ALT 0410
- AZ: 6400 DEF: 2800
- A1: Dir 1600 Dis 035
- A3: Dir 4800 Dis 035
- A4: Dir 4800 Dis 070

AMMO DATA
- TEMP: 70 deg
- HE: M374A2
- WP: M375A2
- ILL: M301A3

TASK: Compute data for a grid mission.
CONDITIONS: Given an initialized MBC, CFF using grid coordinates as the method of target location, DA Form 2399-R, FDC order, and DA Form 2188-R.
STANDARDS: Compute data for the mission's initial fire command to within 1 mil for deflection and elevation.

TASK: Record information on firing records.
CONDITIONS: Given a DA Form 2399-R and DA Form 2188-R, CFF, FO's corrections, information to complete the FDC order, ammunition count, mortar platoon/ section SOP, and MBC.
STANDARDS: Record and compute the mission. Correctly complete all required blocks and spaces on the DA Form 2399-R. Record the information and data needed for the type of mortar and ammunition being fired at the end.



COMPUTER'S RECORD

For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
A Co 2/41 IN	06/03/98	0806	T43	AB400

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 1515 9195
OT DIRECTION: 5850
ALTITUDE: 0350

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

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

TARGET DESCRIPTION: Trucks in woodline
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: SEC	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ: #2	DEFLECTION CORRECTION:	SHELL AND FUZE:	
METHOD OF ADJ: 1 Rd	☐ L ☐ R		
BASIS FOR CORRECTION:	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION:	VI/ALT CORRECTION:	METHOD OF FIRE:	
SHELL AND FUZE: HEQ in ADJ	☐ + ☐ –		
HED in FFE	RANGE CORRECTION:	DEFLECTION:	
METHOD OF FFE: 2 Rds	☐ + ☐ –	CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
TIME OF OPENING FIRE: W/R	AZIMUTH:	ELEVATION:	
	ANGLE T:		

Figure E-1. Situation A (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

1. What is the initial range?
   (a) 3018
   (b) 2970
   (c) 3087
   (d) 3047

2. What is the correct initial fire command?

(a)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: SEC
SHELL AND FUZE: HED

MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd in ADJ
2 Rds HEQ in FFE
DEFLECTION: 3042
CHARGE: 6
TIME SETTING:
ELEVATION: 1039

(b)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: SEC
SHELL AND FUZE: HEQ

MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd in ADJ
2 Rds in FFE
DEFLECTION: 3042
CHARGE: 6
TIME SETTING:
ELEVATION: 1030

(c)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: SEC
SHELL AND FUZE: HEQ

MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd in ADJ
2 Rds HED in FFE
DEFLECTION: 3042
CHARGE: 6
TIME SETTING:
ELEVATION: 1019

(d)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: SEC
SHELL AND FUZE: HEQ

MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd in ADJ
2 Rds HED in FFE
DEFLECTION: 3042
CHARGE: 6
TIME SETTING:
ELEVATION: 1039

NOTE: The first round is fired, and the FO sends: RIGHT 100, DROP 100.

TASK: Compute data for subsequent FO corrections using the MBC.
CONDITIONS: Given an MBC with a mission already in progress and corrections from the FO.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation.

NOTE: That round is fired, and the FO sends: DROP 50, FFE.

3. What is the correct subsequent fire command for the FFE?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	SEC	2 HEQ	2994			1080
(b)	SEC	2 HED	2994			1056
(c)	SEC	2 HED	2994			1072
(d)	SEC	2 HED	2994			1064

NOTE: The FO sends: END OF MISSION (EOM), 4 TRUCKS DESTROYED, EST 6 CAS. The computer records: EOMRAT AB0400, KNPT 00.

SITUATION B

A fire mission is conducted using the CFF and FDC order in Figure E-2.

COMPUTER'S RECORD

For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			T43	

☐ ADJUST FIRE ☑ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID:
OT DIRECTION:
ALTITUDE:

SHIFT FROM: AB 0400
OT DIRECTION: 5590 ALTITUDE:
☑ LEFT / ☐ RIGHT 800
☐ ADD / ☑ DROP 200
☑ UP / ☐ DOWN 50

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

TARGET DESCRIPTION: Troops in woodline
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: SEC	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ:	DEFLECTION CORRECTION:	SHELL AND FUZE:	
METHOD OF ADJ:	☐ L ☐ R		
BASIS FOR CORRECTION:	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION:	W/ALT CORRECTION:	METHOD OF FIRE:	
SHELL AND FUZE: HED	☐ + ☐ –		
	RANGE CORRECTION:	DEFLECTION:	
METHOD OF FFE: 2 Rds	☐ + ☐ –	CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
TIME OF OPENING FIRE: W/R	AZIMUTH:	ELEVATION:	
	ANGLE T:		

Figure E-2. Call for fire and FDC order (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

TASK: Compute data for a shift from a known point mission.
CONDITIONS: Continued from Situation A.
STANDARDS: Compute data for the mission to within 1 mil for deflection and elevation.

4. What is the correct initial fire command?

(a)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HED
MORTAR TO FIRE:
METHOD OF FIRE: 2 Rds
DEFLECTION: 3226
CHARGE: 5
TIME SETTING:
ELEVATION: 0905

(b)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HED
MORTAR TO FIRE:
METHOD OF FIRE: 2 Rds
DEFLECTION: 3226
CHARGE: 4
TIME SETTING:
ELEVATION: 0905

(c)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HED
MORTAR TO FIRE: #2
METHOD OF FIRE: 2 Rds
DEFLECTION: 3226
CHARGE: 4
TIME SETTING:
ELEVATION: 0953

(d)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HED
MORTAR TO FIRE:
METHOD OF FIRE: 2 Rds
DEFLECTION: 2842
CHARGE: 7
TIME SETTING:
ELEVATION: 0980

NOTE: The FO sends: EOM, EST 30 PERCENT CAS. The computer records: EOMRAT AB 0401, KNPT 01.

SITUATION C

The FO calls in a polar plot mission. His location must be determined before the polar plot mission can be computed. (Figure E-3 shows a completed DA Form 2399-R for Situation C.)

TASK: Determine an unknown location by using resection (SURV key).
CONDITIONS: Continued from Situation B.
STANDARDS: Determine the unknown location as a grid coordinate to within 1 meter and record it as an FO location.

NOTE: The FO's call sign is T43. T43 sees KNPT 00 at a direction of 5850 and KNPT 01 at a direction of 5590.

TASK: Compute firing data for a polar plot mission.
CONDITIONS: Continued from above and using the CFF and FDC order in Figure E-3.
STANDARDS: Compute the firing data for the mission to within 1 mil for deflection and elevation.

COMPUTER'S RECORD

For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			T43	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID:
OT DIRECTION:
ALTITUDE:

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

POLAR:
OT DIRECTION: 6240 ALTITUDE:
DISTANCE: 1800
☐ UP / ☐ DOWN
VERTICAL ANGLE ☐ + / ☐ –

TARGET DESCRIPTION: POL Point
METHOD OF ENGAGEMENT: WP in FFE
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ: #2	DEFLECTION CORRECTION:	SHELL AND FUZE:	
METHOD OF ADJ: LRd	☐L ☐R		
BASIS FOR CORRECTION:	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION:	VI/ALT CORRECTION:	METHOD OF FIRE:	
SHELL AND FUZE: HEQ in ADJ	☐+ ☐–		
WP + HEQ in FFE	RANGE CORRECTION:	DEFLECTION:	
METHOD OF FFE: 3 WP 3 HEQ	☐+ ☐–	CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
TIME OF OPENING FIRE: W/R	AZIMUTH:	ELEVATION:	
	ANGLE T:		

Figure E-3. Situation C (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

NOTE: The initial round is fired, and the FO sends LEFT 100.

TASK: Compute data for subsequent FO corrections using the MBC.
CONDITIONS: Given an MBC with a mission already in progress and corrections from the FO to apply.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation.

NOTE: The round is fired and the FO sends: LEFT 50, ADD 50, FFE.

TASK: Compute data for subsequent FO corrections using the MBC.
CONDITIONS: Given an MBC with a mission already in progress and corrections from the FO to apply.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation.

5. What is the correct subsequent fire command for the FFE?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	SEC	3 HEQ 3 WP	2470			1092
(b)	SEC	3 HEQ 3 WP	2491			1131
(c)	SEC	3 HEQ 3 WP	2470			1092
(d)	SEC	3 HEQ 3 WP	2491			1088

NOTE: The FO calls back: EOM, POL POINT BURNING. The computer records: EOMRAT ABO402, KNPT 02.

---

6. What is the FO's grid location?
   (a) 16743 89354
   (b) 16843 89254
   (c) 16943 89154
   (d) 16154 89943

NOTE: Clear the computer before starting Situation D.

SITUATION D

Your platoon has moved to a firing range.

SETUP
TIME OUT: 30
TGT PREFIX: AA
TN: 0200-0600
ALARM: OFF
MIN E: 003
MIN N: 089
GD: E01
LAT: +31
LISTEN ONLY: OFF
BIT RATE: 1200
KEYTONE: 1.4
BLK: SNG
OWN ID: A

WEAPON DATA
UNIT: A Co 2/41 IN
81-mm (M252)
CARRIER-MOUNTED: NO
BP: A2 GRID AP 07550 93650
ALT: 0460
AZ: 1600 DEF: 2800
A1: Dir 3200 Dis 035
A3: Dir 6400 Dis 035
A4: Dir 6400 Dis 070

AMMO DATA
TEMP: 70 deg
HE: M374A2
WP: M375A2
ILL: M301A3

FO LOCATION
W13 AP: 08250 92550
ALT: 0500

TASK: Prepare an MBC with initialization data.
CONDITIONS: Given an MBC with setup, weapon, ammunition, and FO location data.
STANDARDS: Enter the setup, weapon, and ammunition data into the MBC without error.

TASK: Store safety data in the MBC.
CONDITIONS: Continuation of situation D and safety diagram data.
STANDARDS: Store the safety diagram data without error.

LLAZ: 1200
RLAZ: 2000
MAX RN: 4000
MIN RN: 0350
MIN CHG: 1
MAX CHG: 8

TASK: Store MET data and update to the current file in the MBC.
CONDITIONS: Given an initialized MBC and a completed DA Form 3677-R (Figure E-4).
STANDARDS: Enter MET data in the MBC without error.

COMPUTER MET MESSAGE

For use of this form, see FM 3-09.15; the proponent agency is TRADOC.

IDENTIFICATION	OCTANT	LOCATION $L_aL_aL_a$ or xxx	LOCATION $L_oL_oL_o$ or xxx	DATE	TIME (GMT)	DURATION (HOURS)	STATION HEIGHT (10's M)	MDP PRESSURE MB
METCM	Q			YY	$G_dG_dG_o$	G	hhh	$P_dP_dP_d$
METCM	1	145	925	09	100	0	017	002

ZONE HEIGHTS METERS	LINE NUMBER	ZONE VALUES: WIND DIRECTION (10s M)	WIND SPEED (KNOTS)	TEMPERATURE (1/10°K)	PRESSURE (MILLIBARS)
	ZZ	ddd	FFF	TTTT	PPPP
SURFACE	00	221	002	2947	1002
200	01	202	007	2976	0991
500	02	220	014	3011	0963
1000	03	190	008	2978	0919
1500	04	000	000	2939	0872
2000	05	063	015	2933	0821
2500	06	052	019	2918	0772
3000	07	058	025	2899	0729
3500	08	064	028	2864	0689
4000	09				
4500	10				
5000	11				
6000	12				
7000	13				
8000	14				
9000	15				
10000	16				
11000	17				
12000	18				
13000	19				
14000	20				
15000	21				
16000	22				
17000	23				
18000	24				
19000	25				
20000	26				

FROM / TO	DATE AND TIME (GMT)	DATE AND TIME (LST)
MESSAGE NUMBER	RECORDER	CHECKED

DA FORM 3677-R, MAY 92 PREVIOUS EDITIONS ARE OBSOLETE APD V1.01

Figure E-4. Situation D: first mission (an example of completed DA Form 3677-R [Computer MET Message]).

TASK: Store MET data and update to the current file in the MBC.
CONDITIONS: Given an initialized MBC and a completed DA Form 3677-R (Figure E-4).
STANDARDS: Enter MET data in the MBC without error.

COMPUTER'S RECORD
For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			W13	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 1085 9365
OT DIRECTION: 1200
ALTITUDE: 0400

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

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

TARGET DESCRIPTION: RP
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER: Prepare to REG RP00

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ: #2	DEFLECTION CORRECTION:	SHELL AND FUZE:	
METHOD OF ADJ: 1 Rd	☐ L ☐ R		
BASIS FOR CORRECTION: CMET	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION:	VI/ALT CORRECTION:	METHOD OF FIRE:	
SHELL AND FUZE: HE Q	☐ + ☐ –		
	RANGE CORRECTION:	DEFLECTION:	
METHOD OF FFE:	☐ + ☐ –	CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
	AZIMUTH:	ELEVATION:	
	ANGLE T:		

Figure E-5. Situation D: second mission (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

7. What is the correct initial fire command?

(a)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ
MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd
2 Rds in FFE
DEFLECTION: 2800
CHARGE: 6
TIME SETTING:
ELEVATION: 0936

(b)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ
MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd
DEFLECTION: 2800
CHARGE: 6
TIME SETTING:
ELEVATION: 0965

(c)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ
MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd
DEFLECTION: 2800
CHARGE: 6
TIME SETTING:
ELEVATION: 0936

(d)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ
MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd
2 Rds in FFE
DEFLECTION: 2801
CHARGE: 6
TIME SETTING:
ELEVATION: 0965

8. What is the angle T?
   (a) 0450 mils
   (b) 0500 mils
   (c) 0400 mils
   (d) 0300 mils

NOTE: The FO sends: LEFT 100, ADD 150.

9. What is the correct elevation?
   (a) 1069 mils
   (b) 1042 mils
   (c) 0961 mils
   (d) 1061 mils

NOTES: 1. The FO sends: RIGHT 50, ADD 50.

2. That round is fired, and the FO sends: DROP 25, EOM, REGISTRATION COMPLETE.

10. What is the RCF?
    (a) +44
    (b) -51
    (c) +51
    (d) -44

11. What is the DEFK?
    (a) R33
    (b) R36
    (c) L36
    (d) L33

TASK: Compute data for sheaf adjustment.
CONDITIONS: Given an initialized MBC, completed registration mission, DA Form 2399-R, and corrections from the FO for the adjustment of the remainder of the section.
STANDARDS: Adjust the sheaf and determine the sheaf data to within 1 mil for deflection and elevation.

NOTE: The FDC sends an MTO, "Prepare to adjust sheaf," and the FO replies, "Section right."

12. What is the correct subsequent command?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	Sec	1 Rd S/R #2 DNF	2840	7		1023
(b)	Sec	1 Rd S/R #2 DNF	2837			1030
(c)	Sec	S/R	2840	7		1023
(d)	Sec	S/R	2838			1050

NOTE: The FO calls back: NUMBER 1 GUN RIGHT 60; NUMBER 3 GUN LEFT 20; NUMBER 4 ADJUSTED.

13. What are the correct subsequent commands?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	#1	DNF	1) 2823			
			3) 2845			1017
(b)	#3		2845			
	#1		2823			1017
(c)	#3	DNF	2872			
	#1		2851			1001
(d)	#1		2821			1024
	#3	DNF	2842			

NOTE: The FO spots the last round and sends: EOM, SHEAF ADJUSTED. The computer records as: EOMRAT AA0200, KNPT 00.

SITUATION E

While the section is referring and realigning their aiming posts, the section leader hands you a CFF.

TASK: Compute data for a shift from a known point mission.
CONDITIONS: Continue from Situation D using the CFF in Figure E-6.
STANDARDS: Compute data for the mission to within 1 mil for deflection and elevation.

TASK: Record all information on firing records.
CONDITIONS: Given a DA Form 2399-R and DA Form 2188-R, CFF, FO's corrections, information to complete the FDC order, ammunition count, mortar platoon/section SOP, and MBC.
STANDARDS: Record and compute the mission. Correctly complete all required blocks and spaces on the DA Form 2399-R. Record the information and data needed for the type of mortar and ammunition being fired at the end. Complete the DA Form 2188-R.

COMPUTER'S RECORD

For use of this form , see FM 3-22.91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			W 13	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID:
OT DIRECTION:
ALTITUDE:

SHIFT FROM: RP00
OT DIRECTION: 1400 ALTITUDE:
☐ LEFT / ☑ RIGHT 500
☐ ADD / ☑ DROP 200
☐ UP / ☑ DOWN 50

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

TARGET DESCRIPTION: TROOPS IN BUNKER
METHOD OF CONTROL:
METHOD OF ENGAGEMENT:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: SEC	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ: # 2	DEFLECTION CORRECTION:	SHELL AND FUZE:	
METHOD OF ADJ: 1 Rd	☐L ☐R		
BASIS FOR CORRECTION: RP00/CHET	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION: C.VG #2	VI/ALT CORRECTION:	METHOD OF FIRE:	
SHELL AND FUZE: HEQ IN ADJ	☐+ ☐ –		
HED IN FFE	RANGE CORRECTION:	DEFLECTION:	
METHOD OF FFE: 3 Rds	☐+ ☐ –	CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
TIME OF OPENING FIRE: W/R	AZIMUTH:	ELEVATION:	
	ANGLE T:		

Figure E-6. Situation E (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

14. What is the correct initial fire command?

(a)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: SEC
SHELL AND FUZE: HEQ
MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd in ADJ
3 Rds HED in FFE
DEFLECTION: 2572
CHARGE: 6
TIME SETTING:
ELEVATION: 1071

(b)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: SEC
SHELL AND FUZE: HED
MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd
DEFLECTION: 2674
CHARGE: 7
TIME SETTING:
ELEVATION: 1047

(c)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: SEC
SHELL AND FUZE: HEQ
MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd in ADJ
3 Rds HED in FFE
DEFLECTION: 2671
CHARGE: 7
TIME SETTING:
ELEVATION: 1054

(d)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: SEC
SHELL AND FUZE: HEQ
MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd in ADJ
3 Rds HED in FFE
DEFLECTION: 2674
CHARGE: 7
TIME SETTING:
ELEVATION: 1047

TASK: Compute data for subsequent FO corrections using the MBC.
CONDITIONS: Given an MBC with a mission already in progress and corrections from the FO to apply.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation.

NOTE: The FO spots the first round and sends: ADD 100. That round is fired, and the FO sends: RIGHT 50, ADD 50, FFE.

TASK: Compute data for a converged sheaf.
CONDITIONS: Given an initialized MBC using a grid coordinate as the method of target location, DA Form 2399-R, and DA Form 2188-R.
STANDARDS: Compute the firing data for the initial and subsequent fire commands to within 1 mil for deflection and elevation.

15. What is the correct subsequent fire command for the FFE?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	SEC	3 HED	1) 2662			
			2) 2672			
			3) 2682			
			4) 2692			1030
(b)	SEC	3 HED	1) 2681			1009
			2) 2671			1008
			3) 2661			1006
			4) 2651			1005
(c)			1) 2684			1002
			2) 2674			1000
			3) 2664			0999
			4) 2654			0997
(d)			1) 2674			1000
			2) 2664			0999
			3) 2654			0998
			4) 2644			0998

NOTE: The FO sends: EOM. BUNKER DESTROYED, EST 50 PERCENT CAS EOMRAT AA0201, KNPT 01.

SITUATION F

The FO calls in a new mission.

TASK: Compute data for a grid mission using the CFF and FDC order in Figure E-7.
CONDITIONS: Given an initialized MBC, CFF using grid coordinates as the method of target location, DA Form 2399-R, and DA Form 2188-R.
STANDARDS: Compute data for the mission's initial fire command to within 1 mil for deflection and elevation.

COMPUTER'S RECORD

For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			W13	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 1015 9305
OT DIRECTION: 1320
ALTITUDE: 380

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

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

TARGET DESCRIPTION: Foot Bridge 100M ATT 6350
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec MORTAR TO ADJ: #2 METHOD OF ADJ: 1 Rd BASIS FOR CORRECTION: SHEAF CORRECTION: SPECIAL 100 M WD SHELL AND FUZE: HEQ METHOD OF FFE: 3 Rds RANGE LATERAL SPREAD: TIME OF OPENING FIRE: W/R	DEFLECTION: DEFLECTION CORRECTION: ☐L ☐R RANGE: VI/ALT CORRECTION: ☐+ ☐ – RANGE CORRECTION: ☐+ ☐ – CHARGE/RANGE: AZIMUTH: ANGLE T:	MORTAR TO FOLLOW: SHELL AND FUZE: MORTAR TO FIRE: METHOD OF FIRE: DEFLECTION: CHARGE: TIME SETTING: ELEVATION:	

Figure E-7. Situation F (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

NOTE: The initial round is fired, and the FO sends: RIGHT 100, ADD 100.

16. What is the correct subsequent command?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)			2586			0912
(b)			2584			0965
(c)			2686			0941
(d)			2694			1072

NOTE: The FO spots the round and sends: ADD 50, FFE.

TASK: Compute data for a special sheaf using the CFF and FDC order in Figure E-7.
CONDITIONS: Given an MBC with a mission already in progress.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation, and determine turns to the nearest one-half turn.

17. What is the correct subsequent command for the FFE?

SUBSEQUENT COMMANDS

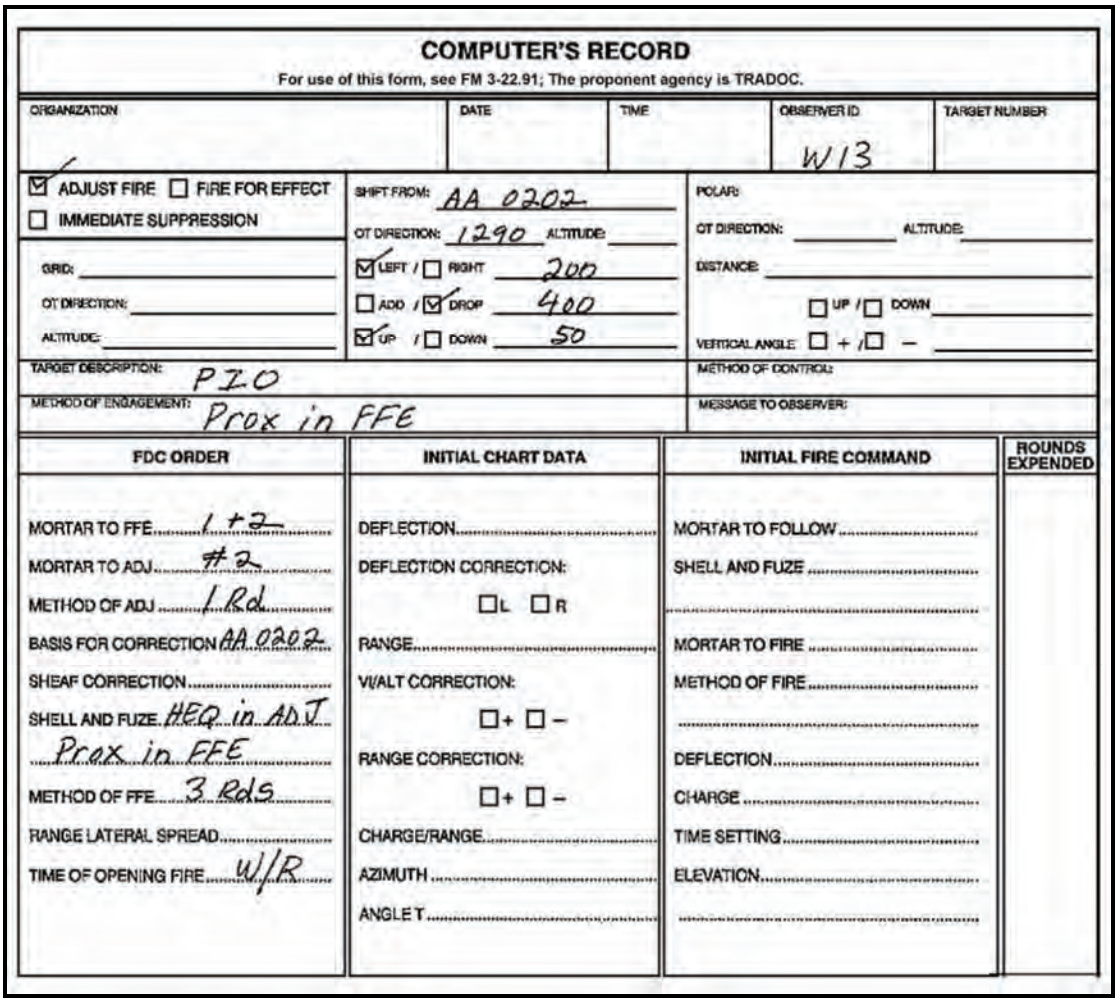
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	Sec	3Rds	1) 2599	6		1086
			2) 2594			1086
			3) 2605			1080
			4) 2710			1080
(b)	Sec	3Rds	1) 2602	6		1056
			2) 2595			1061
			3) 2589			1065
			4) 2582			1069
(c)	Sec	3Rds	1) 2613	5		1060
			2) 2601			1059
			3) 2589			1056
			4) 2576			1053
(d)	Sec	3Rds	1) 2578			1087
			2) 2569			1072
			3) 2561			1060
			4) 2553			1053

NOTE: The FO sends: EOM, BRIDGE DESTROYED, EOMRAT AA0202, KNPT 02.

SITUATION G

W13 sends in the fire request in Figure E-8.

TASK: Record information on firing records.
CONDITIONS: Given a DA Form 2399-R and DA Form 2188-R, CFF, FO's corrections, information to complete the FDC order, ammunition count, mortar platoon/ section SOP, and MBC.
STANDARDS: Record and compute the mission. Correctly complete all required blocks and spaces on the DA Form 2399-R. Record the information and data needed for the type of mortar and ammunition being fired at the end. Complete the DA Form 2188-R.



COMPUTER'S RECORD

For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			W13	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID:
DT DIRECTION:
ALTITUDE:

SHIFT FROM: AA 0202
DT DIRECTION: 1290 ALTITUDE:
☑ LEFT / ☐ RIGHT 200
☐ ADD / ☑ DROP 400
☑ UP / ☐ DOWN 50

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

TARGET DESCRIPTION: PIO
METHOD OF ENGAGEMENT: Prox in FFE
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE 1+2	DEFLECTION	MORTAR TO FOLLOW	
MORTAR TO ADJ #2	DEFLECTION CORRECTION:	SHELL AND FUZE	
METHOD OF ADJ 1 Rd	☐L ☐R		
BASIS FOR CORRECTION AA 0202	RANGE	MORTAR TO FIRE	
SHEAF CORRECTION	VI/ALT CORRECTION:	METHOD OF FIRE	
SHELL AND FUZE HEQ in ADJ	☐+ ☐–		
Prox in FFE	RANGE CORRECTION:	DEFLECTION	
METHOD OF FFE 3 Rds	☐+ ☐–	CHARGE	
RANGE LATERAL SPREAD	CHARGE/RANGE	TIME SETTING	
TIME OF OPENING FIRE W/R	AZIMUTH	ELEVATION	
	ANGLE T		

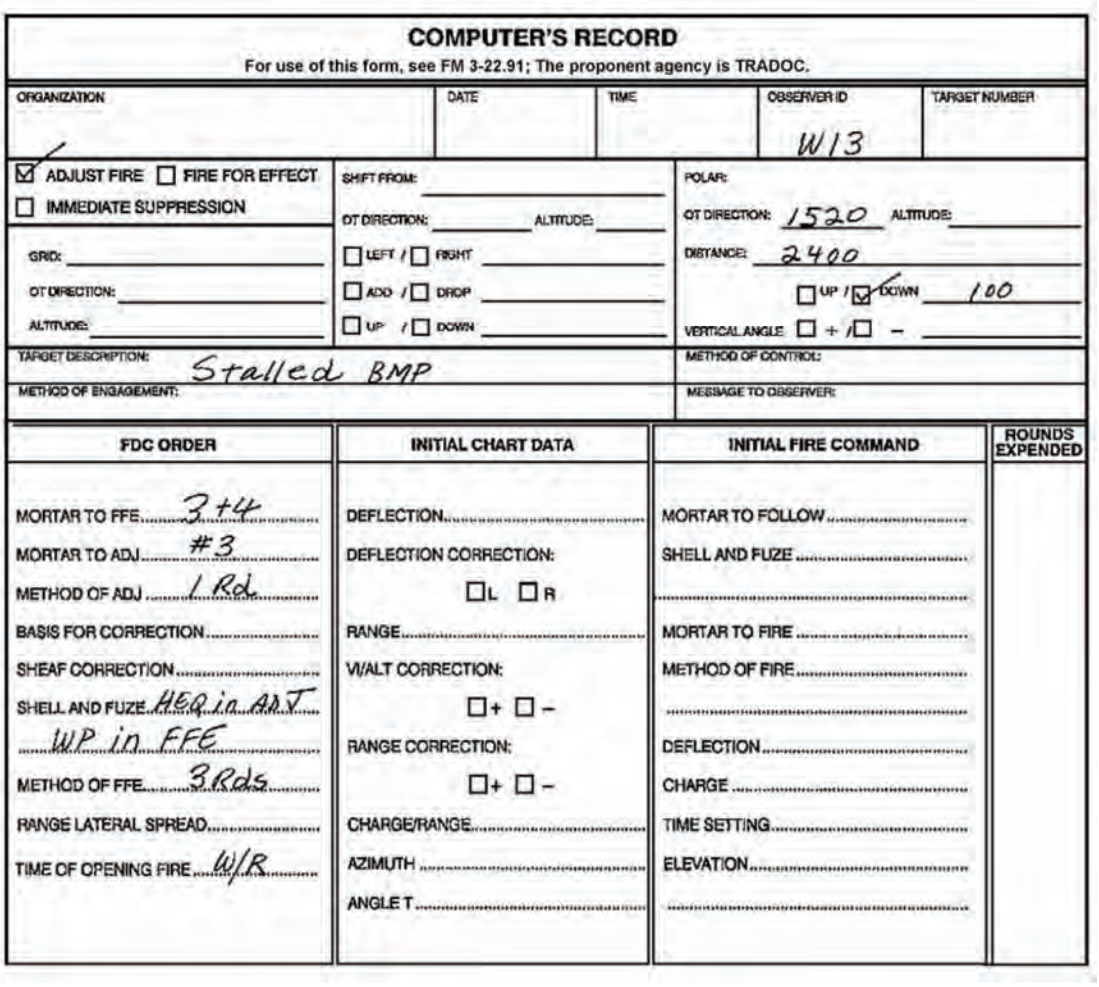
Figure E-8. Situation G: first mission (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

W13 immediately sends in another fire request. The section leader assigns No. 1 and No. 2 guns to the first mission (SHIFT), and No. 3 and No. 4 guns to the second mission (POLAR).

TASK: Compute data for a shift from a known point mission using the CFF and FDC orders in Figure E-8.
CONDITIONS: Given an initialized MBC, CFF using shift from a known point, DA Form 2399-R, and DA Form 2188-R.
STANDARDS: Compute data for the mission to within 1 mil for deflection and elevation.

TASK: Compute firing data for a polar plot mission using the CFF and FDC orders in Figure E-9.
CONDITIONS: Given an initialized MBC, CFF, DA Form 2399-R, and DA Form 2188-R.
STANDARDS: Compute the firing data for the mission to within 1 mil for deflection and elevation.

TASK: Compute firing data for a polar plot mission using the CFF and FDC orders in Figure E-9.
CONDITIONS: Given an initialized MBC, CFF, DA Form 2399-R, and DA Form 2188-R.
STANDARDS: Compute the firing data for the mission to within 1 mil for deflection and elevation.



COMPUTER'S RECORD

For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			W13	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID:
DT DIRECTION:
ALTITUDE:

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

POLAR:
DT DIRECTION: 1520 ALTITUDE:
DISTANCE: 2400
☐ UP / ☑ DOWN 100
VERTICAL ANGLE: ☐ + / ☐ –

TARGET DESCRIPTION: Stalled BMP
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: 3+4	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ: #3	DEFLECTION CORRECTION: ☐L ☐R	SHELL AND FUZE:	
METHOD OF ADJ: 1 Rd			
BASIS FOR CORRECTION:	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION:	VI/ALT CORRECTION: ☐+ ☐–	METHOD OF FIRE:	
SHELL AND FUZE: HE Q in ADJ WP in FFE	RANGE CORRECTION: ☐+ ☐–	DEFLECTION:	
METHOD OF FFE: 3 Rds	CHARGE/RANGE:	CHARGE:	
RANGE LATERAL SPREAD:	AZIMUTH:	TIME SETTING:	
TIME OF OPENING FIRE: W/R	ANGLE T:	ELEVATION:	

Figure E-9. Situation G: second mission (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

18. What is the correct range for the first round in mission one?
    (a) 2,408 meters
    (b) 3,628 meters
    (c) 3,354 meters
    (d) 2,508 meters

19. What is the correct initial fire command for mission two?

(a)

INITIAL FIRE COMMAND	
MORTAR TO FOLLOW	3+4
SHELL AND FUZE	HEQ
MORTAR TO FIRE	#3
METHOD OF FIRE	1 Rd in ADJ 3 WP in FFE
DEFLECTION	2532
CHARGE	6
TIME SETTING	
ELEVATION	0893

(b)

INITIAL FIRE COMMAND	
MORTAR TO FOLLOW	3+4
SHELL AND FUZE	HEQ
MORTAR TO FIRE	#3
METHOD OF FIRE	1 Rd in ADJ 3 WP in FFE
DEFLECTION	2556
CHARGE	6
TIME SETTING	
ELEVATION	0892

(c)

INITIAL FIRE COMMAND	
MORTAR TO FOLLOW	3+4
SHELL AND FUZE	HEQ
MORTAR TO FIRE	#3
METHOD OF FIRE	1 Rd in ADJ 3 Rds in FEE
DEFLECTION	2553
CHARGE	6
TIME SETTING	
ELEVATION	0907

(d)

INITIAL FIRE COMMAND	
MORTAR TO FOLLOW	3+4
SHELL AND FUZE	HEQ
MORTAR TO FIRE	#3
METHOD OF FIRE	1 Rd in ADJ 3 WP in FFE
DEFLECTION	2553
CHARGE	6
TIME SETTING	
ELEVATION	0947

NOTE: The first mission's initial round is fired, and the FO sends: RIGHT 50, DROP 100.

TASK: Compute data for subsequent FO corrections using the MBC.
CONDITIONS: Given an MBC with a mission already in progress and corrections from the FO to apply.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation.

20. What is the correct subsequent command for mission one?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	#2		2556	4		0939
(b)	#2	IRd	2547	4		1112
(c)			2543	4		0895
(d)			2543	4		0928

NOTE: The FO spots the round for mission two and sends: DROP 50, FFE.

21. What is the correct subsequent command for the second mission?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	#2		2556	4		0939
(b)	#2	IRd	2547	4		1112
(c)			2543	4		0895
(d)			2543	4		0928

NOTES: 1. The FO spots the second round for the first mission and sends: ADD 50, FFE.

2. The FO calls back on the second mission: EOM, BMP DESTROYED, EOMRAT AA204, KNPT 04.

22. What is the correct subsequent command for the first FFE mission?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	3+4	3 Prox	2559			1081
(b)	1+2	3 Prox	2557	5		1094
(c)	1+2	3 Prox	2559			1081
(d)	1+2	3 Prox	2557	5		1107

NOTE: The FO sends: EOM, EST 80 PERCENT CAS, EOMRAT AA0203, KNPT03.

SITUATION H

The company commander orders the mortar platoon to displace. The platoon occupies the new position. The initialization data is entered into the MBC.

TASK: Prepare an MBC with initialization data.
CONDITIONS: Given an MBC with weapon and FO location data.
STANDARDS: Enter the weapon and FO location data into the MBC without error.

WEAPON DATA	FO LOCATION
81-MM (M252)	F21 AP: 09850 93100
CARRIER-MOUNTED: NO	ALT: 0300
BP: A2 GRID: AP: 13225 92885	
ALT: 0420	
AZ: 5340 DEF: 2800	
A1: Dir 0540 Dis 035	
A3: Dir 3740 Dis 035	
A4: Dir 3740 Dis 070	

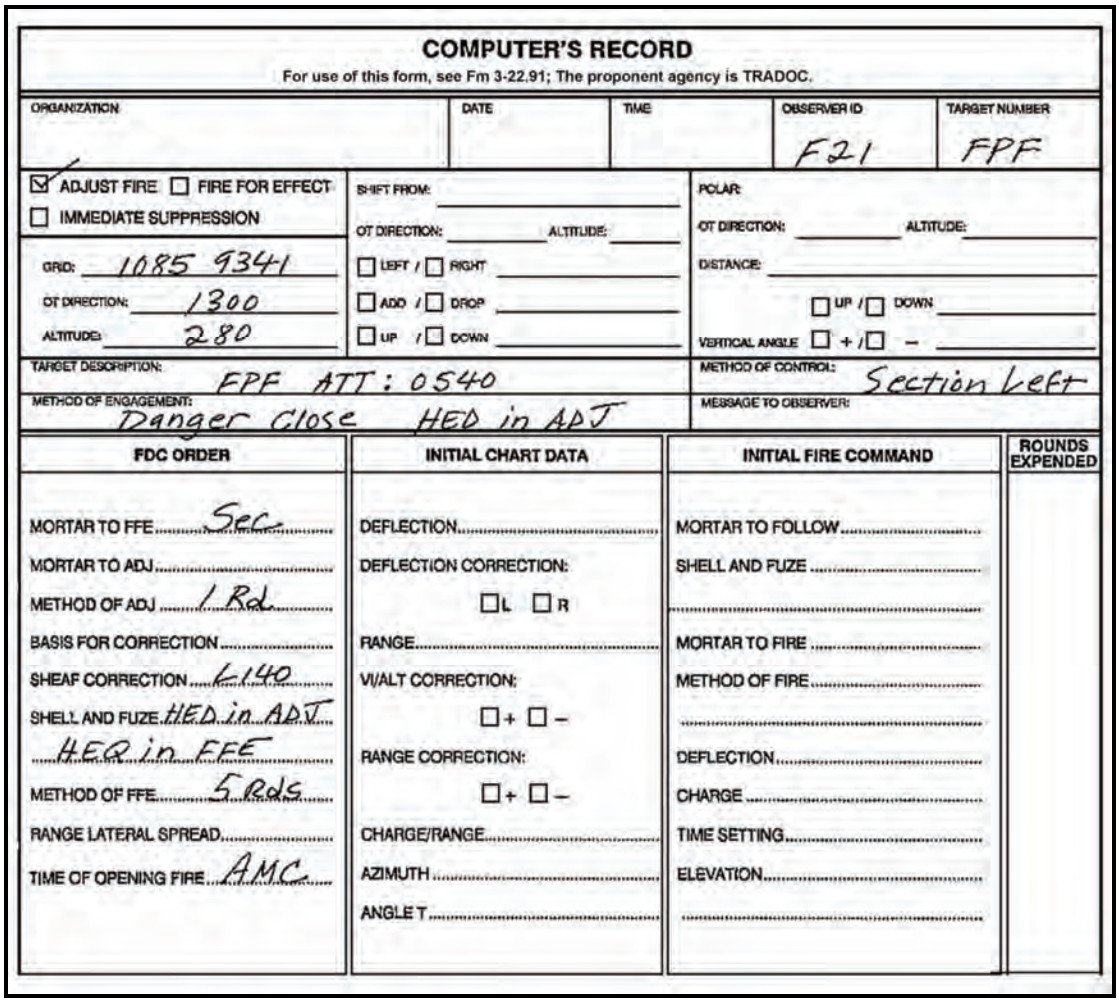
TASK: Store a no-fire line/zone in the MBC.
CONDITIONS: Given an initialized MBC and coordinates for a no-fire line/zone.
STANDARDS: Store a no-fire line/zone without error.

NO-FIRE LOCATION
ZN1 04 PTS
PT1 09450 93300
PT2 10650 93300
PT3 10650 93500
PT4 09450 93500

TASK: Store safety data in the MBC.
CONDITIONS: Given an initialized MBC and a completed safety diagram.
STANDARDS: Store the safety diagram data without error.

SAFETY DATA
LLAZ 4940
RLAZ 5740
MAX RN 3800
MIN RN 0450
MIN CHG 1
MAX CHG 7

The company commander has directed that an FPF be placed at grid 10850 93410. The platoon leader informs the FO, and the FO sends the CFF in Figure E-10.



COMPUTER'S RECORD

For use of this form, see Fm 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			F21	FPF

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 1085 9341
OT DIRECTION: 1300
ALTITUDE: 280

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

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

TARGET DESCRIPTION: FPF ATT: 0540
METHOD OF CONTROL: Section Left
METHOD OF ENGAGEMENT: Danger Close HED in ADJ
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ:	DEFLECTION CORRECTION: ☐L ☐R	SHELL AND FUZE:	
METHOD OF ADJ: 1 Rd			
BASIS FOR CORRECTION:	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION: L140	VI/ALT CORRECTION: ☐+ ☐–	METHOD OF FIRE:	
SHELL AND FUZE: HED in ADJ HER in FFE	RANGE CORRECTION: ☐+ ☐–	DEFLECTION:	
METHOD OF FFE: 5 Rds	CHARGE/RANGE:	CHARGE:	
RANGE LATERAL SPREAD:	AZIMUTH:	TIME SETTING:	
TIME OF OPENING FIRE: AMC	ANGLE T:	ELEVATION:	

Figure E-10. Situation H (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

TASK: Compute firing data for an FPF.
CONDITIONS: Given an initialized MBC, a CFF (requesting adjustment of an FPF), DA Form 2399-R, and DA Form 2188-R.
STANDARDS: Compute data for an FPF to the nearest 1 mil for deflection and elevation.

NOTE: No. 4 gun is the danger close gun.

23. What is the burst point grid for the first round?
    (a) 10850 93410
    (b) 10788 93304
    (c) 10920 93411
    (d) 10790 93000

24. What are the correct initial deflections and elevations?

		DEF (mils)	ELEV (mils)			DEF (mils)	ELEV (mils)
(a)	No. 1	3128	1045	(b)	No. 1	3180	0995
	No. 2	3127	1045		No. 2	3179	0995
	No. 3	3126	1046		No. 3	3178	0994
	No. 4	3200	0900		No. 4	3124	0900
(c)	No. 1	3040	0945	(d)	No. 1	3141	0969
	No. 2	3039	0994		No. 2	3141	0969
	No. 3	3038	0946		No. 3	3141	0969
	No. 4	3200	0900		No. 4	3141	0969

NOTE: The FO spots the round and sends: NO. 4 GUN, LEFT 25, ADD 25.

TASK: Compute data for subsequent FO corrections using the MBC.
CONDITIONS: Given an MBC with a mission already in progress and corrections from the FO to apply.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation.

NOTE: The round is fired and the FO sends: NO. 4 GUN ADJUSTED, REPEAT NO. 3 GUN.

25. What is the correct deflection and elevation for No. 3 gun?

	DEF (mils)	ELEV (mils)		DEF (mils)	ELEV (mils)
(a)	3134	1059	(b)	3124	1050
(c)	3126	3127	(d)	3134	0975

NOTES: 1. The FO spots the round and sends: RIGHT 25.

2. That round is fired, and the FO sends: NO. 3 ADJUSTED, REPEAT NO. 2 GUN.

3. The round is fired, and the FO sends: RIGHT 25, ADD 25.

26. What is the correct deflection and elevation for the No. 2 gun?

	DEF (mils)	ELEV (mils)		DEF (mils)	ELEV (mils)
(a)	3126	0974	(b)	3141	0977
(c)	3127	0975	(d)	3141	0950

NOTES: 1. The round is fired, and the FO sends: NO. 2 ADJUSTED, REPEAT NO. 1 GUN.

2. The round is fired, and the FO sends: EOM, FPF ADJUSTED.

SITUATION I

A short time after adjusting the FPF, you receive the CFF and FDC order in Figure E-11.

COMPUTER'S RECORD

For use of this form, see Fm 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			F21	

☐ ADJUST FIRE ☐ FIRE FOR EFFECT
☑ IMMEDIATE SUPPRESSION

GRID: 1065 9435
OT DIRECTION:
ALTITUDE:

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

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

TARGET DESCRIPTION: Smoke
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ:	DEFLECTION CORRECTION: ☐L ☐R	SHELL AND FUZE:	
METHOD OF ADJ:	RANGE:	MORTAR TO FIRE:	
BASIS FOR CORRECTION:	V/ALT CORRECTION: ☐+ ☐–	METHOD OF FIRE:	
SHEAF CORRECTION:	RANGE CORRECTION: ☐+ ☐–	DEFLECTION:	
SHELL AND FUZE: WP	CHARGE/RANGE:	CHARGE:	
METHOD OF FFE: 2 Rds	AZIMUTH:	TIME SETTING:	
RANGE LATERAL SPREAD:	ANGLE T:	ELEVATION:	
TIME OF OPENING FIRE: W/R			

Figure E-11. Situation I (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

TASK: Compute data for a grid mission using the CFF and FDC order in Figure E-11.

CONDITIONS: Given an initialized MBC, CFF using grid coordinates as the method of target location, DA Form 2399-R, and DA Form 2188-R.

STANDARDS: Compute data for the mission's initial fire command to within 1 mil for deflection and elevation.

27. What is the correct initial fire command?

(a)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: WP
MORTAR TO FIRE:
METHOD OF FIRE: 2 Rds
DEFLECTION: 2808
CHARGE: 6
TIME SETTING:
ELEVATION: 1067

(b)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ
MORTAR TO FIRE:
METHOD OF FIRE: 1 Rd
2 Rds in FFE
DEFLECTION: 2813
CHARGE: 6
TIME SETTING:
ELEVATION: 1052

(c)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: WP
MORTAR TO FIRE:
METHOD OF FIRE: 2 Rds
DEFLECTION: 2813
CHARGE: 6
TIME SETTING:
ELEVATION: 1052

(d)

INITIAL FIRE COMMAND

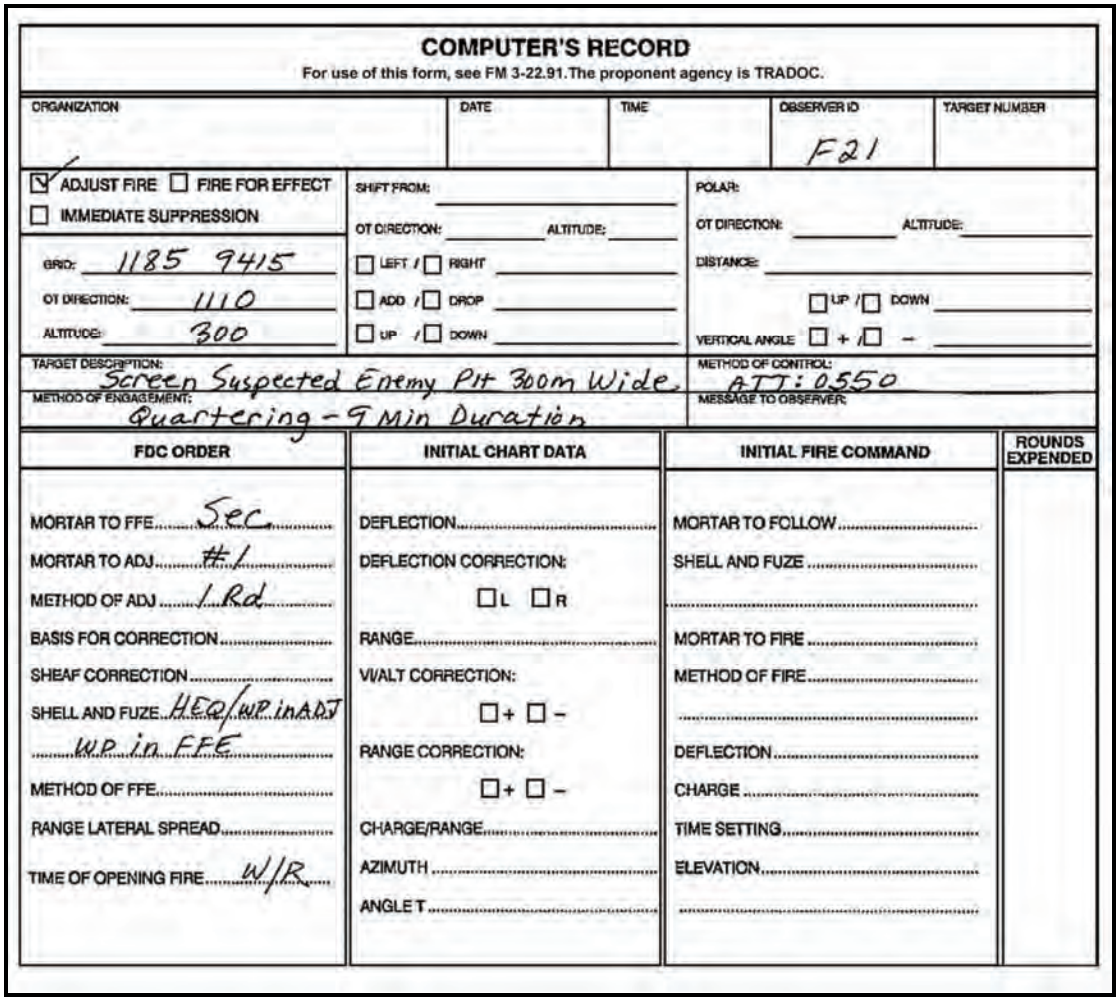
MORTAR TO FOLLOW: Sec
SHELL AND FUZE: WP
MORTAR TO FIRE:
METHOD OF FIRE: 1 Rd in ADJ
2 Rds WP in FFE
DEFLECTION: 2809
CHARGE: 6
TIME SETTING:
ELEVATION: 1067

NOTE: The FO sends: EOM, AREA SCREENED, EOMRAT AA0205, KNPT 05.

SITUATION J

The commander wants a screen at grid 11850 94150. The platoon leader informed the FSO and the FO. A short time later you receive the CFF in Figure E-12.

TASK: Compute firing data for a quick-smoke mission.
CONDITIONS: Given an initialized MBC, call fire (requesting a quick smoke mission), weather conditions, smoke card, DA Form 2399-R, and DA Form 2188-R.
STANDARDS: Compute the initial and subsequent fire commands to the nearest 1 mil for deflection and elevation, and the correct number of rounds in the FFE.



COMPUTER'S RECORD

For use of this form, see FM 3-22.91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			F21	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 1185 9415
OT DIRECTION: 1110
ALTITUDE: 300

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

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

TARGET DESCRIPTION: Screen Suspected Enemy Pit 300m Wide.
METHOD OF ENGAGEMENT: Quartering - 9 Min Duration
METHOD OF CONTROL: ATT: 0550
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec.	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ: #1	DEFLECTION CORRECTION:	SHELL AND FUZE:	
METHOD OF ADJ: 1 Rd	☐ L ☐ R		
BASIS FOR CORRECTION:	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION:	VI/ALT CORRECTION:	METHOD OF FIRE:	
SHELL AND FUZE: HEQ/WP in ADJ	☐ + ☐ –		
WP in FFE	RANGE CORRECTION:	DEFLECTION:	
METHOD OF FFE:	☐ + ☐ –	CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
TIME OF OPENING FIRE: W/R	AZIMUTH:	ELEVATION:	
	ANGLE T:		

Figure E-12. Situation J (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

NOTE: Temperature gradient: neutral; wind speed: 9 knots; humidity: 60 percent.

28. What is the deflection for the last round fired?

(a) 2468
(b) 2498
(c) 2388
(d) 2598

NOTES: 1. The FO spots the round and sends: LEFT 50, ADD 100.

2. The round is fired and the FO sends: ADD 100.

3. The FO spots the round and sends: REPEAT WP.

4. The FO sees the WP and sends: FFE, CONTINUOUS FIRE FROM THE LEFT.

---

29. What is the time interval between rounds?

(a) 20 seconds
(b) 10 seconds
(c) 12 seconds
(d) 6 seconds

30. What is the total number of WP rounds computed for the mission?

(a) 37 rounds
(b) 40 rounds
(c) 41 rounds
(d) 28 rounds

NOTE: The FO calls back: EOM, AREA SCREENED, EOMRAT AA0206, KNPT 06.

SITUATION K

The platoon leader has been ordered to displace No. 3 and No. 4 guns to a new firing point. Enter the following weapon data:

TASK: Prepare an MBC with initialization data.
CONDITIONS: Given an MBC with weapon data.
STANDARDS: Enter the weapon data into the MBC without error.

WPN DATA
BP: B3
CARRIER-MOUNTED: NO
GRID: 10750 91300
ALT: 0350
AZ: 6400 DEF: 2800
B4: Dir 4900 Dis 040

Shortly after the section occupies its new position, another fire request is received. Use the CFF and FDC order in Figure E-13 to compute the mission.

TASK: Compute firing data for a polar plot mission using the CFF and FDC orders in Figure E-13.
CONDITIONS: Given an initialized MBC, CFF, DA Form 2399-R, and DA Form 2188-R.
STANDARDS: Compute the firing data for the mission to within 1 mil for deflection and elevation.

COMPUTER'S RECORD

For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			W13	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID:
DT DIRECTION:
ALTITUDE:

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

POLAR:
DT DIRECTION: 0750 ALTITUDE:
DISTANCE: 3700
☐ UP / ☑ DOWN 100
VERTICAL ANGLE ☐ + / ☐ –

TARGET DESCRIPTION: Tanks in Open
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec MORTAR TO ADJ: # B3 METHOD OF ADJ: 1 Rd BASIS FOR CORRECTION: SHEAF CORRECTION: SHELL AND FUZE: HEQ in ADJ WP in FFE METHOD OF FFE: 3 Rds RANGE LATERAL SPREAD: TIME OF OPENING FIRE: W/R	DEFLECTION: DEFLECTION CORRECTION: ☐ L ☐ R RANGE: V/ALT CORRECTION: ☐ + ☐ – RANGE CORRECTION: ☐ + ☐ – CHARGE/RANGE: AZIMUTH: ANGLE T:	MORTAR TO FOLLOW: SHELL AND FUZE: MORTAR TO FIRE: METHOD OF FIRE: DEFLECTION: CHARGE: TIME SETTING: ELEVATION:	

Figure E-13. Situation K (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

31. What is the correct initial fire command?

(a)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: B Sec
SHELL AND FUZE:
MORTAR TO FIRE: #3
METHOD OF FIRE: 1 Rd. 3 WP in FFE
DEFLECTION: 2803
CHARGE: 8
TIME SETTING:
ELEVATION: 0951

(b)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: #1
SHELL AND FUZE: HEQ
MORTAR TO FIRE:
METHOD OF FIRE: 1 Rd. 3 WP in FFE
DEFLECTION: 2803
CHARGE: 8
TIME SETTING:
ELEVATION: 0981

(c)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: B Sec
SHELL AND FUZE: HEQ
MORTAR TO FIRE: #3
METHOD OF FIRE: 1 Rd in ADJ 3 Rds WP in FFE
DEFLECTION: 2796
CHARGE: 8
TIME SETTING:
ELEVATION: 0962

(d)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ
MORTAR TO FIRE: #1
METHOD OF FIRE: 1 Rd in ADJ 3 Rds WP in FFE
DEFLECTION: 2796
CHARGE: 8
TIME SETTING:
ELEVATION: 0962

TASK: Compute data for subsequent FO corrections using the MBC.
CONDITIONS: Given an MBC with a mission already in progress and corrections from the FO to apply.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation.

NOTE: The FO sends the correction: ADD 50, FFE.

32. What is the correct subsequent command?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	Sec	3 Rds WP	B3+4 2787			0949
			#1+2 2536			1033
(b)	Sec	3 Rds WP	B3+4 2794			0968
			#1+2 2542			1039
(c)	Sec	3 Rds WP	2787			0949
(d)	Sec	3 Rds WP	2536			1033

NOTE: The FO sends: EOM, TANKS BURNING, EOMRAT AA0207, KNPT 07.

SITUATION L

The No. 3 and No. 4 guns have now displaced back to their position with the rest of the platoon. Another mission is received in the FDC. Use the CFF and FDC order in Figure E-14 to compute the mission.

TASK: Compute data for a searching mission using the CFF and FDC order in Figure E-14.
CONDITIONS: Given an MBC with a mission already in progress.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation, and determine turns to the nearest one-half turn.

COMPUTER'S RECORD

For use of this form, see FM 3-22.91. The proponent agent is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			F21	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 1042 9534
OT DIRECTION: 0250
ALTITUDE: 380

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

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

TARGET DESCRIPTION: Co in Open 100×300 ATT 5430
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ: #2	DEFLECTION CORRECTION:	SHELL AND FUZE:	
METHOD OF ADJ: 1 Rd	☐L ☐R		
BASIS FOR CORRECTION:	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION:	VI/ALT CORRECTION:	METHOD OF FIRE:	
SHELL AND FUZE: HEQ	☐+ ☐–		
	RANGE CORRECTION:	DEFLECTION:	
METHOD OF FFE: 12 Rds	☐+ ☐–	CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
TIME OF OPENING FIRE: W/R	AZIMUTH:	ELEVATION:	
	ANGLE T:		

Figure E-14. Situation L (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

TASK: Compute data for subsequent FO corrections using the MBC.
CONDITIONS: Given an MBC with a mission already in progress and corrections from the FO to apply.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation.

NOTES:
1. The FO spots the initial round and sends a correction: RIGHT 200, DROP 200.
2. That round is fired, and the FO sends his next correction: LEFT 50, DROP 100.
3. That round is fired, and the observer calls back: ADD 50, FFE.

33. What is the correct deflection, charge, and elevation for the near edge of the target?

	DEF (mils)	CHG	ELEV (mils)		DEF (mils)	CHG	ELEV (mils)
(a)	2652	6	1062	(b)	2642	7	1083
(c)	2645	7	1072	(d)	2642	7	1072

34. What is the correct deflection, charge, and elevation to the far edge of the target?

	DEF (mils)	CHG	ELEV (mils)		DEF (mils)	CHG	ELEV (mils)
(a)	2649	6	0982	(b)	2649	7	0997
(c)	2645	7	1051	(d)	2649	7	0982

NOTE: The FO observes the FFE and sends: EOM, TROOPS DISPENSING, EOMRAT AA0208, KNPT 08.

SITUATION M

Just at dusk of the same day, the FDC receives another fire request. Use the CFF and FDC order in Figure E-15 to compute the mission.

TASK: Compute data for a traversing mission using the CFF and FDC order in Figure E-15.
CONDITIONS: Given an MBC with a mission already in progress.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation, and determine turns to the nearest one-half turn.

COMPUTER'S RECORD

For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			F21	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 1189 9410
OT DIRECTION: 1150
ALTITUDE: 400

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

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

TARGET DESCRIPTION: Landing Zone 450×50 ATT 0550
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ: #2	DEFLECTION CORRECTION: ☐L ☐R	SHELL AND FUZE:	
METHOD OF ADJ: 1 Rd			
BASIS FOR CORRECTION: Special	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION: W 4.50	VVALT CORRECTION: ☐+ ☐–	METHOD OF FIRE:	
SHELL AND FUZE: HEQ in AAT			
WP in FFE	RANGE CORRECTION: ☐+ ☐–	DEFLECTION:	
METHOD OF FFE: 5 Rds		CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
TIME OF OPENING FIRE: W/R	AZIMUTH:	ELEVATION:	
	ANGLE T:		

Figure E-15. Situation M (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

TASK: Compute data for subsequent FO corrections using the MBC.
CONDITIONS: Given an MBC with a mission already in progress and corrections from the FO to apply.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation.

NOTES: 1. The FO spots the round and sends the correction: LEFT 200, DROP 200.

2. The round is fired, and the FO sends another correction: RIGHT 100, ADD 25.

3. The round is spotted by the FO, and he sends the correction: LEFT 50, FFE, TRAVERSE RIGHT.

35. What is the subsequent command for the FFE?

SUBSEQUENT COMMANDS

	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	Sec	6 Rds WP	1) 2580			1119
			2) 2638			1126
			3) 2696			1131
			4) 2713			1147
(b)	Sec	5 Rds WP	1) 2645	Traverse Right	1 turn	1115
			2) 2685			1119
			3) 2724			0862
			4) 2762			0867
(c)	Sec	5 Rds WP	1) 2598	Traverse Right	1 turn	1122
			2) 2637			1126
			3) 2677			1129
			4) 2716			1132
(d)	Sec	6 Rds WP	1) 2617			1124
			2) 2676			1129
			3) 2735			0910
			4) 2762			0915

36. How many turns are there between rounds?
(a) 1/2 turn
(b) 1 turn
(c) 1 1/2 turns
(d) 2 turns

NOTE: The FO observes the FFE and sends: EOM LZ DESTY.

SITUATION N

It is now dark and the platoon is prepared for night firing. The FDC receives a fire request. Use the CFF and FDC order in Figure E-16 to compute the mission.

TASK: Compute firing data for an illumination mission.
CONDITIONS: Given an initialized MBC, CFF, DA Form 2399-R, and DA Form 2188-R.
STANDARDS: Compute data for an illumination mission to the nearest 1 mil for deflection and elevation, and time setting to within one-tenth of a second.

COMPUTER'S RECORD

For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			F21	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 1125 9385
OT DIRECTION: 1100
ALTITUDE:

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

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

TARGET DESCRIPTION: Suspected Enemy Movement
METHOD OF ENGAGEMENT: ILLUM
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE #1	DEFLECTION	MORTAR TO FOLLOW	
MORTAR TO ADJ	DEFLECTION CORRECTION: ☐L ☐R	SHELL AND FUZE	
METHOD OF ADJ 1 Rd	RANGE	MORTAR TO FIRE	
BASIS FOR CORRECTION	V/ALT CORRECTION: ☐+ ☐–	METHOD OF FIRE	
SHEAF CORRECTION	RANGE CORRECTION: ☐+ ☐–	DEFLECTION	
SHELL AND FUZE ILL	CHARGE/RANGE	CHARGE	
METHOD OF FFE	AZIMUTH	TIME SETTING	
RANGE LATERAL SPREAD	ANGLE T	ELEVATION	
TIME OF OPENING FIRE W/R			

Figure E-16. Situation N (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

TASK: Compute data for subsequent FO corrections using the MBC.
CONDITIONS: Given an MBC with a mission already in progress and corrections from the FO to apply.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation.

NOTE: The round is fired and the FO sends the correction: RIGHT 200, DROP 400, DOWN 100.

37. What is the correct subsequent command?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	#1	1 Rd	3088		26.4	1026
(b)			3089		28.9	1021
(c)	#1	1 Rd	3089		26.4	1026
(d)			3088		26.4	1026

TASK: Compute data for a coordinated illumination mission using the CFF in Figure E-17.
CONDITIONS: Given an initialized MBC, CFF, DA Form 2399-R, and DA Form 2188-R.
STANDARDS: Compute firing data for the deflection and elevation to within 1 mil for all high-explosive and illumination rounds for the initial and subsequent fire commands.

NOTE: The round is fired, and the FO sends a coordinated illumination and HE CFF.

COMPUTER'S RECORD
For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			F21	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

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

GRID: 1125 9385
OT DIRECTION: 1100
ALTITUDE: 300

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

TARGET DESCRIPTION: Enemy Veh
METHOD OF ENGAGEMENT: WP in EFE
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

Figure E-17. Situation N: second mission (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

38. What is the correct FDC order?

(a)

FDC ORDER	
MORTAR TO FFE	2 + 3
MORTAR TO ADJ	#2
METHOD OF ADJ	1 Rd
BASIS FOR CORRECTION	
SHEAF CORRECTION	
SHELL AND FUZE	HEQ in ADJ WP in FFE
METHOD OF FFE	3 Rds
RANGE LATERAL SPREAD	
TIME OF OPENING FIRE	W/R

(b)

FDC ORDER	
MORTAR TO FFE	Sec
MORTAR TO ADJ	#2
METHOD OF ADJ	1 Rd
BASIS FOR CORRECTION	
SHEAF CORRECTION	
SHELL AND FUZE	HEQ in ADJ WP in FFE
METHOD OF FFE	3 Rds
RANGE LATERAL SPREAD	
TIME OF OPENING FIRE	AMC

(c)

FDC ORDER	
MORTAR TO FFE	2 + 3 + 4
MORTAR TO ADJ	#2
METHOD OF ADJ	1 Rd
BASIS FOR CORRECTION	
SHEAF CORRECTION	
SHELL AND FUZE	HEQ in ADJ WP in FFE
METHOD OF FFE	3 Rds
RANGE LATERAL SPREAD	
TIME OF OPENING FIRE	AMC

(d)

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

TASK: Compute data for subsequent FO corrections using the MBC.
CONDITIONS: Given an MBC with a mission already in progress and corrections from the FO to apply.
STANDARDS: Compute data for the corrections to within 1 mil for deflection and elevation.

NOTES:
1. No. 1 gun fires an illumination round and the FO sends: ILLUM MARK.
2. The MARK TIME is 50 seconds.
3. ILL and HE rounds are fired and the FO calls back: HE, DROP 100.

39. What is the range to the target for this correction?

(a) 2,358 meters
(b) 2,318 meters
(c) 2,198 meters
(d) 2,258 meters

NOTE: ILL and HE rounds are fired, and the FO calls back: HE, RIGHT 50, DROP 50, FFE.

40. What is the correct deflection and elevation for the No. 2, No. 3, and No. 4 guns in the FFE?

	DEF (mils)	ELEV (mils)		DEF (mils)	ELEV (mils)
(a)	2946	1047	(b)	2946	1055
(c)	2946	1063	(d)	2946	1070

NOTE: The FO observes the FFE and sends: EOM, VEHICLES BURNING, EOMRAT AA0409, KNPT 09.

SITUATION O

The following are questions relating to various MBC situations:

41. When the MBC is connected to a radio, it is proper procedure to conduct a MODEM test.

TRUE FALSE

42. While operating the MBC, the computer becomes unusually hot and a hissing sound is detected. The first thing to do is turn the MBC off.

TRUE FALSE

43. When storing the MBC, the battery can be left in the computer for an unlimited length of time.

TRUE FALSE

44. While operating the MBC using an external power source in the vehicle, the vehicle should not be started.

TRUE FALSE

45. Never use a sharp object, such as a pencil, to press the switches when operating the MBC.

TRUE FALSE

46. The MBC is waterproof when one switch on the keyboard is punctured.

TRUE FALSE

47. The first step before operating the MBC is to place a battery into the battery compartment.

TRUE FALSE

48. The last check before operating the MBC is to conduct a self-test.

TRUE FALSE

49. How many messages can the MBC receive from a digital device?
    (a) a. 4
    (b) 9
    (c) 14
    (d) 2

50. When receiving a completed fire request (FR) message from a digital device, why must you review it before processing the mission?
    (a) To prevent errors.
    (b) To be able to send an MTO.
    (c) To receive an ACK.
    (d) To manually enter the GRID switch.

51. When entering SET-UP data, what two entries must be the same as the digital device to communicate digitally?
    (a) Listen Only and Bit Rate.
    (b) Bit Rate and Block Mode.
    (c) Key Tone and Black Mode.
    (d) Bit Rate and Key Tone.

52. After pushing the COMPUTE switch during a mission and the display window displays *RANGE ERR*, what is the correct action to take?
    (a) End the mission.
    (b) Clear the MET.
    (c) Verify initialization and input entries.
    (d) Enter a higher charge and recompute.

53. When receiving an FR from a digital device, the display window shows SAFETY VIOLATION. What corrective action should be taken?
    (a) Recompute.
    (b) Send an MTO.
    (c) Send a CMD message.
    (d) Clear out safety diagram.

54. Which FM or technical manual (TM) is used when performing preventive maintenance checks and services (PMCS) on the M23 mortar ballistic computer?
    (a) FM 3-22.90.
    (b) TM 9-1350-261-10.
    (c) TM 9-1300-257-10.
    (d) TM 9-1220-246-12&P.

55. After entering safety data into the MBC, the need for safety T's is no longer warranted.

TRUE FALSE

SECTION IV. PLOTTING BOARD TEST

The candidate analyzes the following situations and then selects the appropriate answers.

SITUATION A

You are going to the firing range. The platoon leader goes to range control and obtains the safety information. Using the information that follows, construct a safety diagram.

TASK:	Construct a safety diagram on the M16 plotting board.
CONDITIONS:	Given an M16 plotting board, right and left limit azimuths, minimum and maximum ranges, type of weapon, firing point with either 8- or 10-digit grid coordinates, charge zones, and 300-series firing table.
STANDARDS:	Convert left and right limits to deflections, and minimum and maximum ranges to elevations. Construct a diagram on an M16 plotting board without error.

Mortar grid: 06406580
Left limit azimuth: 4800
Right limit azimuth: 5600
Maximum range: 4,000
Minimum range: 500
Charge zone: 2-8
Referred deflection: 2800

1. What are the left and right deflections?

	LEFT DEF (mils)	**RIGHT DEF (mils)**
(a)	2400	1200
(b)	4800	5600
(c)	2800	2400
(d)	3200	2400

2. What is the minimum elevation (mils that can be fired at the maximum range)?
   (a) 0941 mils
   (b) 1471 mils
   (c) 0907 mils
   (d) 1428 mils

SITUATION B

You move out to the field. The platoon leader determines an eight-digit grid and an altitude to the mortar position. He instructs you to construct a modified-observed firing chart.

TASK: Prepare a plotting board for operation using the modified-observed firing chart.
CONDITIONS: Given an M16 plotting board, a Fort Benning Installation Map 1:50,000, Edition 1-DMA, Series:V745Z; a mil protractor; an area of responsibility; a direction of fire (DOF); an eight-digit coordinate to the mortar position; a target or RP; and a grid intersection to represent the pivot point.
STANDARDS: Superimpose a grid system on the M16 plotting board using the grid intersection given without error.

TASK: Forward plot a target to the modified-observed chart from an observed chart.
CONDITIONS: Given an M16 plotting board, DA Form 2188-R with previously fired targets, setup data, DA Form 2399-R, CFF, and firing table.
STANDARDS: Plot the target, compute the firing data to within 1 mil with a 10-mil tolerance for deflection and 25 meters for range with a 25-meter tolerance, and record and update firing records without error.

Mortar grid: 07506539	Altitude: 440
OP No. 1: 096660	Altitude: 450
Direction of fire: 2020 mils	
Grid intersection: 09/64	
Mounting azimuth: 2000 mils	
Referred deflection: 4800 mils	
Forward plot AC070:	Chart deflection: 4536 mils
	Chart range: 2,950 meters
	Altitude: 440 meters

The section leader receives a CFF and checks the map. He then hands you the CFF in Figure E-18 and instructs you to compute the mission.

TASK: Compute data for a grid mission using the CFF and FDC order in Figure E-18.
CONDITIONS: Given an M16 plotting board, sector of fire, 1:50,000 map, protractor, DA Form 2399-R, tabular firing tables, CFF for a grid mission, FO corrections, paper, and pencil.
STANDARDS: Determine the deflection to within 1 mil with a 10-mil tolerance and the range to within 25 meters with a 25-meter tolerance.

TASK: Determine the VI between the mortar altitude and the target altitude.
CONDITIONS: Given the mortar altitude and the target altitude.
STANDARDS: Determine the VI to the nearest whole meter and the range correction to apply without error.

TASK: Determine VI to the nearest whole meter and the range correction to apply without error.
CONDITIONS: Given an M16 plotting board, altitude of the mortar position, CFF with the target altitude, and a firing table.
STANDARDS: Apply the VI correction without error when computing a mission. Record and update firing records. Determine deflections to the nearest 1 mil with a 10-mil tolerance. Determine the range to within 25 meters with a 25-meter tolerance. Convert the range to the correct charge and elevation.

TASK: Compute angle T.
CONDITIONS: Given the observer to target (OT) direction, direction of fire (GT), No. 2 pencil, and paper.
STANDARDS: Determine the angle T to the nearest 1 mil. Record the angle T to the nearest 10 mils. Send the angle T to the nearest 100 mils to the FO. Notify the FO in the message to observer when the angle T exceeds 500 mils.

COMPUTER'S RECORD

For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			H51	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 098 654
OT DIRECTION: 1800
ALTITUDE: 490

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

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

TARGET DESCRIPTION: ENY DEF POS
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

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

Figure E-18. Situation B: first mission (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

3. What is the initial chart deflection?
   (a) 3205 mils
   (b) 5205 mils
   (c) 2800 mils
   (d) 0700 mils

4. What is the command range to fire the first round?

NOTE: The chart range is 2,300.

   (a) 2,300 meters
   (b) 2,325 meters
   (c) 2,375 meters
   (d) 2,275 meters

NOTE: The FO spots the first round and sends these corrections: RIGHT 150, DROP 50, FFE; OT direction 1800.

5. What is the correct subsequent fire command?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)		2 Rds	5365	2450 / 4		0840
(b)	Sec	2 Rds	5140	2250 /		1002
(c)	Sec	2 Rds	5362	2450 /		0840
(d)		2 Rds	5140	2250 /		1002

NOTE: The rounds are fired and the FO sends EOM. Update and mark as target AC071.

You receive the CFF in Figure E-19 and see that it is in your area of operations. You are instructed to compute the mission.

TASK: Compute data for a grid mission using the CFF and FDC order in Figure E-19.
CONDITIONS: Given an M16 plotting board, sector of fire, 1:50,000 map, protractor, DA Form 2399-R, tabular firing tables, CFF for a grid mission, FO corrections, paper, and No. 2 pencil.
STANDARDS: Determine deflection to within 1 mil with a 10-mil tolerance and range to within 25 meters with a 25-meter tolerance.

TASK: Determine the VI between the mortar altitude and the target altitude.
CONDITIONS: Given the mortar altitude and target altitude.
STANDARDS: Determine the VI to the nearest whole meter and the range correction to apply without error.

TASK: Determine VI and the correction to apply when computing a mission using the M16 plotting board.
CONDITIONS: Given an M16 plotting board, altitude of the mortar position, CFF with the target altitude, and firing table.
STANDARDS: Apply the VI correction without error when computing a mission. Record and update firing records. Determine deflections to the nearest 1 mil with a 10-mil tolerance. Determine the range to within 25 meters with a 25-meter tolerance. Convert range to the correct charge and elevation.

TASK: Compute angle T.
CONDITIONS: Given the observer-target (OT) direction, direction of fire (GT), No. 2 pencil, and paper.
STANDARDS: Determine the angle T to the nearest 1 mil. Record the angle T to the nearest 10 mils. Send the angle T to the nearest 100 mils to the FO. Notify the FO in the message to observer when the angle T is 500 mils or more.

COMPUTER'S RECORD
For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			H51	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

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

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

GRID: 115 648
OT DIRECTION: 1900
ALTITUDE: 490

TARGET DESCRIPTION: Bunkers
METHOD OF ENGAGEMENT: HED in FFE
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

Figure E-19. Situation B: second mission (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

6. What is the FDC order?

(a)

FDC ORDER

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

(b)

FDC ORDER

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

(c)

FDC ORDER

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

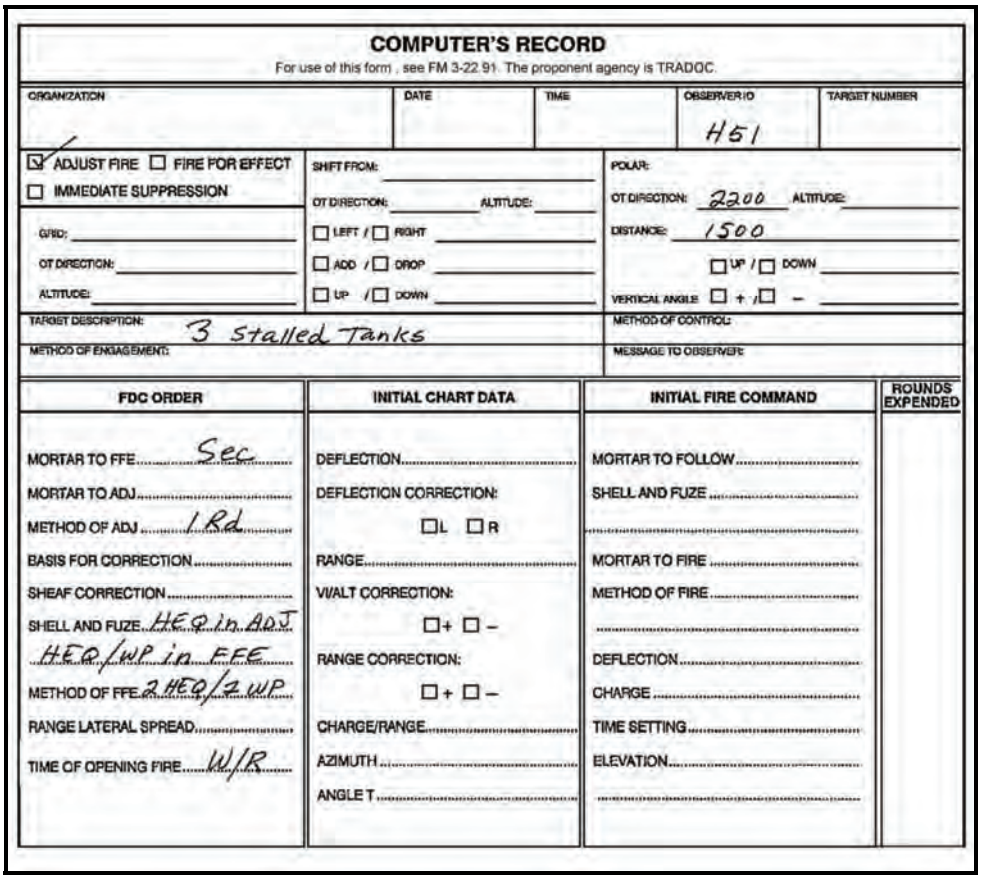
(d)

FDC ORDER

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

You are handed the CFF and FDC order in Figure E-20 and are instructed to compute the mission.

TASK:	Compute data for a shift from a known point mission using a plotting board.
CONDITIONS:	Given a plotting board, DA Form 2399-R, firing table, CFF for a shift from a known point mission, and FO corrections.
STANDARDS:	Determine deflection to within 1 mil with a 10-mil tolerance and range to within 25 meters with a 25-meter tolerance.



COMPUTER'S RECORD

For use of this form , see FM 3-22.91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER I/O	TARGET NUMBER
			H51	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID:
OT DIRECTION:
ALTITUDE:

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

POLAR:
OT DIRECTION: 2200 ALTITUDE:
DISTANCE: 1500
☐ UP / ☐ DOWN
VERTICAL ANGLE ☐ + / ☐ –

TARGET DESCRIPTION: 3 Stalled Tanks
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec MORTAR TO ADJ: METHOD OF ADJ: 1 Rd BASIS FOR CORRECTION: SHEAF CORRECTION: SHELL AND FUZE: HEQ in ADJ HEQ/WP in FFE METHOD OF FFE: 2 HEQ/2 WP RANGE LATERAL SPREAD: TIME OF OPENING FIRE: W/R	DEFLECTION: DEFLECTION CORRECTION: ☐ L ☐ R RANGE: VI/ALT CORRECTION: ☐ + ☐ – RANGE CORRECTION: ☐ + ☐ – CHARGE/RANGE: AZIMUTH: ANGLE T:	MORTAR TO FOLLOW: SHELL AND FUZE: MORTAR TO FIRE: METHOD OF FIRE: DEFLECTION: CHARGE: TIME SETTING: ELEVATION:	

Figure E-20. Situation B: third mission (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

7. What is the initial deflection?
   (a) 4606 mils
   (b) 4994 mils
   (c) 4800 mils
   (d) 4660 mils

8. The initial chart range is 2,375. What is the command range?
   (a) 2,325 meters
   (b) 2,350 meters
   (c) 2,375 meters
   (d) 2,400 meters

NOTE: The FO spots the first round and sends this correction: ADD 50, FFE.

9. What is the final deflection for the adjusting mortar?
   (a) 4999 mils
   (b) 4805 mils
   (c) 4665 mils
   (d) 4611 mils

NOTE: The adjusted chart range is 2,450.

10. What is the deflection for No. 3?
    (a) 4627
    (b) 4611
    (c) 4595
    (d) 4665

NOTE: The FO sends EOM. Mark as target AC073.

You receive the CFF, check the map, and issue the FDC order to the computers. Using the CFF and FDC order in Figure E-21, compute the mission.

TASK: Compute data for a polar plot mission using a plotting board.
CONDITIONS: Given an M16 plotting board prepared for operation to include the mortar position, reference points, and FO positions plotted; firing tables; DA Form 2399-R; CFF using the polar method of target location; and subsequent corrections.
STANDARDS: Determine deflection to the nearest 1 mil with a 10-mil tolerance, determine range to 25 meters with a 25-meter tolerance, and convert range to the correct charge and elevation.

COMPUTER'S RECORD

For use of this form , see FM 3-22 91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			H51	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID:
OT DIRECTION:
ALTITUDE:

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

POLAR:
OT DIRECTION: 2200 ALTITUDE:
DISTANCE: 1500
☐ UP / ☐ DOWN
VERTICAL ANGLE ☐ + / ☐ –

TARGET DESCRIPTION: 3 Stalled Tanks
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ:	DEFLECTION CORRECTION:	SHELL AND FUZE:	
METHOD OF ADJ: 1 Rd	☐L ☐R		
BASIS FOR CORRECTION:	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION:	VI/ALT CORRECTION:	METHOD OF FIRE:	
SHELL AND FUZE: HEQ in ADJ	☐+ ☐–		
HEQ/WP in FFE	RANGE CORRECTION:	DEFLECTION:	
METHOD OF FFE: 2 HEQ/2 WP	☐+ ☐–	CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
TIME OF OPENING FIRE: W/R	AZIMUTH:	ELEVATION:	
	ANGLE T:		

Figure E-21. Situation B: fourth mission (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

11. What is the correct initial fire command?

(a)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ

MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd
2 HEQ/2 WP in FFE
DEFLECTION: 5131
CHARGE: 6
TIME SETTING:
ELEVATION: 0886

(b)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ

MORTAR TO FIRE:
METHOD OF FIRE: 1Rd
2 HEQ/2 WP in FFE
DEFLECTION: 5269
CHARGE: 6
TIME SETTING:
ELEVATION: 0886

(c)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ

MORTAR TO FIRE:
METHOD OF FIRE: 1 Rd
2 HEQ/2 WP in FFE
DEFLECTION: 5131
CHARGE: 6
TIME SETTING:
ELEVATION: 0839

(d)

INITIAL FIRE COMMAND

MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ

MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd
2 HEQ/2 WP in FFE
DEFLECTION: 5269
CHARGE: 6
TIME SETTING:
ELEVATION: 0839

NOTE: The FO spots the first round and sends: DROP 50, FFE.

12. What is the correct subsequent fire command?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	Sec	2 HEQ 2 WP	5260			0839
(b)		2 HEQ 2 WP	5140			0886
(c)	Sec	2 HEQ 2 WP	5140			0839
(d)		2 HEQ 2 WP	5260			0886

NOTE: The FO sends EOM.

SITUATION C

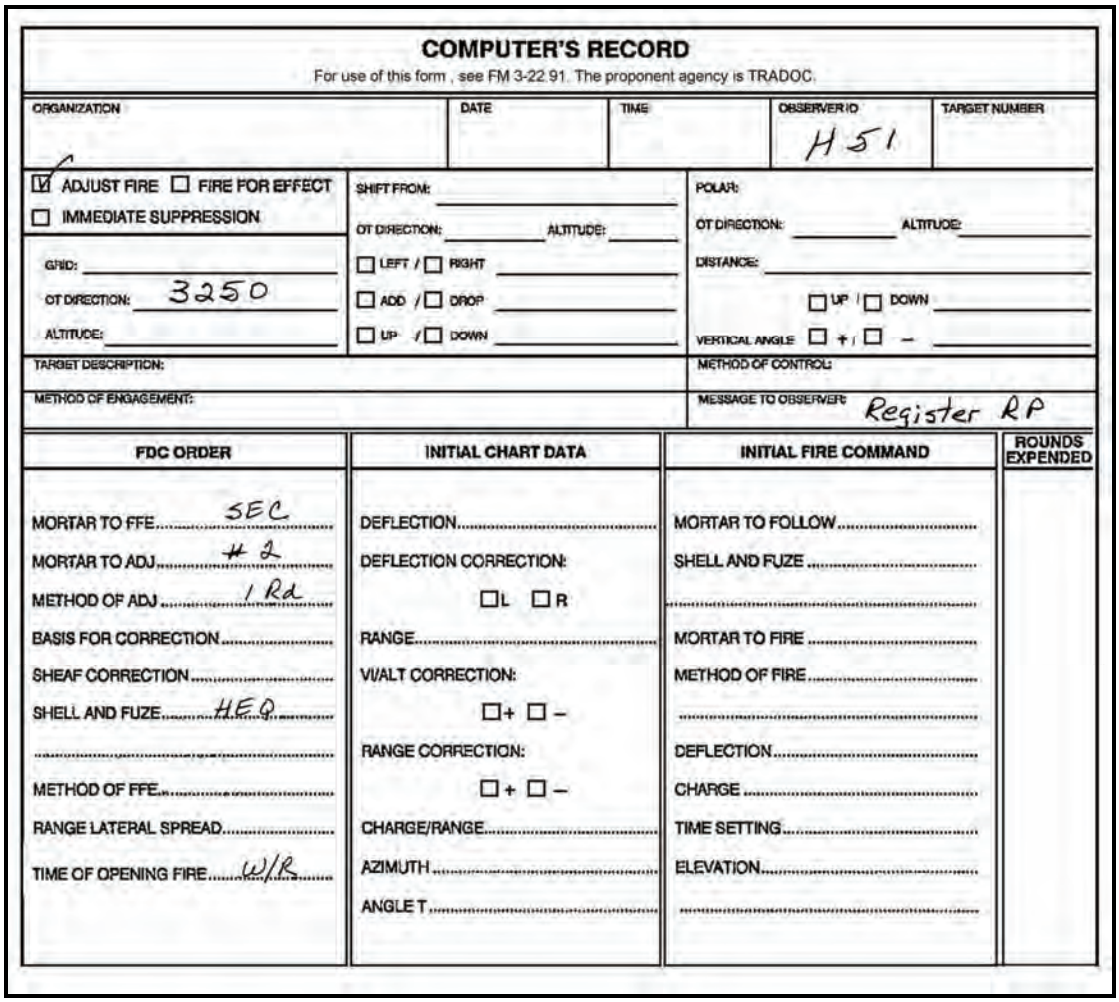
Your platoon is moving to a defensive position for a few days. Your platoon leader has the site surveyed. He then instructs you to set up a surveyed firing chart and to conduct a coordinated registration. Using the information below, construct a surveyed chart. Using the information in Figure E-22, conduct the registration mission.

TASK: Construct a surveyed firing chart.
CONDITIONS: Given an M16 plotting board, a grid intersection to represent the pivot point, a surveyed mortar position, a surveyed RP, and a referred deflection.
STANDARDS: Determine the direction of fire to the nearest mil, determine the mounting azimuth to the nearest 50 mils, and superimpose the deflection scale without error.

TASK: Compute data for a registration mission using a plotting board.
CONDITIONS: Given an M16 plotting board, surveyed mortar position, and surveyed RP.
STANDARDS: Determine the deflection to within 1 mil with a 10-mil tolerance. Determine the range to within 25 meters with a 25-meter tolerance. Convert the range to the correct charge and elevation without error.

Mortar grid: 06726544
RP No. 1 grid: 09946362
Referred deflection: 3800 mils
Grid intersection: 08/64
Altitude: 450 meters
Altitude: 400 meters

13. What is the direction of fire?
   (a) 2270 mils
   (b) 2130 mils
   (c) 3800 mils
   (d) 2170 mils



COMPUTER'S RECORD

For use of this form , see FM 3-22.91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			H51	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID:
OT DIRECTION: 3250
ALTITUDE:

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

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

TARGET DESCRIPTION:
METHOD OF CONTROL:
METHOD OF ENGAGEMENT:
MESSAGE TO OBSERVER: Register RP

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: SEC	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ: #2	DEFLECTION CORRECTION:	SHELL AND FUZE:	
METHOD OF ADJ: 1 Rd	☐L ☐R		
BASIS FOR CORRECTION:	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION:	VI/ALT CORRECTION:	METHOD OF FIRE:	
SHELL AND FUZE: HE Q	☐+ ☐–		
	RANGE CORRECTION:	DEFLECTION:	
METHOD OF FFE:	☐+ ☐–	CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
TIME OF OPENING FIRE: W/R	AZIMUTH:	ELEVATION:	
	ANGLE T:		

Figure E-22. Situation C: first mission (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

14. What is the command deflection and command range for the first round?

	DEF (mils)	RANGE (mils)
(a)	3373	3775
(b)	3820	3750
(c)	3820	3675
(d)	3773	3625

NOTE: The FO spots the first round and sends these corrections: LEFT 50, ADD 50.

15. What is the deflection and elevation for the second round?

	DEF (mils)	RANGE (mils)
(a)	3831	0880
(b)	3801	0839
(c)	3959	0896
(d)	3781	0862

NOTES: 1. The FO spots the second round and sends: ADD 25, EOM, REGISTRATION COMPLETE.

2. The FDC sends a message to the FO: PREPARE TO ADJUST SHEAF.

3. The FO sends: SECTION LEFT.

TASK: Compute firing data for a sheaf adjustment using the plotting board.
CONDITIONS: Given an M16 plotting board, an active registration mission, FO corrections for sheaf adjustments, DA Form 2399-R, and firing tables.
STANDARDS: Determine total range correction to apply within 25 meters range with a 25-meter tolerance.

16. What is the correct subsequent fire command?

	SUBSEQUENT COMMANDS					
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV
(a)	Sec	1 Rd S/L #2 DNF	3830	3750		0862
(b)	Sec	1 Rd S/L #2 DNF	3830	3750		0896
(c)	Sec	1 Rd	3802	3750		0880
(d)	Sec	1 Rd S/L #2 DNF	3785	3750		0839

NOTES: 1. The FO makes a spotting and sends: NO. 3, RIGHT 10; NO. 1, RIGHT 20; NO. 4 ADJUSTED, EOM S/A.

2. The command range to the target is 3,750 meters.

17. What are the deflections for the No. 3 and No. 1 guns?

	No. 3 DEF (mils)	No. 1 DEF (mils)
(a)	3777	3780
(b)	3843	3840
(c)	3793	3797
(d)	3827	3824

TASK: Determine firing corrections.
CONDITIONS: Given the altitude of a mortar position and RP in meters, chart deflection, chart range, adjusted deflection, adjusted range for the RP, or a completed DA Form 2399-R for a registration mission.
STANDARDS: Determine corrections to include:

a. Altitude correction to within 1 meter.
b. Range difference to the nearest 25 meters.
c. Range correction factor to within 1 meter.
d. Deflection correction to within 1 mil.

18. If the initial chart deflection was 3820 and the final chart deflection was 3830, what is the deflection correction for RP No. 1?
    (a) R10
    (b) 0
    (c) L10
    (d) L30

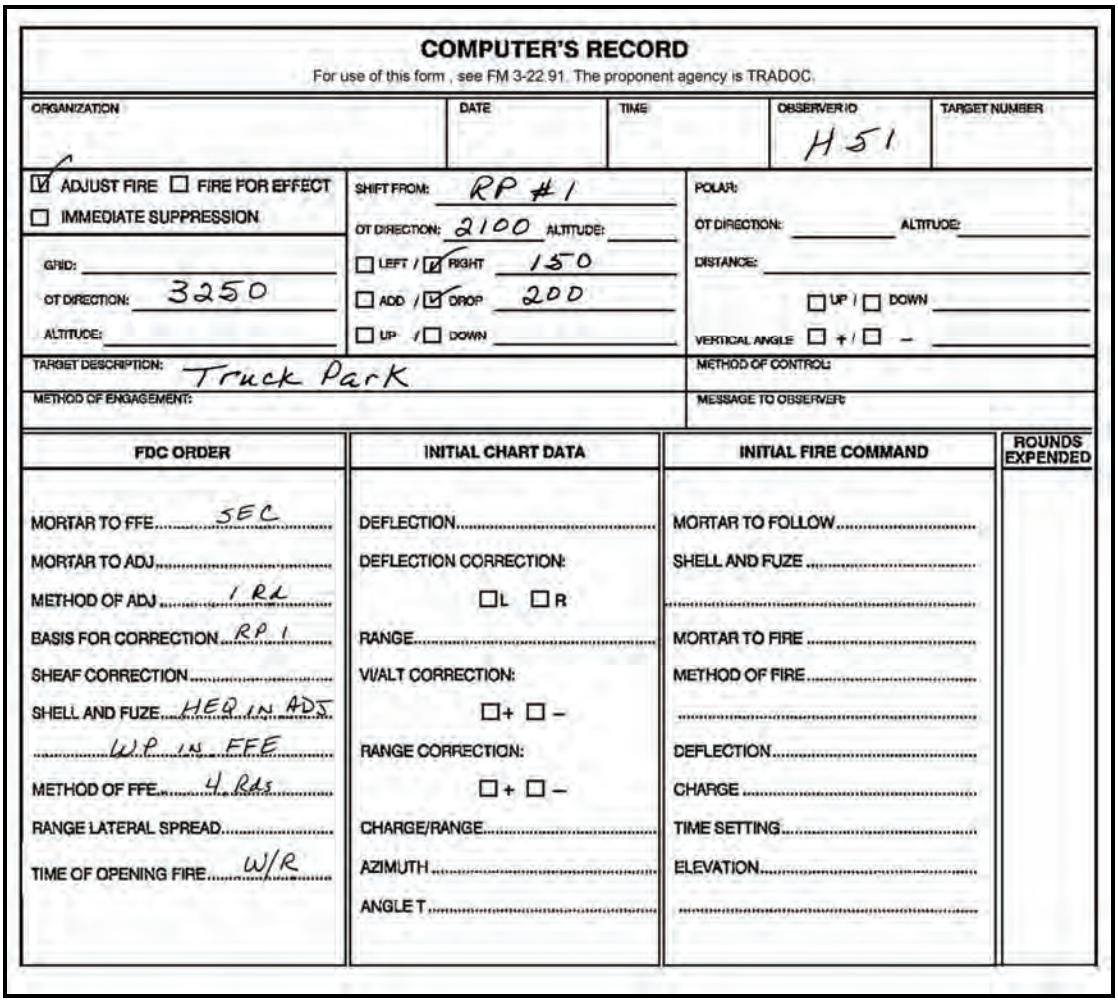
19. The initial chart range was 3,700 and the RP was hit at a command range of 3,750. What is the range correction factor?
    (a) +50
    (b) +20
    (c) -50
    (d) +75

After updating and computing all the corrections, you receive a CFF. The section leader hands you the CFF and the FDC order in Figure E-23 and instructs you to compute the mission.

TASK: Compute data for a shift from a known point mission using a plotting board.
CONDITIONS: Given a plotting board, DA Form 2399-R, firing table, CFF for a shift from a known point mission, and FO corrections.
STANDARDS: Determine deflection to within 1 mil with a 10-mil tolerance and range to within 25 meters with a 25-meter tolerance.

TASK: Compute firing data from a surveyed firing chart for a total range correction mission using a plotting board.
CONDITIONS: Given an M16 plotting board, an RP with deflection correction and range correction factors, CFF, DA Form 2399-R, and firing tables.
STANDARDS: Determine total range correction to apply within 25 meters for range with a 25-meter tolerance.

20. What is the total range correction for this mission?
    (a) -25
    (b) +70
    (c) 3500
    (d) +45



COMPUTER'S RECORD

For use of this form , see FM 3-22.91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
			H51	

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID:
OT DIRECTION: 3250
ALTITUDE:

SHIFT FROM: RP #1
OT DIRECTION: 2100 ALTITUDE:
☐ LEFT / ☑ RIGHT 150
☐ ADD / ☑ DROP 200
☐ UP / ☐ DOWN

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

TARGET DESCRIPTION: Truck Park
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: SEC	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ:	DEFLECTION CORRECTION:	SHELL AND FUZE:	
METHOD OF ADJ: 1 RD	☐L ☐R		
BASIS FOR CORRECTION: RP 1	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION:	VI/ALT CORRECTION:	METHOD OF FIRE:	
SHELL AND FUZE: HED IN ADJ	☐+ ☐–		
WP IN FFE	RANGE CORRECTION:	DEFLECTION:	
METHOD OF FFE: 4 RDS	☐+ ☐–	CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
TIME OF OPENING FIRE: W/R	AZIMUTH:	ELEVATION:	
	ANGLE T:		

Figure E-23. Situation C: second mission (excerpt from an example of completed DA Form 2399-R [Computer's Record]).

Appendix F

Error Messages

This appendix addresses all the possible error messages that may appear while using the MBC. Explanations and actions are also discussed.

CHARACTERS

F-1. Along with text, the three common characters found within an error message are alpha, numeric, and alphanumeric:

- @ = Alpha character.
- # = Numeric character.
- $ = Alphanumeric character.

MESSAGES, EXPLANATIONS, AND ACTIONS

F-2. Error messages confirm that a problem has occurred and specific actions must be taken to compute or log data on the MBC. The various types of messages that may appear and the appropriate action that should be taken to correct the error are as follows:

ERROR MESSAGE	EXPLANATION and ACTION
@@ * RANGE ERR *	Target location cannot be precisely achieved by ballistic calculations. The following menu indicates error magnitude. ACTION: Verify all initialization and input data. Check error magnitude in following menu. If error is excessive, use alternate weapon or ammunition type.
@# ACTIVE, MSN #	Weapon selected (@#) is now activated for mission #. ACTION: Choose an alternate weapon not now in use, or terminate mission #.
@# IS BP	When entering WPN BATA, basepiece number entered as alternate piece. ACTION: Enter correct weapon number.
@# MISSED: ####	Follows *RANGE ERR* message. Indicates error magnitude as distance in meters from target. ACTION: Verify all initialization and input entries. If error is excessive, select an alternate charge, weapon, or ammunition type.
@# NOT FOUND	No WPN DATA entered for this weapon. ACTION: Enter WPN DATA for this weapon or choose an alternate weapon.
@#:@# DANGER	WARNING: Friendly weapon is positioned at or near computed target location. First @# is firing weapon ID. Second @# is endangered weapon position ID. ACTION: Verify target and FO location entries. If locations are correct and endangered FO is still in place, verify mission.

ERROR MESSAGE	EXPLANATION and ACTION
@#:@/## DANGER	WARNING: Friendly FO is positioned at or near computed target location. The @# is firing weapon ID. The @/## is endangered FO ID. ACTION: Verify target and FO location entries. If locations are correct and endangered FO is still in place, verify mission.
^ AZ TOO BIG	Difference between safety fan LLAZ and RLAZ entries is 3200 mils or more. ACTION: Change safety fan LLAZ and RLAZ entries to get delta azimuth of less than 3200 mils.
^ AZ TOO SMALL	Difference between safety fan LLAZ and RLAZ entry is less than 400 mils. ACTION: Change safety fan LLAZ and RLAZ entry to get delta azimuth of at least 400 mils.
^ RANGE TOO SMALL	Difference between safety fan MIN RN and MAX RN entries is less than 200 meters. ACTION: Change SFTY DATA MIN RN and MAX RN entry to get delta range of 200 meters or greater.
ADJ COMPLETE	All weapons in sheaf are already adjusted. ACTION: No further adjustments are possible within current mission.
BAD AIR DENSITY	Temperature and pressure entries will not yield ballistics solution. ACTION: Verify temperature and pressure values. If correct for given MET, data are not usable in MBC.
BAD CHARGE ZONE	SFTY DATA, MIN CHG entry is greater than MAX CHG entry. ACTION: Change MIN CHG and MAX CHG entries so that MIN CHG is less than or equal to MAX CHG.
BAD FO:@/## FR	FR message received from FO for which no initialization was entered. Corrections cannot be computed. ACTION: If action is required, enter FO LOC initialization data.
BAD HEIGHT	Absolute altitude or delta height is outside the range (400 meters to 10,000 meters). ACTION: Verify all altitude, height, or vertical angle entries. If all values are correct, given mission cannot be computed.
BAD KNPT:## SHFT	Upon receipt of FR SHIFT message, known point message is not stored in KNPT buffer. ACTION: If known point is valid, enter KNPT data. If known point number is in error, orally request retransmission of corrected message.
BAD POWER UP	Hardware malfunction; memory probably corrupted. ACTION: Power down and back up several times. If this or another power-up error occurs, check battery or power supply. If error still occurs, return MBC to next higher maintenance level.
BAD ^ HEIGHT	Similar to BAD HEIGHT error. Computed delta height exceeds acceptable limits. ACTION: Verify all altitude, height, and vertical angle entries. If all values are correct, given mission cannot be computed.

ERROR MESSAGE	EXPLANATION and ACTION
BAD ^ WIND ##-##	Direction and velocity entries in consecutive MET datum planes yield easting and northing wind components that differ by more than 29 knots. The ##-## indicates MET datum planes in error. ACTION: Verify direction and velocity entries for stated MET datum planes. If correct for given MET, data are not usable in MBC.
BANK:FAIL	Memory bank switching hardware failure. ACTION: Return MBC to next higher maintenance level.
BAT @ NOT FOUND	Initialization data not yet entered for this battery. ACTION: Enter initialization data for this battery or select weapon from another battery.
CHARGE VIOLATION	Illegal cartridge-fuze-charge combination entry, such as: 81-mm, with VT fuze, at charge 0. ACTION: Make alternate WPN/AMMO entries to avoid the above illegal combinations.
CHG TOO BIG	Minimum range for user-selected charge is greater than range to target. ACTION: Leave charge field blank (MBC selects optimum charge) or enter valid smaller alternate charge. If valid charge cannot be found for these WPN/AMMO entries, make alternate WPN/AMMO entries.
CHG TOO LOW	User-selected charge maximum range is less than the range to target. ACTION: Leave the charge field blank (MBC selects optimum charge) or enter valid larger alternate charge. If valid charge cannot be found for these WPN/AMMO entries, make alternate WPN/AMMO entries.
DEFL TOO BIG	Required deflection exceeds maximum left or right traverse limitations for carrier-mounted 107-mm mortars. ACTION: Select alternate weapon for which limitations are not exceeded.
DISP $$$ MEM $$$	Follows REV NO. FAILURE error message. Indicates revision numbers for display/processor and memory respectively. ACTION: Return MBC to next higher maintenance level.
DUPLICATE WPNS	Same weapon number entered two or more times into TFC, GUNS selection for multiple weapon missions. ACTION: Delete duplicate entries.
E TOO BIG	Computed delta easting exceeds 32767. ACTION: Verify all entries affecting delta easting. Also verify that MIN E and MIN N entries in the SET UP data are appropriate for mission coordinates.
ENTRY NOT FND	Required FO, KNPT, or TGT initialization data not yet entered into the appropriate memory file. ACTION: Enter initialization data for required FO, KNPT, or TGT, or choose alternate course of action not requiring this data.
EXCESSIVE WIND	Wind deviations exceed stability limitations of MBC. ACTION: Verify MET entries. If correct, this MET is unusable.

ERROR MESSAGE	EXPLANATION and ACTION
FATAL ERR, REINIT	Mission data have been corrupted. ACTION: End mission with EOM and restart mission from beginning.
FILE EMPTY	No data in initialization data buffer. ACTION: Verify the initialization function selection under review and enter the required initialization data.
FILE FULL	No more initialization data storage space available in buffer. ACTION: Delete unneeded data to make space for new initialization data entries.
FO TOO CLOSE	FO is too close to target to perform MPI mission (within 10 meters). ACTION: Verify FO and target coordinate entries.
FORMAT ERROR	All valid data not entered into blank menu fields. ACTION: Enter all required data into blank menu fields or select alternate menu sequence using appropriate action switch.
FPF LN EMPTY	Selected FPF line is now unused. ACTION: Select appropriate FPF line having stored data.
GUN IS ADJUSTED	Adjustments have already been completed for this weapon. ACTION: Select new weapon to adjust only after all adjustments have been completed for the current weapon. Once new weapon is selected, previous adjustments are fixed and further adjustment is not permitted for weapon currently in use.
ID ASSIGNED	This KNPT number or TGT number entry has already been used. ACTION: Choose alternate number for data storage, or delete stored data before storing new data.
ILL ENTRY	Illegal value entered into blank field of data entry menu. ACTION: Determine proper value range for data and change data entry accordingly.
ILLEGAL CHARGE	Manually entered charge is invalid for selected ammunition. ACTION: Leave charge field blank (MBC selects optimum charge) or enter valid alternate charge.
ILLEGAL SWITCH	Invalid keypress. ACTION: Check entry. Make only valid entries.
ILLEGAL TGT NUM	Target number is within target number block range assigned in SET UP. ACTION: Manually enter a target number outside range defined in SET UP, or notify sender to retransmit valid target number.
INST:FAIL	Processor failure. ACTION: Return MBC to next higher maintenance level.
LN ALREADY INIT	FPF line is already in use (initialized). ACTION: Select alternate FPF line or clear line to reinitialize.

ERROR MESSAGE	EXPLANATION and ACTION
MAX NOT GREATER	MAX fire line is closer than MIN fire line. ACTION: Verify MIN and MAX fire line entries.
MODEM:FAIL	Modem CCA failure. ACTION: Return MBC to next higher maintenance level.
MSG BUFFER EMPTY	No messages are stored in message buffers. ACTION: DO NOT press MSG switch unless message lamp is blinking.
MSN # UNASSIGNED	Unassigned mission selected for activation. ACTION: Activate an alternate mission when operating on a previously initiated mission.
MSN ERROR	Probable MBC software fault. ACTION: End mission and reenter. Compute mission. If error reoccurs, return MBC to next higher maintenance level.
N TOO BIG	Computed delta northing exceeds 32767. ACTION: Verify all entries affecting delta northing. Also, verify that MIN E and MIN N entries in SET UP data are appropriate for mission coordinates.
NO ACTIVE MSN	No missions are stored in mission buffers or no mission is presently activated. ACTION: Initiate new mission using GRID, SHIFT, or POLAR switch or FR message; or select a stored mission using MSN switch and appropriate display switch.
NO ADJUST DATA	All required adjust data have not been entered. ACTION: Do not press COMPUTE switch for an ADJ before viewing ADJ data entry field (DEV).
NO AVAIL MSN	Mission buffers are full (three missions stored). ACTION: Terminate one stored mission by selecting EOM, EOMRAT, or EOMFPF. Then initiate new mission.
NO CURRENT MET	Current MET has not been initialized. ACTION: Enter or review appropriate NEW MET data and initialize CURR MET by pressing UPDATE*, or select STD MET.
NO FO ENTERED	No FO entry in mission input data. ACTION: When sending digital response to manual input mission, enter FO ID when beginning mission. FO ID is entered automatically in BMD-supported missions.
NO MAP MOD	Computation (such as computing gun orders) requires MIN E and MIN N coordinates, and none were assigned in SET UP data entry. ACTION: Completely initialize SET UP data.
NO OUTPUT DATA	Review of FIRE DATA or SFTY DATA or other operation (such as ADJ, REG, or REPLOT) requires existing output data. ACTION: Press COMPUTE switch after properly entering appropriate mission input data.

ERROR MESSAGE	EXPLANATION and ACTION
NO SHEAF DATA	Special sheaf selected but without width or direction entry. ACTION: Enter all sheaf data before pressing COMPUTE switch.
NO TGT DATA	Insufficient target location data. ACTION: Press MSN switch, then sequence through mission input data menus. Enter all input data on all entry menus.
NO TGT NUM	Target numbers not yet assigned for target block definition in SET UP data. ACTION: Assign new block of target numbers using SET UP initialization menu sequence.
NO TRIANGLE	Line segments in SURV INT or RES problem do not converge. ACTION: Verify input angle and coordinate data entries.
NO WPN DATA	Weapon not yet selected using WPN/AMMO switch. ACTION: Enter weapon on WPN select menu before pressing COMPUTE switch.
POWER FAILURE	MBC powered down by means other than ON/OFF switch, such as by removing battery or external power. ACTION: Turn power off using ON/OFF switch before disconnecting power source.
PTS AVAIL:##	Remaining number of points available in fire zone storage buffer when new fire zone entry contains too many points. ACTION: Define new fire zone with fewer points or delete unused fire zones to provide additional buffer storage space.
RAM:FAIL @##	IMICRO test random access memory failure. ACTION: Return MBC to next higher maintenance level.
RANGE TOO SMALL	Range to target is zero, or when entering FIRE ZONES data, distance between points is less than 10 meters. ACTION: Verify mission input entry or FIRE ZONES data entry.
REG TOO BIG	Range corrections exceed 999 meters when computing a registration. ACTION: Register target only when range corrections are 999 meters or less (usually much less).
REV NO. FAILURE	Memory CCA and display/processor CCA have incompatible revision numbers. ACTION: Return MBC to next higher maintenance level.
RANGE TOO BIG	Entered or computed range is too large. ACTION: Change distance or coordinate entries to reduce range to acceptable value.
ROM:FAIL A##	MICRO test read-only-memory failure. ACTION: Return MBC to next higher maintenance level.

ERROR MESSAGE	EXPLANATION and ACTION
SAFETY VIOLATION	Impact point is outside defined safety fan boundaries. ACTION: Verify target location and safety data entries. Reenter, if necessary. No further action can be taken.
SINGLE WPN ONLY	More than one weapon is designated on TFC sequence GUNS: @# _____ menu but selected TFC CONtrol allows only one weapon. ACTION: Select TFC CONtrol function allowing multiple weapons, or DO NOT enter additional weapons.
SPC SHEAF ERROR	Weapon registration is illegal while in TFC CONtrol (SPECial SHEAF). ACTION: To perform a registration, change TFC CONtrol selection.
SUPERSONIC	Calculated shell velocity exceeds mach 1. ACTION: Prevailing nonstandard conditions provide inaccurate MBC calculations. Verify all nonstandard initialization entries including AMMO powder TEMP, AMMO weight corrections, all MET data, and target and weapon ALT.
TEMP OUT OF RNGE	Powder temperature entry outside range (-70 to 140). ACTION: Verify that powder temperature entry is within allowable range.
TEMP TOO LOW	MBC cannot compute gun orders for 107-mm mortars with extension when powder temperature is below -30 degrees. ACTION: Mission cannot be fired under given conditions. Verify ammunition powder temperature and target location entries.
TEMP TOO LOW	Air temperature in MET data is below 1536 (153.6 degrees Kelvin or -183.2 degrees Fahrenheit). ACTION: Verify that air temperature entry is 1536 or above.
TGT HIGH/RN BIG	Target is beyond maximum range or maximum altitude at maximum allowable safe charge, and charge has not been manually entered. ACTION: Mission cannot be fired under given conditions. Verify WPN/AMMO and target location entries.
TGT LOW/RN SMALL	Target is below minimum range or minimum altitude at minimum allowable safe charge, and charge has not been manually entered. ACTION: Mission cannot be fired under given conditions. Verify WPN/AMMO and target location entries.
TGT TOO HIGH	Target altitude is greater than 90 percent of MAX ORD of computed flight trajectory. Reliable results cannot be obtained. ACTION: Increase charge or elevation entries, if possible.

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Glossary

SECTION I. ACRONYMS AND ABBREVIATIONS

AAR	after-action report; after-action review
AC	alternating current
ACA	airspace coordination areas
A/F	adjust fire
AFATDS	Army Field Artillery Tactical Data System
ALT	alternate, used when describing the ALT key
AMC	at my command
AOF	azimuth of fire
AR	Army Regulation
ARTEP	Army Training and Evaluation Program
AZ	azimuth, used in conjunction with the LHMBC, MBC, and MFCS
BIT	built-in test
BOLAD	boundary outer limit alert distances
BPS	bits per second
CAS	close air support
CFF	call for fire
CFL	coordinated fire line
CI	commander's interface
CMD	command, used in conjunction with the MBC
COMSEC	communications security
CS	O-cholorobrnxylmalonstrile ("tear gas")
CSR	controlled supply rate
DA	Department of the Army
DC	direct current
DCT	deflection conversion table
DD	driver's display
DEFK	deflection correction
DF	deflection
DLY	delay
DMD	digital message device
DNL	do not load
DOF	direction of fire
DS	direct support
ELEV	elevation
EOM	end of mission
FA	field artillery
FBCB2	Force XXI battle command—brigade and below
FC	fires cell
FCS	frame check sequencing
FDC	fire direction center
FDCCP	Fire Direction Center Certification Program
FEC	forward error correction
FFE	fire for effect
FIST	fire support team

FLOT	forward lines of own troops
FM	frequency modulation; field manual
FO	forward observer
FOS	forward observer system
FPF	final protective fires
FPL	final protective line
FR	fire request
FSCL	fire support coordination line
FSCMs	fire support coordination measures
FSCOORD	fire support coordinator
FSE	fire support element
FSO	fire support officer
FT	firing table
FTX	field training exercise
FZ	fuze, used in conjunction with fire control equipment
GD	grid declination, gunner's display
GEOREF	geographical reference
GMT	Greenwich mean time
GPS	Global Positioning System
GT	gun-target
GUI	graphic user interface
HE	high explosive
HEQ	high-explosive quick
HOB	height of burst
IAW	in accordance with
ID	identification
ILLUM	illumination
IMLC	Infantry Mortar Leader’s Course
IMP	impact
IMU	inertial measurement unit
IR	infrared
IS	immediate suppression
ITEP	Individual Training and Evaluation Program
JMEM	joint munitions effectiveness manual
KNPT	known point, used in conjunction with the MBC
L	left, used in conjunction with fire control equipment
LARS	left add, right subtract
LAT	latitude, used in conjunction with fire control equipment
LB	lateral boundaries
LCD	liquid crystal display
LD	line of departure
LED	light-emitting diode
LFX	live-fire exercise
LHMBC	lightweight handheld mortar ballistic computer
LZ	landing zone
m	meter(s)
MANCOC	Maneuver Advanced Noncommissioned Officer Course
MAZ	mounting azimuth

MBC	mortar ballistic computer
MDP	meteorological datum plane
MET	meteorological
METL	mission-essential task list
MFCS	Mortar Fire Control System
MGRS	Military Grid Reference System
MIN	minimum, used in conjunction with fire control equipment
mm	millimeter
MOA	method of attack
MOC	method of control
MOF	method of fire, multi-option fuze
MOS	military occupational specialty
MPI	mean point of impact
MPS	meters per second
MSDA	mortar surface danger area
Msg	message, used in conjunction with fire control equipment
MTO	message to observer
MTP	mission training plan
MTSQ	mechanical time superquick
NCO	noncommissioned officer
NFA	no-fire area
NGF	naval gunfire
NiMH	nickel metal hydride
Obs Num	observer number
OIC	officer in charge
OP	observation point; operation
OpACK	operationally acknowledge, used in conjunction with fire control equipment
OpOUT	operationally out, used in conjunction with fire control equipment
OpRDY	operationally ready, used in conjunction with fire control equipment
OpSTA	operationally stationary, used in conjunction with fire control equipment
OpStatus	operation status, used in conjunction with fire control equipment
OT	observer-target
PD	point-detonating
PDA	personal digital assistant (Chapter 17 only); power distribution assembly (Chapter 15)
PE	probable error
PE_d	probable error in deflection
PE_r	probable error in range
PLGR	precision lightweight Global Positioning System receiver
PMCS	preventive maintenance checks and services
PRN	printer, used in conjunction with fire control equipment
PROX	proximity
PTM	plain text message
QWERTY	standard typewriter keyboard, top row left, first six letters
R	right, used in conjunction with fire control equipment
RALS	right add, left subtract
RAM	random access memory; volatile; stores data only until device is turned off or loses power
RCF	range correction factor
RFA	restricted fire area
RFL	restricted fire line

Rnds Cmplt	rounds complete, used in conjunction with fire control equipment
ROM	read-only memory
RP	registration point, red phosphorus
RPDA	ruggedized personal digital assistant
RPM	rounds per minute
RTO	radiotelephone operator
S-3	operations and training officer
SAASM	selective availability antispoof module (type of GPS card)
SD	secure digital (memory card)
SL	section left
SOI	signal operating instructions
SOP	standing operating procedure
SQ	superquick
SR	section right
STX	situational training exercise
TC	training circular
TCIM	tactical communication interface modem
TDC	time dispersal coding
TFC	technical fire control
TFT	thin-film transistor
TGT	target, used in conjunction with fire control equipment
TL	traverse leg
TM	technical manual
TMPC	terrain mortar position correction
TOC	tactical operations center
TOF	time of flight
TOT	time on target
TRADOC	United States Army Training and Doctrine Command
TRC	total range correction
TS	traverse station
TTT	time to target
UO	urban operations
URN	unit reference number
US	United States
UTM	universal transverse mercator
V	volt
VA	vertical angle
VDC	volt direct current
VI	vertical interval
VMS	vehicle motion sensor
VT	variable time
WP	white phosphorus
WPN	weapon, used in conjunction with fire control equipment
WR	when ready, used in conjunction with fire control equipment

SECTION II. TERMS

decrement	a gradual decrease in quality or quantity; or the amount of decrease
random-access memory	read-write computer memory on which the location of data does not affect the speed of its retrieval; especially, the main storage available to the user for programs and data
read-only memory	a usually small computer memory that contains special-purpose information, such as operating system software, which must not and cannot be altered
volatile memory	memory that stores data only until device is turned off or loses power
zeroize	to return to zero

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These documents must be available to the intended users of this publication.

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TM 9-2350-277-10. *Operator's Manual For Carrier, Personnel, Full-Tracked, Armored, M113A3 (NSN 2350-01-219-7577) Carrier, Command Post, Light Tracked, M577A3 (2350-01-369-6058) Carrier, Anti-Tank (Tow), Full Tracked, Armored, M901A3 (2350-01-369-7253) Carrier, Fire Support Personnel, Full Tracked, Armored, M981A3 (2350-01-369-6079) Carrier, Smoke Generator, Full Tracked, M1059A3 (2350-01-369-6083) Carrier, Mortar, 120-mm M121, Self Propelled, M1064A3 (2350-01-369-6282) Carrier, Standardized Integrated Command Post System (SICPS) M1068A3; Carrier, Mechanized Smoke Obscurant M58*. 2 January 2001.

ARMY FORMS

DA Form 2188-R. *Data Sheet (LRA).*
DA Form 2399-R. *Computer's Record (LRA).*
DA Form 2601-1-R. *MET Data Correction Sheet for Mortars (LRA).*
DA Form 2601-2-R. *MET Data Correction Sheet 6400-Mils (Mortars) (LRA).*
DA Form 3675-R. *Ballistic Message (LRA).*
DA Form 3677-R. *Computer MET Message (LRA).*
DA Form 5472-R. *Computer's Record (MPI) (LRA).*

READINGS RECOMMENDED

These sources contain relevant supplemental information.

FM 4-25.11. *First Aid*. Reprinted with Change 1. 23 December 2002.
FM 6-30. *Tactics, Techniques, and Procedures for Observed Fire*. 16 July 1991.
FM 7-0. *Training the Force*. 22 October 2002.
FM 7-1. *Battle Focused Training*. 15 September 2003.
FM 7-90. *Tactical Employment of Mortars*. 09 October 1992.
FM 25-4. *How to Conduct Training Exercises*. 10 September 1984.
FT 81-AR-2. *Firing Tables for Mortar, 81-mm, M252, Firing Cartridge, HE, M821, Cartridge, HE M889, Cartridge, RP, M819, Cartridge Illum, M853A1, Cartridge TP, M879, Cartridge HE, M821A1 and 821A2, Cartridge HE, M889A1 and Mortar, 81mm, M29A1, Mortar,81mm, M252, Mortar, 120mm, M120 and M121 with 81mm, Insert Training Device Firing Cartridge, TP (SR), M880*. 1 June 1997.
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US Army Publishing Directorage	http://www.apd.army.mil
DA Forms	http://www.apd.army.mil/USAPA_PUB_formrange_f.asp
General Dennis J. Reimer Training and Doctrine Digital Library	http://www.adtdl.army.mil

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MET DATA CORRECTION SHEET FOR MORTARS

For use of this form, see FM 3-22.91; the proponent agency is TRADOC.

COMMAND DATA			MET MESSAGE			
CHARGE	CHART RANGE	ELEVATION	TYPE	STATION	DATE	
ALT OF MORTARS (m)			TIME	ALT MDP	LINE NUMBER	
ALT OF MDP			WIND DIRECTION	WIND VELOCITY	AIR TEMP	AIR DENSITY
SECTION ABOVE + MDP Δ H BELOW —		+ —	Δ H CORRECTIONS		$\Delta^T \pm$	$\Delta^D \pm$
			CORRECTED VALUES			

WIND COMPONENTS AND DEFLECTION CORRECTION

WHEN DIRECTION OF WIND IS LESS THAN DIRECTION OF FIRE ADD	6400
DIRECTION OF WIND	
DIRECTION OF FIRE	
CHART DIR OF WIND	

CROSS WIND _____ (VELOCITY) X L R _____ (COMPONENT) = L R _____ (LATERAL WIND) KNOTS X _____ (CORR FACTOR) = _____ (DEFL CORR)

RANGE WIND _____ (VELOCITY) X T H _____ (COMPONENT) = T H _____ (RANGE WIND) KNOTS

MET RANGE CORRECTIONS

	KNOWN VALUE	STANDARD VALUES	VARIATION FROM STANDARDS	UNIT CORRECTIONS	PLUS	MINUS
POWDER TEMP	ΔV —	0	D I			
RANGE WIND	T H	0	T H			
AIR TEMP		100	D I			
AIR DENSITY		100	D I			
WT OF PROJECTILE	□	2 □	D I			
				TOTAL		
				RANGE CORR		

MET CORRECTION TO APPLY

	DEFL	RANGE
LAST MESSAGE	L R	+ —
THIS MESSAGE	L R	+ —
CORR TO APPLY	L R	+ —

MET DATA CORRECTION SHEET 6400 MILS (MORTARS)

For use of this form, see FM 3-22.91; the proponent agency is TRADOC.

FIRING DATA			MET MESSAGE			
CHARGE	CHART RANGE	ELEVATION	TYPE	STATION	DATE	TIME

ALTITUDE OF MORTARS (M)		ALT MDP	LINE NUMBER	WIND DIRECTION
ALTITUDE OF MDP		WIND VELOCITY	AIR TEMP	AIR DENSITY
SECTION ABOVE + BELOW − MDP Δ H	+ −	Δ H CORRECTIONS	Δ T ±	Δ D +
		CORRECTED VALUES		

WIND COMPONENTS

WHEN DIRECTION OF WIND IS LESS THAN DIRECTION OF FIRE ADD	
DIRECTION OF WIND	
TOTAL	
DIRECTION OF FIRE	

	(RP) I	II	III	IV	V	VI	VII	VIII
CHART DIRECTION OF WIND (6400 IS LESS THAN CORRESPONDING DIRECTIONAL VARIATION TO CHECK POINTS)								
DIRECTIONAL VARIATION TO CHECK POINTS								
CHART WIND TO CHECK POINTS								

DEFLECTION CORRECTIONS

WIND VELOCITY (KNOTS)								
CROSS WIND COMPONENT	L R	L R	L R	L R	L R	L R	L R	L R
CROSS WIND	L R	L R	L R	L R	L R	L R	L R	L R
CROSS WIND CORRECTION FACTOR								
DEFLECTION CORRECTION	L R	L R	L R	L R	L R	L R	L R	L R

RANGE CORRECTIONS

WIND VELOCITY (KNOTS)								
RANGE WIND COMPONENT	T H	T H	T H	T H	T H	T H	T H	T H
RANGE WIND	T H	T H	T H	T H	T H	T H	T H	T H
RANGE WIND UNIT CORRECTION								
RANGE WIND CORRECTION	+ −	+ −	+ −	+ −	+ −	+ −	+ −	+ −

	KNOWN VALUE	STANDARD VALUES	VARIATION FROM STANDARD	UNIT	PLUS	MINUS
POWDER TEMP	Δ V = −		D I			
AIR TEMP			D I			
AIR DENSITY			D I			
PROJECTILE WT	☐	☐	D I			

ABSOLUTE REGISTRATION CORRECTIONS				
REGISTRATION CORRECTION	+ −	L R		
RP MET CORRECTION	+ −	L R	BALLISTIC RANGE CORR.	
ABSOLUTE REG. CORRECTION	+ −	L R		

DIRECTIONAL CORRECTIONS

	I (RP)	II	III	IV	V	VI	VII	VIII
BALLISTIC RANGE CORR.	+ −	+ −	+ −	+ −	+ −	+ −	+ −	+ −
RANGE WIND CORRECTION	+ −	+ −	+ −	+ −	+ −	+ −	+ −	+ −
TOTAL RANGE CORRECTION	+ −	+ −	+ −	+ −	+ −	+ −	+ −	+ −
MET CORRECTION	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R
ABSOLUTE REG. CORRECTION	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R
CORRECTIONS TO APPLY	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R	+ − L R

DATA SHEET

For use of this form, see FM 3-22.91 The proponent agency is TRADOC.

SETUP

TIME OUT:
TGT PRFX:
TGT NO:
ALARM: ☐ ON ☐ OFF
MIN E: _____
MIN N: _____
GD: ☐ E ☐ W
LAT: ☐ + ☐ -
LISTEN: ☐ ON ☐ OFF
BIT RATE:
KEY TONE:
BLK: ☐ SNG ☐ DBL
OWNER ID:

WEAPON DATA

UNIT:
___ mm CAR: ☐ YES ☐ NO
BP:
E:
N:
ALT:
AZ:
DEF:
ELE:

WPN: _____	WPN: _____
DIR: _____	DIR: _____
DIS: _____	DIS: _____
WPN: _____	WPN: _____
DIR: _____	DIR: _____
DIS: _____	DIS: _____
WPN: _____	WPN: _____
DIR: _____	DIR: _____
DIS: _____	DIS: _____

FO DATA

FO	ALT	GRID

AMMUNITION DATA

TEMPERATURE _____ **TYPE:** ☐ HE ☐ WP ☐ ILL ☐ CS ☐ TNG

LOT NUMBER									
WEIGHT									
ON HAND									
RECEIVED									
TOTAL									
ROUNDS EXPENDED									
ROUNDS REMAINING									

TARGET DATA

TARGET ID			CHART DATA		FIRING CORRECTIONS				FIRING DATA				INTELLIGENCE				ROUNDS	
TGT NO.	GRID	ALT	DEFL	RG / CHG	DEFL CORR	RANGE CORR	ALT / VI	ALT CORR	DEFL	RG / CHG	FUZE TIME SETTING	ELEV	TIME FIRED	TARGET DESCRIPTION	METHOD OF ENGAGEMENT	SURVEILLANCE	EXP	REM

LHMBC/MFCS DATA SHEET

For use of this form, see FM 3-22.91; The proponent agency is TRADOC.

GEO REF

Ellipsoid:

Datum:

Min Easting:

Min Northing:

Zone:

Hemi:

DATA

TGT Prefix:

MIN:

MAX:

Alarm:

☐ ON ☐ OFF

Next:

WEAPON DATA

Firing Unit:

mm CAR: Y ☐ N ☐

Unit Name:	Unit Name:
Easting/DIR:	Easting/DIR:
Northing/DIS:	Northing/DIS:
ALT:	ALT:
AZ:	AZ:
DEF:	DEF:
Obs Num:	Obs Num:
Unit Name:	Unit Name:
Easting/DIR:	Easting/DIR:
Northing/DIS:	Northing/DIS:
ALT:	ALT:
AZ:	AZ:
DEF:	DEF:
Obs Num:	Obs Num:

SUBSCRIBERS

FDC IP:

Unit:	URN:	ADR:	Grid:	Alt:	Obs#:

COMMO

COMMO	A	B
Protocol:		
Device Type:		
Modulation:		
Data Rate:		
COMSEC:		
FH Mode:		
EDC Mode:		
NAD Method:		
NET Usage:		
Num Stations:		
Rank:		

AMMUMITION DATA TEMP

Shell Type:					
Lot Number:					
On Hand:					
Received:					
TOTAL:					
RNDS Expended:					
RNDS Remaining:					

TARGET DATA

TARGET ID			CHART DATA		FIRING CORRECTIONS				FIRING DATA				INTELLIGENCE			ROUNDS	
TGT NO.	GRID	ALT	DEFL/ AZ	RG CHG	DEFL/ AZ CORR	RANGE CORR	ALT VI	ALT CORR	DEFL/ AZ	RG CHG	FUZE/TIME SETTING	ELEV	TGT DESC.	METHOD OF ENGAGEMENT	SURVEILLANCE	EXP	REM

COMPUTER'S RECORD (MPI)

For use of this form, see FM 3-22.91; the proponent agency is TRADOC.

UNIT | DATE | TIME

MESSAGE TO OBSERVERS

PREPARE TO OBSERVE MPI REGISTRATION

OP# _____ DIR _____ VA + - _____

OP# _____ DIR _____ VA + - _____

REPORT WHEN READY TO OBSERVE

VERTICAL ANGLE COMPUTATIONS

RP ALTITUDE _____

OP # _____	OP # _____
RP ALT _____	RP ALT _____
OP ALT _____	OP ALT _____
VI + - _____	VI + - _____
OP RANGE _____	OP RANGE _____
W / RXM _____	W / RXM _____
(VI + RN IN THOUSANDS - VA)	
100/R _____	100/R _____
VI x 100/R _____	VI x 100/R _____
(NEAREST .1)	*(NEAREST .1)*
VA + - _____	VA + - _____
(NEAREST MIL)	*(NEAREST MIL)*

OBSERVER'S READINGS

ROUND NO	OP #	OP #
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
(MUST BE SIX USABLE AZIMUTHS)		
TOTAL OF AZIMUTHS *(ADD EACH COLUMN)*		
AVG OF AZIMUTHS *(TOTAL ÷ 6)*		
DIR TO MPI		

DATA SECTION

81-MM/60-MM

RP GRID _____ CHA _____ ELE _____

RP ALT _____	MPI ALT _____
MORT ALT _____	MORT ALT _____
VI + - _____	VI + - _____
ALT CORR + - _____	ALT CORR + - _____
RP CHART DATA	MPI DATA
DEF _____	DEF _____
RN _____	RN _____
(MINUS ALT CORR)	*(MINUS ALT CORR)*
DEF CORR	RANGE CORR
RP DEF _____	RP RN _____
MPI DEF _____	MPI RN _____
DIFF L R _____	DIFF + - _____
DEF CORR L R _____	RCF + - _____
(TO APPLY, REVERSE SIGN)	*(TO APPLY, REVERSE SIGN)*

120 mm

MPI ALT _____ CHA FIRED _____

MORT ALT _____ CHA CORR + - _____

VI _____

(USE THIS VI TO COMP CHA CORR)
(SUBTRACT IF + AND IF -)

CHART CHARGE TO MPI _____

CHART DEFL TO MPI _____

(DRAW THE ADJ CHG GAGE LINE FROM THE MPI POINT TO THE CHART CHG OF THE MPI POINT

CHART RANGE TO MPI _____

DEFL FIRED _____

DEFL CORR R L _____

(DETERMINE THE LARS CORR TO GET FROM MPI TO RP DEFL)

GRID OF MPI _____

COMPUTER'S RECORD

For use of this form, see FM 3-22.91; the proponent agency is TRADOC

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER

☐ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID _____
OT DIRECTION _____
ALTITUDE _____

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

POLAR
OT DIRECTION _____ ALTITUDE _____
DISTANCE _____
☐ UP / ☐ DOWN _____
VERTICAL ANGLE ☐ + / ☐ - _____

TARGET DESCRIPTION
METHOD OF CONTROL
METHOD OF ENGAGEMENT
MESSAGE TO OBSERVER

FDC ORDER

MORTART TO FFE _____
MORTAR TO ADJ _____
METHOD OF ADJ _____
BASIS FOR CORRECTION _____
SHEAF CORRECTION _____
SHELL AND FUZE _____
_____
METHOD OF FFE _____
RANGE LATERAL SPREAD _____
TIME OF OPENING FIRE _____

INITIAL CHART DATA

DEFLECTION _____
DEFLECTION CORRECTION
☐ L ☐ R
RANGE _____
VI/ALT CORRECTION
☐ + ☐ -
RANGE CORRECTION
☐ + ☐ -
CHARGE/RANGE _____
AZIMUTH _____
ANGLE T _____

INITIAL FIRE COMMAND

MORTAR TO FOLLOW _____
SHELL AND FUZE _____
_____
MORTAR TO FIRE _____
METHOD OF FIRE _____
_____
DEFLECTION/AZIMUTH _____
CHARGE _____
TIME SETTING _____
ELEVATION _____
_____

ROUNDS EXPENDED

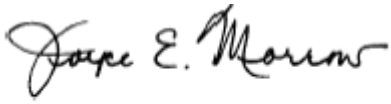
OBSERVER CORRECTION			CHART DATA		SUBSEQUENT COMMANDS						
DEV	RANGE	TIME (HEIGHT)	DEFL	CHARGE (RANGE)	MORTAR FIRE	METHOD FIRE	DEFL AZIMUTH	RANGE / CHARGE	TIME (SETTING)	ELEV	

FM 3-22.91
17 July 2008

By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:



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