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 topdown 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.

2	Question
ĝ	Adjust mission
深	Alert
深	Alert
彩	Alert
M	Steer to arrow for compass
LEE	Fire for effect
0	Immediate priority
CF	Check fire
NEW	New
PRC	Processed
0	Check
	Check on (read-only)
	Check off
~	Check on
0	Problem
×	Error
ð	Fire Direction Center

- E Emergency priority
- ▲ Forward observer
- Fire support element
- ð Gun
- Flash priority
- Information
- 🕀 Lock
- Steer to legend
- ! Exclamation
- P 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)
- R Routine priority
- Registration point (RP)
 - Firing point (FP)
 - Data

FP

DAHO

- + Target
- A 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.

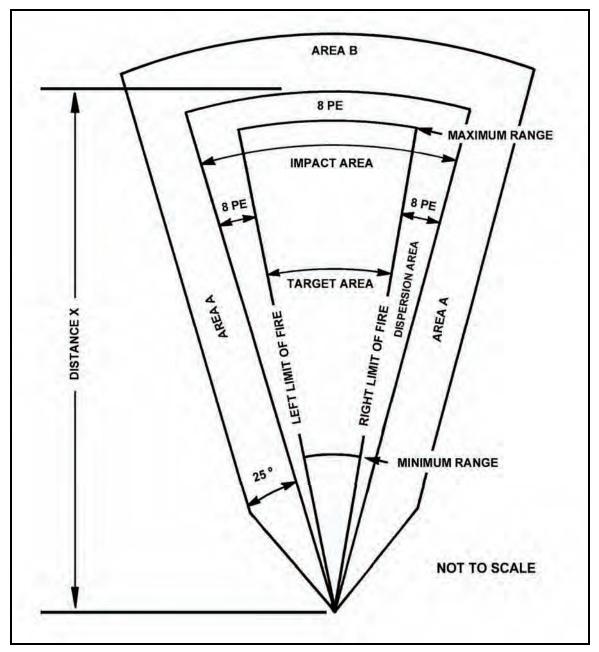


Figure C-1. Mortar surface danger zone.

(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.

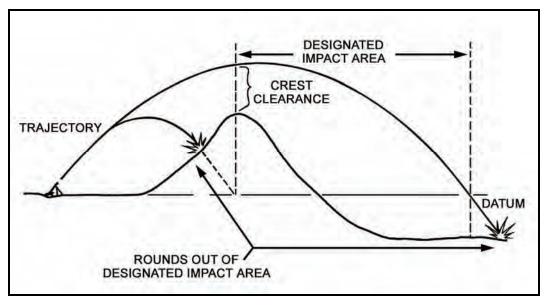


Figure C-2. Effects of vertical interval and crest clearances.

(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).

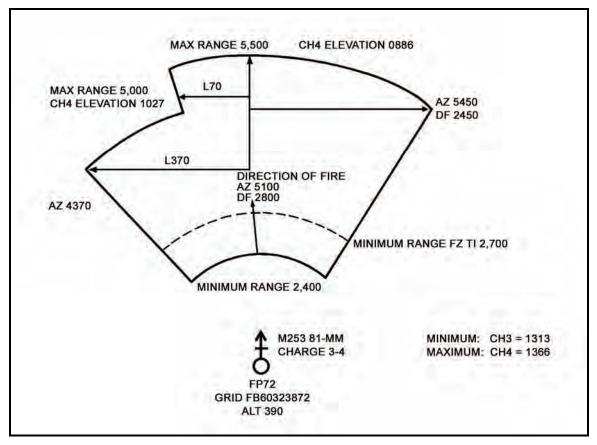


Figure C-3. Basic safety diagram.

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.

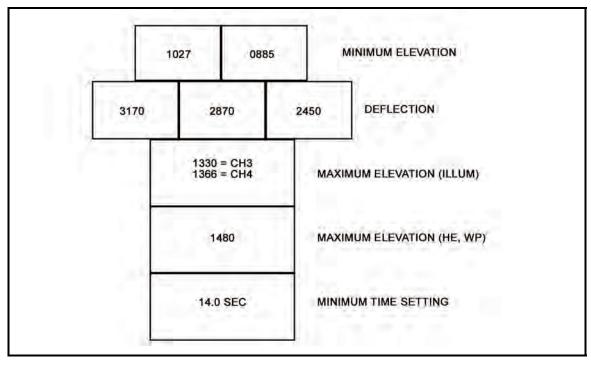


Figure C-4. Safety T.

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.

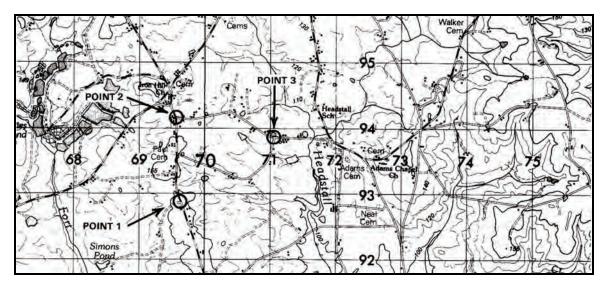


Figure D-1. Three distant points.

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

4520	
POINT 1	AIMING CIRCLE

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).

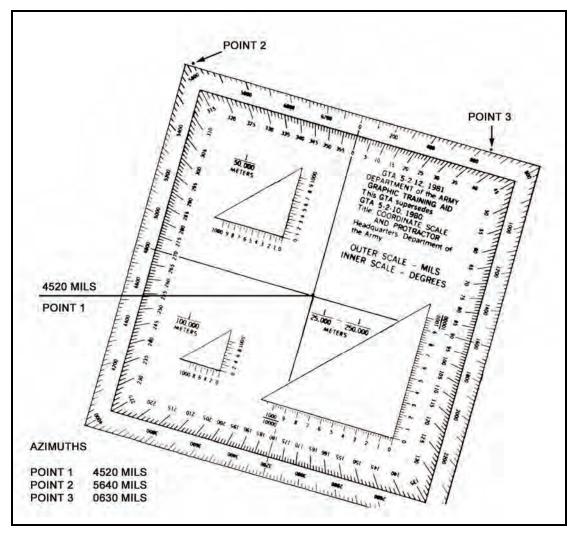


Figure D-3. Protractor aligned with correct azimuth.

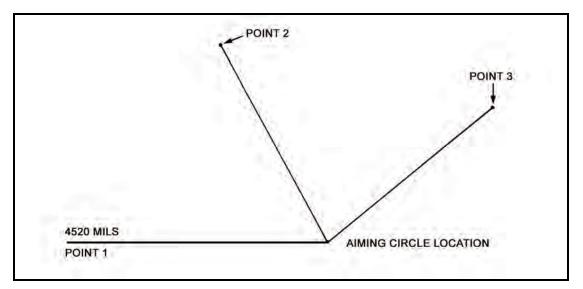


Figure D-4. Two more lines drawn from dot.

(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.

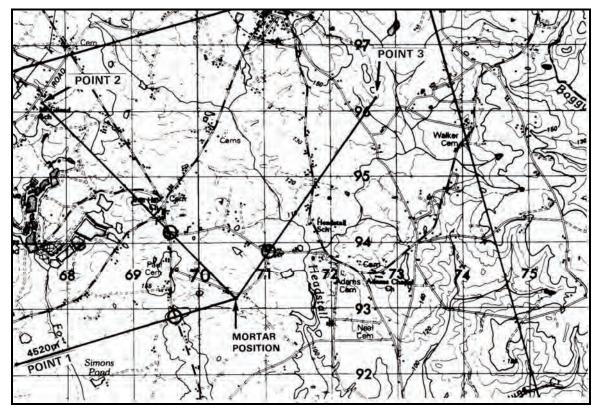


Figure D-5. Positioning of tracing paper.

(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).

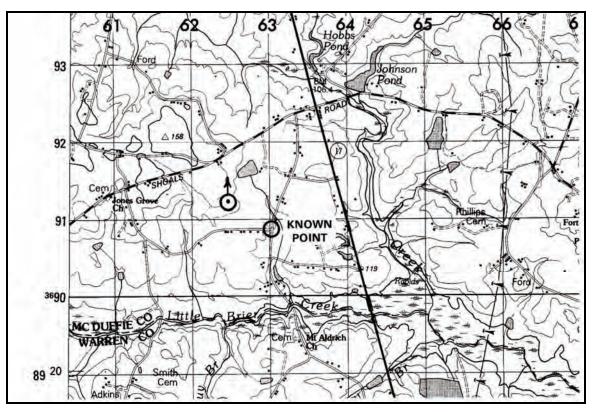


Figure D-6. Hasty survey.

- (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).

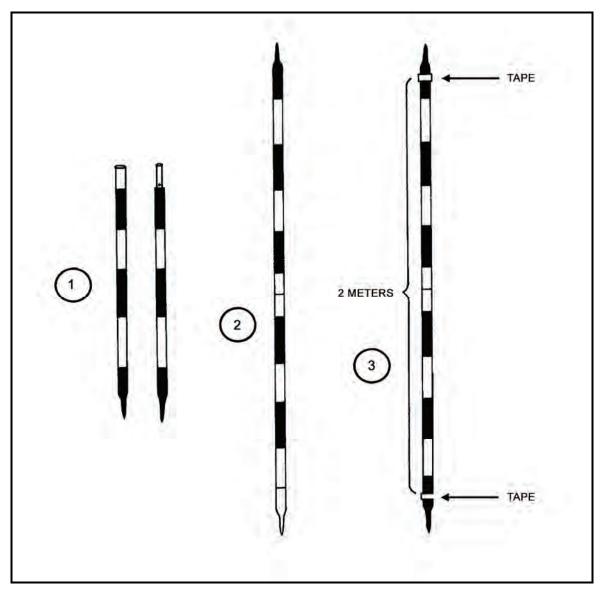


Figure D-7. Subtense bar.

- (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).

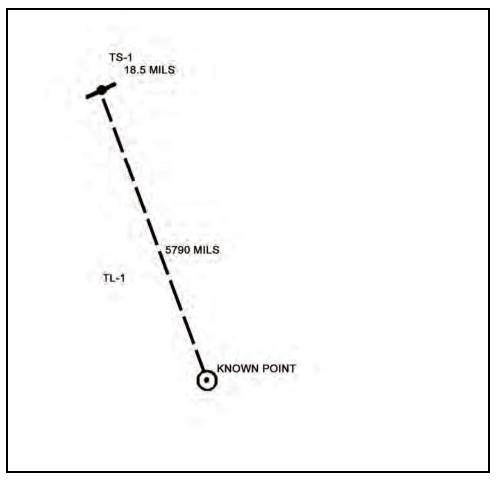


Figure D-8. Traverse leg 1.

- (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.

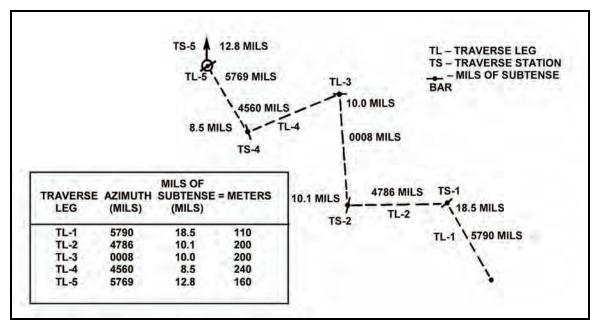


Figure D-9. Construction of a diagram.

- (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)										
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	6.61	
.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		1
11.0	185.20	18.0	113.17	25.0	81.48	32.0	63.66	39.0	52.23	1 1 1	1
.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		1
.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		
	sed with 2-m	1	La contra a la	0,	75,41	.0	00.02	.0	40.	10	

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 eightdigit 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: CONDITIONS: STANDARDS:	Place the MBC into operation using Given a BA 5588/U battery, power s Place the MBC into operation.		or external power sources. ble, MBC, and a variable power supply.				
TASK: CONDITIONS: STANDARDS:	Operate the panel switches on the I Given an MBC. Operate the panel switches without						
TASK: CONDITIONS: STANDARDS:	Perform the MBC system self-test. Given an operating MBC. Perform the self-test without error a your supervisor.	and report	any deficiencies, shortcomings, or failures to				
TASK: CONDITIONS: STANDARDS:	Given an MBC with setup, weapon,	Prepare an MBC with initialization data. Given an MBC with setup, weapon, and ammunition data. Enter the setup, weapon, and ammunition data into the MBC without error.					
SE	ETUP	WEAP	ON DATA				
	TIME OUT: 30		UNIT: A Co 2/41 IN				
	TGT PREFIX: AB		81-mm (M252)				
	TN: 0400-0800		CARRIER-MOUNTED:				
		NO					
	ALARM: OFF	00050	BP: A2 GRID PA 15880				
	MIN E: 010	88950	ALT 0410				
	GD: E01		AZ: 6400 DEF: 2800				
	LAT: +31		A1: Dir 1600 Dis 035				
	LISTEN ONLY: OFF		A3: Dir 4800 Dis 035				
	BIT RATE: 1200		A4: Dir 4800 Dis 070				
	KEYTONE: 1.4						
	BLK: SNG	AMMO	DATA				
	OWN ID: A		TEMP: 70 deg				
			HE: M374A2				
			WP: M375A2				
			ILL: M301A3				
TASK: CONDITIONS:			ordinates as the method of target location, DA				
STANDARDS:	Form 2399-R, FDC order, and DA Form 2188-R. Compute data for the mission's initial fire command to within 1 mil for deflection and elevation.						
TASK: CONDITIONS:		Form 21	88-R, CFF, FO's corrections, information to mortar platoon/ section SOP, and MBC.				
STANDARDS:	Record and compute the mission.	Correctly	complete all required blocks and spaces on and data needed for the type of mortar and				

For use	and the second sec	MPUTER'S F			ADOC.		
OFIGANIZATION A CO 2/41 IN		DATE 06/03/98	TIME	BOG T43		TARGET NUMBER	
ADJUST FIRE FIRE FOR EFFECT IMMEDIATE SUPPRESSION GRID: 15/5 9/95 OT DRECTION: 5850 ALTITUDE: 0350 TARGET DESCRIPTION: Trucks in METHOD OF ENGAGEMENT: Trucks in	SHIFT FROM: 01 DIRECTION: ULEFT / 0 AOD / 0 0 U VP / 0		ALTITUDE:				
FDC ORDER MORTAR TO FFE $S.C.$ MORTAR TO ADJ # 2 METHOD OF ADJ $/Rd$ BASIS FOR CORRECTION SHEAF CORRECTION SHEAF CORRECTION SHEAF CORRECTION SHEAL AND FUZE $//EQ.in.AST$ $HED.in.FFE$ $RANGE LATERAL SPREAD$ TIME OF OPENING FIRE U/R	DEFLECTION DEFLECTION RANGE VI/ALT CORRI RANGE CORF CHARGE/RAN AZIMUTH	0+0-		MORTAR TO SHELL AND MORTAR TO METHOD OF DEFLECTIO CHARGE TIME SETTIN	TIAL FIRE COMM/		

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?

INITIAL FIRE COMMAND (a) (b) **INITIAL FIRE COMMAND** MORTAR TO FOLLOW SEC Sec MORTAR TO FOLLOW SHELL AND FUZE HED SHELL AND FUZE HEQ #2 #2 MORTAR TO FIRE MORTAR TO FIRE METHOD OF FIRE / Rol in ADJ METHOD OF FIRE / Rd in ADT 2 Rds HEQ in FFE Rds in FFE 3042 DEFLECTION 6 CHARGE TIME SETTING TIME SETTING 1039 1030 ELEVATION ELEVATION (c) INITIAL FIRE COMMAND (d) INITIAL FIRE COMMAND MORTAR TO FOLLOW Sec MORTAR TO FOLLOW HEQ HEQ SHELL AND FUZE SHELL AND FUZE MORTAR TO FIRE. MORTAR TO FIRE ... METHOD OF FIRE / Rd. in ADV METHOD OF FIRE in 2 Rds HED E 3042 DEFLECTION ... DEFLECTION. 6 6 CHARGE CHARGE TIME SETTING TIME SETTING 019 039 ELEVATION ELEVATION

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?

		SUBSEC	UENT COMMAND	5	
MORTAR FIRE	METHOD FIRE	DEFL	RANGE	TIME (SETTING)	ELEV
SEC	2 HEQ	2994			1080
SEC	ZHED	2994			1054
SEC	2HED	2994			1072
SEL	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.

For use o	COMPUTER'S I f this form, see FM 3-22.91; The p		ency is TRA	DOC.		
ORGANIZATION	DATE	TIME		observerid T43	TARGET	NUMBER
ADJUST FIRE FOR EFFECT	енет раом: <u>AB 0.400</u> от direction: <u>5590</u> алтис 12 Герт / □ риант <u>800</u>	e	POLAR: OT DIRECTION DISTANCE:	·	ALIITUDE:	
	□ ADD / 10 OROP200 DUP / □ DOWN50		and the state of t			
TARGET DESCRIPTION: TFOODS	in woodline		METHOD OF C			
FDC ORDER	INITIAL CHART DATA		INITI	AL FIRE COMMA	ND	EXPENDE
MORTAR TO FFE		SH	IELL AND FL	OLLOW		
SHEAF CORRECTION SHELL AND FUZE HED METHOD OF FFE 2 RdG RANGE LATERAL SPREAD		DE	FLECTION.	7IRE		
TIME OF OPENING FIRE \mathcal{M}/\mathcal{R}	AZIMUTH	EL	ELEVATION			

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?

(b) (a) INITIAL FIRE COMMAND INITIAL FIRE COMMAND MORTAR TO FOLLOW Sec MORTAR TO FOLLOW Sec SHELL AND FUZE HED SHELL AND FUZE HED MORTAR TO FIRE MORTAR TO FIRE METHOD OF FIRE 2 Rds METHOD OF FIRE 2 Rds DEFLECTION 3226 DEFLECTION 3226 CHARGE 5 TIME SETTING TIME SETTING ELEVATION 0905 ELEVATION 0905 (d) (c) INITIAL FIRE COMMAND INITIAL FIRE COMMAND MORTAR TO FOLLOW Sec MORTAR TO FOLLOW Sec SHELL AND FUZE HED SHELL AND FUZE HED #2 MORTAR TO FIRE MORTAR TO FIRE METHOD OF FIRE 2 Rds 2 Rds METHOD OF FIRE DEFLECTION 2842 3226 DEFLECTION 4 CHARGE TIME SETTING TIME SETTING 0953 ELEVATION 0980 ELEVATION

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: CONDITIONS: STANDARDS:	Determine an unknown location by using resection (SURV key). Continued from Situation B. 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.

For use		DMPUTER'S I e FM 3-22.91; The p		and the second se	oc.		
ORGANIZATION	DATE TIME				oeserverid T43	TARGET	NUMBER
		0808	e	DISTANCE			
FDC ORDER MORTAR TO FFE. S. C. MORTAR TO ADJ. $\#2$. METHOD OF ADJ. Rd . BASIS FOR CORRECTION. SHEAF C	INITIAL CHART DATA DEFLECTION. DEFLECTION CORRECTION: DL RANGE. V/ALT CORRECTION: D+ RANGE CORRECTION: D+ CHARGE/RANGE. AZIMUTH			MORTAR TO F SHELL AND FI MORTAR TO F METHOD OF F DEFLECTION CHARGE TIME SETTING ELEVATION	AL FIRE COMMA		ROUND EXPENDI

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	

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?

1000		SUBSEC	QUENT COMMAND	s	
MORTAR	METHOD FIRE	DEFL	RANGE	TIME (SETTING)	ELEV
SEC	3 HEQ 3 WP	2470		1.	1092
SEC	3 HEQ 3 WP	2491			1131
SEC	3 HER 3WP	2470			1092
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	WEAPON DATA UNIT: A Co 2/41 IN 81-mm (M252) CARRIER-MOUNTED:
	ALARM: OFF MIN E: 003 MIN N: 089 GD: E01 LAT: +31 LISTEN ONLY: OFF BIT RATE:	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
	1200 KEYTONE: 1.4 BLK: SNG OWN ID: A	AMMO DATA TEMP: 70 deg HE: M374A2 WP: M375A2 ILL: M301A3 FO LOCATION W13 AP: 08250 92550 ALT: 0500
TASK: CONDITIONS: STANDARDS:		zation data. veapon, ammunition, and FO location data. nd ammunition data into the MBC without error.
TASK: CONDITIONS: STANDARDS:	Store safety data in the MBC Continuation of situation D a Store the safety diagram da	and safety diagram data.
	LLAZ: 1200 RLAZ: 2000 MAX RN: 4000 MIN RN: 0350 MIN CHG: 1	

MAX CHG: 8

TASK:	
CONDITIONS:	
STANDARDS:	

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

	F	COMPUTE or use of this form, see FM						
IDENTIFI- CATION METCM	OCTANT	LOCATION LaLaLa LoLoLo or or xxx xxx	DATE YY	TIME (GMT) GoGoGo	DURATION (HOURS) G	STATION HEIGHT (10's M) hhh	MDP PRESSURE MB Pd PdPd	
METCM	1	145 925	09	100	0	017	002	
merom		110 140		ZONEV	7.	011		
ZONE HEIGHTS METERS	LINE NUMBER ZZ	WIND DIRECTION (10s M) ddd	SP (KN	IND EED OTS)	TEMPERAT (1/10%)		PRESSURE (MILLIBARS)	
SURFACE	00	221		12	2947			
200	01						1002	
500	02	202	00		2976	2		
		220		4	3011	,	0963	
1000	03	190	00				0919	
1500	04	000	000		2939	-	0872	
2000	05	063	015		2933		0821	
2500	06	052	019		2918		0772	
3000	07		025		2899	-	0729	
3500	08	064	0.	*8	2864		0087	
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 T	DATE AND TIME (GMT)			DATE AND TIME (LST)		
MESSAGE NU	JMBER	RECORDER	9		CHECKE	D		

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

TASK: CONDITIONS: STANDARDS:

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

ORBANIZATION	DATE	TIME	OBSERVER I		TARGET NUMBER	
□ ADJUST FIRE □ FIRE FOR EFFECT □ IMMEDIATE SUPPRESSION GRD:	PPRESSION ot directions Altitude: 1365 ILEFT / BIGHT			POLAR: OT DIRECTION: ALTIFLIDE: DISTANCE: UP / DOWN VERTICAL ANGLE VERTICAL ANGLE METHOD OF CONTROL: MESSAGE TO COSSERVER: Prepare to REG RP00		
FDC ORDER MORTAR TO FFE. MORTAR TO ADJ. #2 METHOD OF ADJ. BASIS FOR CORRECTION SHEAF CORRECTION. SHEAF CORRECTION. SHEAL AND FUZE. METHOD OF FFE. RANGE LATERAL SPREAD.				INITIAL FIRE O		

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 (b) INITIAL FIRE COMMAND MORTAR TO FOLLOW Sec MORTAR TO FOLLOW Sec SHELL AND FUZE HEQ SHELL AND FUZE HEQ MORTAR TO FIRE # 2 #2 MORTAR TO FIRE METHOD OF FIRE 1 Rd 2 Rds in FFE DEFLECTION 2800 DEFLECTION 2800 6 CHARGE TIME SETTING..... TIME SETTING ELEVATION 0936 ELEVATION 0965 INITIAL FIRE COMMAND (c) (d) INITIAL FIRE COMMAND Sec MORTAR TO FOLLOW Sec MORTAR TO FOLLOW SHELL AND FUZE HEQ MORTAR TO FIRE # 2 MORTAR TO FIRE # 2 METHOD OF FIRE 1 Rd METHOD OF FIRE / Rd 2 Rds in FFE DEFLECTION 2800 DEFLECTION 2801 6 CHARGE CHARGE TIME SETTING TIME SETTING ELEVATION 0965 ELEVATION 0936

- 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								
MOR		METHOD	DEFL	RANGE	TIME (SETTING)	ELEV			
50	2	TROS/R #2. DNF	2840	7	-	1023			
Se	4	1 Rd S/R #2 DNF	2837			1030			
Se	4	S/R	2840	7		1023			
Se	C	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	TIME (SETTING)	ELEV				
(a)	#1	DNF	2823							
			32845	-		1017				
(b)	#3		2845							
	#1	-	2823			1017				
(c)	#3	DNE	2872							
	#/		2851			1001				
(d)	#1		2821			1024				
	#3	DNF	2842	-		1521				

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: CONDITIONS: STANDARDS:	Record all information on firing records. 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. 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.

For	1	MPUTER'S , see FM 3-22.91. T	10-2-2-22	Contraction of the	ADOC.		
ORGANIZATION		DATE	TIME		OBSERVERID TARGE		NUMBER
		<u><u><u>R</u>P00</u> <u>1400</u> ацти 1400 ацти 1813411 <u>500</u> бяюр <u>200</u> бомм <u>50</u> NKGR</u>		METHOD OF	GUE () +/ () -		
FDC ORDER MORTAR TO FFE. SEC. MORTAR TO ADJ. # 2. METHOD OF ADJ. I R.A. BASIS FOR CORRECTION <u>RPOO/CMET</u> SHEAF CORRECTION <u>CVG</u> # 2. SHELL AND FUZE. <u>HEQ. IN</u> <u>ADT</u> <u>HED. IN</u> <u>EFE</u> METHOD OF FFE. <u>3</u> Rds. RANGE LATERAL SPREAD.	DEFLECTION DEFLECTION RANGE VI/ALT CORI RANGE COF	0+ 0 -		MORTAR TO SHELL AND F MORTAR TO METHOD OF DEFLECTION CHARGE	IAL FIRE COMMAN FOLLOW UZE FIRE FIRE G		EXPENDE
TIME OF OPENING FIRE. W/R			DEITHERE	ELEVATION			

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 (b) INITIAL FIRE COMMAND MORTAR TO FOLLOW Sec MORTAR TO FOLLOW SCC HED SHELL AND FUZE HEQ SHELL AND FUZE MORTAR TO FIRE ... MORTAR TO FIRE # METHOD OF FIRE. 1 METHOD OF FIRE HED FFE Rds 2572 2674 DEFLECTION DEFLECTION ... 7 CHARGE CHARGE TIME SETTING TIME SETTING. 1047 ELEVATION 1071 ELEVATION (c) INITIAL FIRE COMMAND (d) INITIAL FIRE COMMAND MORTAR TO FOLLOW. MORTAR TO FOLLOW. HEQ SHELL AND FUZE SHELL AND FUZE MORTAR TO FIRE ... METHOD OF FIRE / Rdin METHOD OF FIRE. 3 Rds HED in ろ 26 7 DEFLECTION DEFLECTION CHARGE CHARGE TIME SETTING TIME SETTING. ELEVATION ELEVATION ...

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: CONDITIONS: Compute data for a converged sheaf.

IS: 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?

			SUBSEC	UENT COMMAND	S	
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE	TIME (SETTING)	ELEV
(a)	Sec	3HED	2662			
		14-1-2	2)2672			
	-		2682		-	
			2692	-		1030
b)	Sec	3 HED	2681	2)	1009
	1000	A	2621			1008
			32661		-	1006
			4)2651	1.1		1005
c)			2684			1002
	1		2474		1	1000
		12.21	32664			0999
			\$2654			0997
d)		1	2674			1000
			2664			0999
	10.000		2454			0998
			2654			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.

For u	and the second sec	See FM 3-22.91; The	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		DOC.	_	
ORGANIZATION		DATE	TIME		OBSERVERID TANG		NUMBER
ADJUST FIRE FIRE FOR EFFECT IMMEDIATE SUPPRESSION GRID: 1015 9305 OT DIRECTION: 1320 ALTITUDE: 380 TARGET DESCRIPTICH: Foot Bridge METHOD OF ENGAGEMENT:		Гяант OROP DOWN)6:	POLAR: OT DIRECTION DISTANCE: VERTICAL ANK METHOD OF 0 MESSAGE TO			
FDC ORDER MORTAR TO FFE. Sec. MORTAR TO ADJ # 2 METHOD OF ADJ / Rd. BASIS FOR CORRECTION SPECTAL SHEAF CORRECTION / PO M WI SHELL AND FUZE HEQ METHOD OF FFE. 3 Rds RANGE LATERAL SPREAD TIME OF OPENING FIRE W/R.	PANGE VVALT COR RANGE COR RANGE COR RANGE COR CHARGE/R/ AZIMUTH	0+0-		MORTAR TO F SHELL AND F MORTAR TO F METHOD OF I DEFLECTION CHARGE CHARGE CHARGE	AL FIRE COMMAI		

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?

	S		SUBSEC	UENT COMMAND	s	
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE	TIME (SETTING)	ELEV
)			2586			0912
)			2584			0965
)			2686			0941
)			2694	1		1072

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

TASK: CONDITIONS: STANDARDS: Compute data for a special sheaf using the CFF and FDC order in Figure E-7. Given an MBC with a mission already in progress.

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?

			SUBSEC	UENT COMMAND	IS	
	MORTAR FIRE	METHOD	DEFL	RANGE	TIME (SETTING)	ELEV
a)	Sec	3Rds	2599	6		1086
			2594			1086
		-	2605			1080
			2210			1080
b)	Sec	3 Rds	2602	6		1056
	-	1	2595			1061
			2589			1065
			2582			1069
c)	Sec	3Rds	2613	5	1	1060
			2601			1059
			2589			10.56
			\$2576			1053
d)	Sec	3 Rds				1087
			32569	-		1072
		-	2561			1060
		1	\$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
STANDARDS.	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.

For use		MPUTER'S		and the second se	C.		
ORGANIZATION		DATE	TIME				NUMBER
		<u>АА 0202</u> <u>1290</u> літт пант <u>20</u> баор <u>40</u> ронан <u>57</u>	uoe 0	POLARS OT DIRECTION: DISTANCE VERTICAL ANGL METHOD OF CX MESSAGE TO C			
FDC ORDER		TIAL CHART DAT	A	INITIA	L FIRE COMMA	ND	ROUNDS
MORTAR TO FFE $1 + 2$ MORTAR TO ADJ $# 2$ METHOD OF ADJ $1 Rd$ BASIS FOR CORRECTION AA. 0202 SHEAF CORRECTION SHEAL CORRECTION SHEAL AND FUZE HEQ in AD. T <u>PCOX</u> in <u>FFE</u> METHOD OF FFE 3 RdS RANGE LATERAL SPREAD TIME OF OPENING FIRE W/R	DEFLECTION RANGE VI/ALT CORF RANGE COF CHARGE/RA AZIMUTH	D+ D -		MORTAR TO FU MORTAR TO FI METHOD OF FI DEFLECTION CHARGE	DLLOW		

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

For use of	The strength End	FM 3-22.91; TI			ADOC.			
ORGANIZATION		DATE	TIME		OBSERVERID W13	TARGET	NUMBER	
		PRSHT	ITTUDE:	POLAR:				
FDC ORDER MORTAR TO FFE. 3+44 MORTAR TO ADJ. #3 METHOD OF ADJ. 1 Rd. BASIS FOR CORRECTION SHEAF C	DEFLECTIO DEFLECTIO RANGE V/ALT CORI RANGE COR CHARGE/R/ AZIMUTH	0+0-	-	MORTAR TO SHELL AND MORTAR TO METHOD OF DEFLECTION CHARGE	TIAL FIRE COMMAN FOLLOW			

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 tw	o?
-----	---------	-------------	---------	--------------	-----	------------	----

INITIAL FIRE COMMAND INITIAL FIRE COMMAND (a) (b) MORTAR TO FOLLOW 3+4 3+4 MORTAR TO FOLLOW HEQ HEQ SHELL AND FUZE SHELL AND FUZE # 3 MORTAR TO FIRE MORTAR TO FIRE METHOD OF FIRE . I.R.d. in METHOD OF FIRE / Rd in WP In FFE WP FFE in 2532 DEFLECTION 2556 DEFLECTION 6 CHARGE CHARGE TIME SETTING TIME SETTING. 0893 9 ELEVATION ELEVATION (c) INITIAL FIRE COMMAND (d) INITIAL FIRE COMMAND 3+4 3+4 MORTAR TO FOLLOW MORTAR TO FOLLOW ... HEQ SHELL AND FUZE SHELL AND FUZE #3 3 MORTAR TO FIRE MORTAR TO FIRE inA METHOD OF FIRE / Rd in. METHOD OF FIRE / Red ADV FEE 53 DEFLECTION. DEFLECTION. 6 CHARGE CHARGE TIME SETTING. TIME SETTING 0907 ELEVATION ELEVATION

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?

			SUBSEC	QUENT COMMAND	s	
M	ORTAR FIRE	METHOD FIRE	DEFL	RANGE	TIME (SETTING)	ELEV
-	#2		2556	-4	-	0939
Ŧ	#2	IRd	2547	- 4		1112
Ĩ			2543	- 4		0895
			2543	- 4		0928

NOTE: The FO spots the round for mission two and sends:
--

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

I			SUBSEC	QUENT COMMAND	s	
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE	TIME (SETTING)	ELEV
	#2		2556	-4	-	0939
	#2	IRd	2547	- 4		1112
			2543	- 4		0895
			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?

			SUBSEC	UENT COMMAND	s	
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE	TIME (SETTING)	ELEV
a)	3+4	3 Prox	2559			1081
)	1+2	3Prox	2557	5		1094
;)	1+2	3Prox	2559			1081
t)	1+2	3Prox	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.

ł

FO LOCATION F21 AP: 09850 93100 ALT: 0300

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

ZN104 PTSPT109450 93300PT210650 93300PT310650 93500PT409450 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.

For use		OMPUTER'S F ae Fm 3-22.91; The p		States of States	DOC.		
ORGANIZATION	DATE TIME		1	OBSERVER ID F21			
Y ADJUST FIRE FIRE FOR EFFECT IMMEDIATE SUPPRESSION GRID: 1085 93441 OT DRECTION: 1300 ALTITUDE: 280 TARGET DESORIPTION: FPF METHOD OF ENGAGEMENT:			POLAR OT DIRECTIO DISTANCE VERTICAL AN METHOD OF MESSAGE TO			Left	
Danger Clos FDC ORDER		TIAL CHART DATA		1.000	IAL FIRE COMMA	ND	ROUND
MORTAR TO FFE. SEC. MORTAR TO ADJ. SEC. MORTAR TO ADJ. SEC. METHOD OF ADJ SAL SHEAF CORRECTION L ADJ SHEAF CORRECTION L ADJ METHOD OF FFE. SRASS RANGE LATERAL SPREAD. TIME OF OPENING FIRE AMC	DEFLECTIO RANGE VI/ALT CORI RANGE COR CHARGE/RA AZIMUTH	0+0-		SHELL AND F MORTAR TO I METHOD OF DEFLECTION CHARGE TIME SETTIN ELEVATION	FOLLOW		

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,
STANDARDS:	and DA Form 2188-R. 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

		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	
TASK:Compute data for subsequent FO corrections using the MBC.CONDITIONS:Given an MBC with a mission already in progress and corrections from th apply.					from the FO to			
STANDA	RDS:		or the corrections to	within 1	nil for def	lection and eleva	tion.	
NOTE: The round is fired and the FO sends: NO. 4 GUN ADJUSTED, REPEAT NO. 3 GUN.								
25. Wha	t is the co	Dirrect deflection a DEF (mils) 3134	and elevation for No ELEV (mils) 1059	o. 3 gun? (b)	DEF (n 312-	,	. ,	
	()					100	-	

24. What are the confect initial deflections and clevations.	24.	What are the correct initial	deflections and elevations?
--	-----	------------------------------	-----------------------------

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

3127

3126

(c)

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

(d)

3134

0975

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

26. What	t is the corre	ect deflection DEF (mils)	and elevation for the ELEV (mils)	e No. 2 gun?	DEF (mils)	ELEV (mils)
	(a)	3126	0974	(b)	3141	0977
	(c)	3127	0975	(d)	3141	0950
	NOTES:		round is fired, T NO. 1 GUN.	and the	FO sends:	NO. 2 ADJUSTED,

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.

For use		DMPUTER' see Fm 3-22.91; 1	200002.000		ADOC.			
ORGANIZATION		DATE	TIME		OBJERVERID TARGE		NUMBER	
ADJUST FIRE FIRE FOR EFFECT	SHIFT FROM: POLAR: OT DIRECTION; ALTITUDE: OT DIRECTION; LEFT / RIGHT DISTANCE: DISTANCE: ADD / OROP				DION:ALTITUDE:			
FDC ORDER INITIAL CHART DATA				MESSAGE TO OBSERVER:				
MORTAR TO FFE	DEFLECTIO RANGE VVALT COR RANGE COI CHARGE/R/	DEFLECTION DEFLECTION CORRECTION:			FOLLOW			

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	(b)	INITIAL FIRE COMMAND
	MORTAR TO FOLLOW SEC		MORTAR TO FOLLOW Sec. Shell and fuze HEQ
	MORTAR TO FIRE		MORTAR TO FIRE METHOD OF FIRER.d. R.d.sR.d. DEFLECTION
c)	INITIAL FIRE COMMAND MORTAR TO FOLLOW SEC	(d)	INITIAL FIRE COMMAND MORTAR TO FOLLOW Sec. SHELL AND FUZE WP
	MORTAR TO FIRE		MORTAR TO FIRE METHOD OF FIRE 1 R. d. in ADJ 2 Rds WP in FFE DEFLECTION 2809
	CHARGE		CHARGE

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:	
CONDITIONS	5

Compute firing data for a quick-smoke mission.

S: 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.

For us	COMPUTE e of this form, see FM 3-22	R'S RECORD	ency is TRADOC.		
ORGANIZATION	DATE	TIME		Deserver id Target	
YADJUST FIRE FIRE FOR EFFECT IMMEDIATE SUPPRESSION GRO: 1/85 OT DIFECTION: 1/10 ALTTUDE: 300 TARGET DESCRIPTION: Screen Suspected METHODOF FERGRAGEMENT: Quartering -	SHIFT FROM: OT DIRECTION: LEFT / BIGHT ADD / DROP UP / DOWN ENEMY PIT 30 9 Min Duract	aritude:		1.2.4	
FDC ORDER	INITIAL CHART DATA		INITIAL FIRE COMMAND		
MORTAR TO FFE Sec MORTAR TO ADJ $#$ METHOD OF ADJ Rd BASIS FOR CORRECTION SHEAF CORRECTION S	DEFLECTION	ON: SHI] R MO] - CH] - CH	RTAR TO FOLLOW.		

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. Given an initialized MBC, CFF, DA Form 2399-R, and DA Form 2188-R. Compute the firing data for the mission to within 1 mil for deflection and elevation. CONDITIONS: STANDARDS:

For us		See FM 3-22.91;		a start but to be a start	ADOC.		
ORGANIZATION		CATE TIME			W13	TARGET NUMBER	
		OT DIRECTION:			POLAR: 07.50 ALTITUDE: DISTANCE 3700 UP / DOWN UP / DOWN VERTICAL ANGLE + / D METHOD OF CONTROL: MESSAGE TO OBSERVER:		
FDC ORDER MORTAR TO FFE Sec. MORTAR TO ADJ # B.3 METHOD OF ADJ / R.d.	DEFLECTION			MORTAR TO F	AL FIRE COMMANN		ROUND
BASIS FOR CORRECTION SHEAF CORRECTION SHELL AND FUZE/ HEQ in ADT WP in FFE METHOD OF FFE. 3 Rds RANGE LATERAL SPREAD TIME OF OPENING FIRE W/R	VVALT CORP RANGE COF CHARGE/R/ AZIMUTH	D+ D -		METHOD OF F	IRE		

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?

INITIAL FIRE COMMAND (a) (b) INITIAL FIRE COMMAND MORTAR TO FOLLOW B. Sec HEQ SHELL AND FUZE SHELL AND FUZE 3 MORTAR TO FIRE ... MORTAR TO FIRE Rd 1 IRd METHOD OF FIRE METHOD OF FIRE WP in FFE UP FFE in 2803 2803 DEFLECTION. DEFLECTION 8 8 CHARGE CHARGE TIME SETTING TIME SETTING. 0951 0981 ELEVATION ELEVATION (c) INITIAL FIRE COMMAND (d) INITIAL FIRE COMMAND B Sec Sec MORTAR TO FOLLOW MORTAR TO FOLLOW ... HEQ SHELL AND FUZE HEQ SHELL AND FUZE # # MORTAR TO FIRE. MORTAR TO FIRE METHOD OF FIRE / Rel in ADV METHOD OF WP in FFE Rds 2796 796 DEFLECTION ... DEFLECTION 8 CHARGE CHARGE . TIME SETTING TIME SETTING 096: 9 ELEVATION ELEVATION.

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?

			SUBSEC	DUENT COMMAND	S	
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE	TIME (SETTING)	ELEV
a)	Sec	3 Rds WP	B3+4 2787			0949
			#1+2.			1033
b)	Sec	3 Rds	83+4			0968
			#1+2-2542		1	1039
c)	Sec	3 Rds WP	2787			0949
d)	Sec	3 Rds	2536		1	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.

For use	CON e of this form, see	FM 3-22.91. The			DOC.		
OHGANIZATION	D	ATE	TIME		OBSERVERID F21	TARGET	NUMBER
ADJUST FIRE FIRE FOR EFFECT IMMEDIATE SUPPRESSION GRID: 1042. 9534 OT DRECTION: 0250 ALTITUDE: 380 TARGET DESCRIPTION: CO in Open 1 METHOD OF ENGAGEMENT:	SHIFT FROM: OT DIRECTION: USPT / BIG DOD / OR UP / DOD 00 × 300			METHOD OF	GLE [] + /]	-	
FDC ORDER MORTAR TO FFE <u>5.CC</u> MORTAR TO ADJ <u># 2</u> METHOD OF ADJ <u>1.R.d</u> BASIS FOR CORRECTION SHEAF CORRECTION SHELL AND FUZE <u>HEQ</u>	DEFLECTION DEFLECTION C RANGE W/ALT CORREC			MORTAR TO I SHELL AND F MORTAR TO I METHOD OF	FOLLOW		EXPENDE
METHOD OF FFE	CHARGE/RANGE			ELEVATION			

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: CONDITIONS: STANDARDS:

Compute data for a traversing mission using the CFF and FDC order in Figure E-15. Given an MBC with a mission already in progress.

Compute data for the corrections to within 1 mil for deflection and elevation, and determine turns to the nearest one-half turn.

For use		MPUTER'S			DOC.			
ORGANIZATION		DATE	TIME		OBSERVERID TARSI		NUMBER	
GRID: 1/89 9410 LEFT / ROHT DISTANCE OT DRECTION: 1/50 ADD / OROP DISTANCE ALTITUDE: 400 OWN VETTICAL A TARGET DESCRIPTION: 400 OWN VETTICAL A TARGET DESCRIPTION: ADD / OWN WETTICAL A METHOD OF ENCAGEMENT: MESSAGE MESSAGE								
FDC ORDER	IN	TIAL CHART DAT	TA	INITIAL FIRE COMMAND			ROUNDS	
MORTAR TO FFE. Sec. MORTAR TO ADJ. #2. METHOD OF ADJ. /Rd. BASIS FOR CORRECTION K 4250 SHEAF CORRECTION K 450 SHELL AND FUZE HEQ in ANT WP in FFE METHOD OF FFE. 5 Rds. RANGE LATERAL SPREAD. TIME OF OPENING FIRE. W/R .	DEFLECTIO RANGE VVALT COR RANGE CO CHARGE/RU AZIMUTH	0+0-		SHELL AND F MORTAR TO METHOD OF DEFLECTION CHARGE TIME SETTIN ELEVATION	F01LOW			

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?

	100		SUBSEC	QUENT COMMANI	DS	and the state
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE	TIME (SETTING)	ELEV
a)	Sec	6 Rds WP	2580	-		1119
			2638			1126
		11	2696		-	1131
1	1		2713	1		1147
(b)	Sec	5 Rds WP	2645	Right	Iturn	1115
	1.00		2685		1000	1119
	1		2724		-	0862
			\$2762			0867
c)	Sec	5 Rds WP	2598	Right	1 turn	1122
			2637	12.00		1126
			32677			1129
			\$2716			1132
d)	Sec	WP B	2417			1124
		1	2676			1129
	-		2735			0910
			\$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: CONDITIONS: STANDARDS: Compute firing data for an illumination mission.

Given an initialized MBC, CFF, DA Form 2399-R, and DA Form 2188-R.

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.

For use of		FM 3-22.91; The pro	202 0 22		oc.		
OPGANIZATION		DATE	TIME		observer 10 F21	TARGET	NUMBER
ADJUST FIRE FIRE FOR EFFECT IMMEDIATE SUPPRESSION GRED: //25 OT DRECTICAL //00 ALTITUDE: TARGET DESCRIPTION: Suspected METHOD OF ENGAGEMENT: TLLUM	SHIFT FROM: OT DIRECTION: LEFT / [] A00 / [] Un / [] ENemy /	DROP		POLAR: OT DIRECTION DISTANCE: VERTICAL ANK METHOD OF C MESSAGE TO	k / □ UP / □ 00 aug □ + /□ - Σοληπου		
FDC ORDER	INIT	TIAL CHART DATA		INITI	AL FIRE COMMA	ND	ROUND
MORTAR TO FFE. MORTAR TO ADJ. METHOD OF ADJ. BASIS FOR CORRECTION SHEAF CORRECTION SHELL AND FUZE <u><i>LLL</i></u> METHOD OF FFE. RANGE LATERAL SPREAD TIME OF OPENING FIRE. <u><i>ULR</i></u>	DEFLECTION RANGE VVALT CORR RANGE COR CHARGE/RAI AZIMUTH	□+ □ -	1 	SHELL AND FI MORTAR TO F METHOD OF F DEFLECTION CHARGE TIME SETTING ELEVATION	OLLOW		

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	TIME (SETTING)	ELEV		
#/	1 Rd	3088		24.4	1026		
		3089		28.9	1021		
#/	1Rd	3089		26.4	1026		
		3088		26.4	1026		

TASK: CONDITIONS: STANDARDS:

Compute data for a coordinated illumination mission using the CFF in Figure E-17. Given an initialized MBC, CFF, DA Form 2399-R, and DA Form 2188-R. 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		GRISERVERID F2/	TARGET NUMBER		
ADJUST FIRE IFIRE FOR EFFECT	SHIFT FROM:	- 4	ALTITUDE:	POLAR: OT DIRECTION	No at	LITTUGE:		
GRD: 1/25 9385								
OT DIRECTION: 1100				UP / _ DOWN				
TARGET DESORIPTION: ENEMY V	eh			METHOD OF	CONTROL			
METHOD OF ENGAGEMENT: WP in			-	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) (b) FDC ORDER FDC ORDER 2+3 MORTAR TO FFE MORTAR TO FFE # #2 MORTAR TO ADJ MORTAR TO ADJ Rd METHOD OF ADJ METHOD OF ADJ BASIS FOR CORRECTION BASIS FOR CORRECTION SHEAF CORRECTION SHEAF CORRECTION SHELL AND FUZE HEQ IN ADJ HEQ IN ADT SHELL AND FUZE .. WP ND METHOD OF FFE METHOD OF FFE. RANGE LATERAL SPREAD. RANGE LATERAL SPREAD. TIME OF OPENING FIRE ... TIME OF OPENING FIRE. (c) FDC ORDER (d) FDC ORDER 2+3+ sec MORTAR TO FFE ... MORTAR TO FFE #2 MORTAR TO ADJ MORTAR TO ADJ Rd Rd METHOD OF ADJ . METHOD OF ADJ BASIS FOR CORRECTION BASIS FOR CORRECTION SHEAF CORRECTION SHEAF CORRECTION SHELL AND FUZE HEQ IN AD SHELL AND FUZE HEQ. IN. Ras 3 2 METHOD OF FFE. METHOD OF FFE. RANGE LATERAL SPREAD. RANGE LATERAL SPREAD. TIME OF OPENING FIRE ... TIME OF OPENING FIRE

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	ELEV		DEF	ELEV	
	(mils)	(mils)		(mils)	(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	RIGHT DEF
	(mils)	(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: CONDITIONS: STANDARDS:	Given an M16 plotting board, a Series:V745Z; a mil protractor eight-digit coordinate to the m represent the pivot point.	eration using the modified-observed firing chart. a Fort Benning Installation Map 1:50,000, Edition 1-DMA, ; an area of responsibility; a direction of fire (DOF); an ortar position; a target or RP; and a grid intersection to a the M16 plotting board using the grid intersection given
TASK: CONDITIONS: STANDARDS:	Given an M16 plotting board, I DA Form 2399-R, CFF, and firm Plot the target, compute the	dified-observed chart from an observed chart. DA Form 2188-R with previously fired targets, setup data, ng table. firing data to within 1 mil with a 10-mil tolerance for ange with a 25-meter tolerance, and record and update
OP No. 1: 0 Direction of Grid interso Mounting a Referred do	f fire: 2020 mils ection: 09/64 azimuth: 2000 mils eflection: 4800 mils	Altitude: 440 Altitude: 450 Chart deflection: 4536 mils
Forward pl	ot AC070:	Chart deflection: 4536 mils

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.

Chart range: 2,950 meters Altitude: 440 meters

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: CONDITIONS: STANDARDS:	Determine the VI between the mortar altitude and the target altitude. Given the mortar altitude and the target altitude. 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: CONDITIONS: STANDARDS:	Compute angle T. Given the observer to target (OT) direction, direction of fire (GT), No. 2 pencil, and paper. 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.

For use	and some a set of the set	OMPUTER'S ee FM 3-22.91; The p		and the second second	DOC.		
ORGANIZATION		DATE	TIME		observerid H51	TARGET	NUMBER
Y ADJUST FIRE FIRE FOR EFFECT IMMEDIATE SUPPRESSION BRID: 098 098 654 ot direction: 1800 ALTITUDE: 490 TARGET DESCRIPTION: ENY END OF ENDAGEMENT:	SHIFT FROM: OT DIRECTION: LEFT / [] 0 400 / []	REGHT)E:	METHOD OF	MtA		
FDC ORDER	IN	INITIAL CHART DATA		INITIAL FIRE COMMAND		ND	ROUNDS
MORTAR TO FFE. $Sec.$ MORTAR TO ADJ. $#2$ METHOD OF ADJ. $LRd.$ BASIS FOR CORRECTION. SHEAF CORRECTION. SHEAF CORRECTION. SHELL AND FUZE HEQ METHOD OF FFE. $2Rds$ RANGE LATERAL SPREAD. TIME OF OPENING FIRE. W/R .	DEFLECTIO RANGE V/ALT COR RANGE COR CHARGE/R/ AZIMUTH	D+ D -		SHELL AND F MORTAR TO METHOD OF DEFLECTION CHARGE TIME SETTIN ELEVATION	FOLLOW		

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	DEFL	RANGE	TIME (SETTING)	ELEV				
(a)		2.Rds	5345	2450 4	-	0840				
(b)	Sec	2Rds	2140	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: CONDITIONS: STANDARDS:	Compute data for a grid mission using the CFF and FDC order in Figure E-19. 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. Determine deflection to within 1 mil with a 10-mil tolerance and range to within 25 meters with a 25-meter tolerance.
TASK: CONDITIONS: STANDARDS:	Determine the VI between the mortar altitude and the target altitude. Given the mortar altitude and target altitude. 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: CONDITIONS: STANDARDS:	Compute angle T. Given the observer-target (OT) direction, direction of fire (GT), No. 2 pencil, and paper. 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.

For us	COMPUTER e of this form, see FM 3-22.9			DOC.		
DRAMIZATION.	DATE	TIME		H51	TARGET NUMBER	
ADJUST FIRE FIRE FOR EFFECT	SHIFT FROM			POLAN; OT DIRECTION: ALTITUDE:		
GRD2 115 648	нант		DISTANCE			
OT DIFECTION: 1900	- 400 / D 0404	UP# / DOWN4				
AUTITUDE 490	up / cows					
TARGET DESCRIPTION BUNKERS			METHOD OF CONTROL:			
METHOD OV ENGADEDMENT: HED in FFE			MESSAGE TO OBJERVER:			

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?

(b) (a) FDC ORDER FDC ORDER Sec Sec MORTAR TO FFE. MORTAR TO FFE. MORTAR TO ADJ MORTAR TO ADJ. METHOD OF ADJ ... METHOD OF ADJ BASIS FOR CORRECTION BASIS FOR CORRECTION SHEAF CORRECTION SHEAF CORRECTION SHELL AND FUZE ... SHELL AND FUZE ... 3 METHOD OF FFE ... METHOD OF FFE. RANGE LATERAL SPREAD. RANGE LATERAL SPREAD. TIME OF OPENING FIRE. TIME OF OPENING FIRE (d) (c) FDC ORDER FDC ORDER Sec Ser MORTAR TO FFE MORTAR TO FFE. #2 MORTAR TO ADJ. MORTAR TO ADJ. METHOD OF ADJ .. METHOD OF ADJ BASIS FOR CORRECTION BASIS FOR CORRECTION. SHEAF CORRECTION SHEAF CORRECTION SHELL AND FUZE. D SHELL AND FUZE METHOD OF FFE METHOD OF FE FANGE LATERAL SPREAD. RANGE LATERAL SPREAD TIME OF OPENING FIRE TIME OF OPENING FIRE

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.

			I market		20100000	Terret	Co Canada
ORGANIZATION	DATE	TIME		H51			
		oriop Down	e	VERTICAL AN	NE <u>2200</u> / S00 □ ^{VP} /□ ^{IX} KILE □ + /□ CONTROL: SOBSERVER:		
FDC ORDER	INI	TIAL CHART DATA	. 11	INIT	TAL FIRE COMMA	ND	ROUNDS
MORTAR TO FFE Sec MORTAR TO ADJ METHOD OF ADJ IRd BASIS FOR CORRECTION SHEAF CORRECTION SHELL AND FUZE HEQ in EFE HEQ IWP in FEE METHOD OF FFE2 HEQ $I2$ WP RANGE LATERAL SPREAD TIME OF OPENING FIRE W/R	DEFLECTION DEFLECTION CORRECTION:			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.

For	the second states	See FM 3-22 91 The		The second second	ADOC.		
ORGANIZATION		DATE	TIME		H51		NUMBER
	SHIFT FROM: OT DIRECTONE. UEFT / [] A000 / [] UP / [] UP / [] C. J. Tan.	0R0P	B	VERTICAL AN	/500 [199/] [10 Relie [1] + /[]		
FDC ORDER MORTAR TO FFE Sec MORTAR TO ADJ METHOD OF ADJ Rd BASIS FOR CORRECTION SHEAF CORRECTION SHELL AND FUZE HEQ in ADJ HEQ WP in EFE METHOD OF FFE $2HEQ/2WP$ RANGE LATERAL SPREAD TIME OF OPENING FIRE W/R	INITIAL CHART DATA DEFLECTION. DEFLECTION CORRECTION: □L □R RANGE. VVALT CORRECTION: □+ - RANGE CORRECTION: □+ - CHARGE/RANGE. AZIMUTH.			INN MORTAR TO SHELL AND F MORTAR TO METHOD OF DEFLECTION CHARGE TIME SETTIN ELEVATION.			

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 (b) INITIAL FIRE COMMAND Sec MORTAR TO FOLLOW SEC MORTAR TO FOLLOW SHELL AND FUZE HEQ MORTAR TO FIRE #2 MORTAR TO FIRE METHOD OF FIRE IRd 2 HER/2WP in FFE 2 HEQ /2WP in FEE DEFLECTION 5131 5269 DEFLECTION 6 CHARGE TIME SETTING..... TIME SETTING ELEVATION 0886 ELEVATION 0886 (c) INITIAL FIRE COMMAND INITIAL FIRE COMMAND (d) MORTAR TO FOLLOW SEC Sec MORTAR TO FOLLOW SHELL AND FUZE HEQ HEQ SHELL AND FUZE . 2 # MORTAR TO FIRE MORTAR TO FIRE 1Rd 1Rd METHOD OF FIRE ... METHOD OF FIRE. 2 HEQ/2 WP in FFE 2 HEQ/2WP in 5131 5269 DEFLECTION DEFLECTION 6 6 CHARGE CHARGE TIME SETTING TIME SETTING ELEVATION 0839 0839 ELEVATION

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

12. What is the correct subsequent fire command?

-		SUBSEC	UENT COMMAND	s	
MORTAR	METHOD FIRE	DEFL	RANGE	TIME (SETTING)	ELEV
Sec	2HER 2WP	5260			0839
	2 HER 2 WP	5140			0886
Sec	2 HER 2 WP	5140			0839
	2 HEQ 2WP	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: CONDITIONS:	Construct a surveyed firing chart. 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: CONDITIONS: STANDARDS:	Compute data for a registration mission using a plotting board. Given an M16 plotting board, surveyed mortar position, and surveyed RP. 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	C	H51	TARGET	NUMBER
	SHIFTFROM:	ROP		POLAR: OT DIRECTION: DISTANCE: VERTICAL ANGL METHOD OF CC	ער וער סטער ב + ו		RP
FDC ORDER MORTAR TO FFE.	I.com	IAL CHART DAT			L FIRE COMMAN		ROUNDS
MORTAR TO ADJ # 2 METHOD OF ADJ / Rd BASIS FOR CORRECTION					ZE		
SHEAF CORRECTION	VVALT CORRI	□+ □ -		NETHOD OF FI	RE		
METHOD OF FFE.	AZIMUTH	U+U-		IME SETTING.			

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	RANGE
	(mils)	(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	RANGE
	(mils)	(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?

			SUBSEC	QUENT COMMAND	S	
	MORTAR FIRE	METHOD FIRE	DEFL	RANGE	TIME (SETTING)	ELEV
)	Sec	1 RdS/L #2 DNF	3830	3750		0862
)	Sec	1 Rd S/L #2 DNF	the states	3750		0896
)	Sec	IRd	3802	3750		0880
)	Sec	1RdS/L #2DNF	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.

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- 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	No. 1 DEF
	(mils)	(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: CONDITIONS: STANDARDS:	Compute data for a shift from a known point mission using a plotting board. Given a plotting board, DA Form 2399-R, firing table, CFF for a shift from a known point mission, and FO corrections. 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

For	COMPUTE use of this form , see FM 3-2	2.91. The proponent ager	ncy is TRADOC.	
OFISANZATION	DATE	TIME	OBSERVERIO H 51	TARGET NUMBER
ADJUST FIRE I FIRE FOR EFFECT IMMEDIATE SUPPRESSION GNID: OT DIRECTION: 3250 ALTITUDE: TARGET DESCRIPTION: Truck P METROD OF ENGAGEMENT:	SHIFT FROM: <u><u>RP</u> OT DIFLECTION: <u>2100</u> <u>LEFT / []</u> RIGHT <u></u> <u>D</u> ADD / [] OROP <u></u> <u>D</u> UP- 1 <u>D</u> DOWN <u></u> <u>C</u> r K</u>	ALITTUDE: 01 / 5 0 0 2 0 0 VE M		-
FDC ORDER MORTAR TO FFE. <u>SEC</u> MORTAR TO ADJ METHOD OF ADJ / RL	DEFLECTION DEFLECTION.CORRECT	ION: SHEI IR:	INITIAL FIRE COMMANI	
BASIS FOR CORRECTION RP 1 SHEAF CORRECTION SHELL AND FUZE HER 1.5 ADS WP 1.5 $FFEMETHOD OF FFE. HRdsRANGE LATERAL SPREAD.TIME OF OPENING FIRE. W/R$	RANGE.	I - MET I - DEF I - CHA I - ELEN	RTAR TO FIRE	

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

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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
WW KANUE EKK	menu indicates error magnitude.
	menu mulcales error magintude.
	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 #.
@#ACTIVE, MON #	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.
	when entering with DATA, basepiece number entered as anothate 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.
E TOO BIG	ACTION: Delete duplicate entries. 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	ACTION: End mission with EOM and restart mission from beginning. No data in initialization data buffer.
	ACTION: Verify the initialization function selection under review and enter the
FILE FULL	required initialization data. No more initialization data storage space available in buffer.
TILE FOLL	No more initialization data storage space available in burier.
	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
FPF LN EMPTY	sequence using appropriate action switch. 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
ILL ENTRY	new data. Illegal value entered into blank field of data entry menu.
ILL ENTKI	megar 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 ontry. Make only valid antries
ILLEGAL TGT NUM	ACTION: Check entry. Make only valid entries. 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
INST:FAIL	sender to retransmit valid target number. Processor failure.
	1 rocessor randre.
	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.

	EXPLANATION and ACTION
NOT 1	MAX fire line is closer than MIN fire line.
ATER	
	ACTION: Verify MIN and MAX fire line entries.
EM:FAIL	Modem CCA failure.
	ACTION: Return MBC to next higher maintenance level.
	No messages are stored in message buffers.
ГҮ	
	Unassigned mission selected for activation.
	ACTION: Activate an alternate mission when operating on a previously initiated
	mission.
ERROR	Probable MBC software fault.
	1
	Computed dena northing exceeds 52707.
	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.
ACTIVE MSN	No missions are stored in mission buffers or no mission is presently activated.
	ACTION: Initiate new mission using CPID SHIFT or POI AP switch or FP message:
	All required adjust data have not been entered.
	wission buriers are fun (unce missions stored).
	ACTION: Terminate one stored mission by selecting EOM, EOMRAT, or EOMFPF.
	Then initiate new mission.
CURRENT MET	Current MET has not been initialized.
	ACTION: Enter or review appropriate NEW MET data and initialize CURR MET by
	No FO entry in mission input data.
	······································
	ACTION: Completely initialize SET UP data.
	Review of FIRE DATA or SFTY DATA or other operation (such as ADJ, REG, or
	KEPLOI) requires existing output data.
	ACTION: Press COMPUTE switch after properly entering appropriate mission input
	data.
# 1 SSIGNED 1 ERROR 1 O BIG 1 O BIG 1 ACTIVE MSN 1 ADJUST DATA 1 ADJUST DATA 1 AVAIL MSN 1 TURRENT MET 1 O ENTERED 1 AP MOD 1	Probable MBC software fault. ACTION: End mission and reenter. Compute mission. If error reoccurs, return MBC next higher maintenance level. Computed delta northing exceeds 32767. ACTION: Verify all entries affecting delta northing. Also, verify that MIN E and M N entries in SET UP data are appropriate for mission coordinates. 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 messa or select a stored mission using MSN switch and appropriate display switch. All required adjust data have not been entered. ACTION: Do not press COMPUTE switch for an ADJ before viewing ADJ data en field (DEV). Mission buffers are full (three missions stored). ACTION: Terminate one stored mission by selecting EOM, EOMRAT, or EOMF Then initiate new mission. Current MET has not been initialized. ACTION: Enter or review appropriate NEW MET data and initialize CURR MET pressing UPDATE*, or select STD MET. No FO entry in mission input data. ACTION: When sending digital response to manual input mission, enter FO ID w beginning mission. FO ID is entered automatically in BMD-supported missions. Computation (such as computing gun orders) requires MIN E and MIN N coordina and none were assigned in SET UP data. Review of FIRE DATA or SFTY DATA or other operation (such as ADJ, REG REPLOT) requires existing output 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
NO TRIANGLE	sequence. Line segments in SURV INT or RES problem do not converge.
NO IRIANGLE	Line segments in SORV INT of 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.
RANGE TOO	ACTION: Return MBC to next higher maintenance level.
SMALL 100	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.
DANGE TOO DIG	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	Impact point is outside defined safety fan boundaries.
VIOLATION	
	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).
SI C SILL'II LIUTOR	
	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	Powder temperature entry outside range (-70 to 140).
RNGE	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
TEMI TOO LOW	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	Target is below minimum range or minimum altitude at minimum allowable safe
SMALL	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
	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
	azinitum, used in conjunction with the Ernvide, wide, and wites
BIT	built-in test
BOLAD	boundary outer limit alert distances
BPS	bits per second
215	
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
	11.7
DA	Department of the Army
DC	direct current
DCT	deflection conversion table
DD	driver's display
DD	
DD DEFK	deflection correction
DEFK	deflection correction deflection
DEFK DF DLY	deflection correction deflection delay
DEFK DF	deflection correction deflection
DEFK DF DLY DMD DNL	deflection correction deflection delay digital message device
DEFK DF DLY DMD	deflection correction deflection delay digital message device do not load direction of fire
DEFK DF DLY DMD DNL DOF	deflection correction deflection delay digital message device do not load
DEFK DF DLY DMD DNL DOF	deflection correction deflection delay digital message device do not load direction of fire
DEFK DF DLY DMD DNL DOF DS	deflection correction deflection delay digital message device do not load direction of fire direct support
DEFK DF DLY DMD DNL DOF DS ELEV	deflection correction deflection delay digital message device do not load direction of fire direct support elevation
DEFK DF DLY DMD DNL DOF DS ELEV	deflection correction deflection delay digital message device do not load direction of fire direct support elevation
DEFK DF DLY DMD DNL DOF DS ELEV EOM	deflection correction deflection delay digital message device do not load direction of fire direct support elevation end of mission
DEFK DF DLY DMD DNL DOF DS ELEV EOM	deflection correction deflection delay digital message device do not load direction of fire direct support elevation end of mission field artillery
DEFK DF DLY DMD DNL DOF DS ELEV EOM FA FBCB2	deflection correction deflection delay digital message device do not load direction of fire direct support elevation end of mission field artillery Force XXI battle command—brigade and below
DEFK DF DLY DMD DNL DOF DS ELEV EOM FA FBCB2 FC	deflection correction deflection delay digital message device do not load direction of fire direct support elevation end of mission field artillery Force XXI battle command—brigade and below fires cell
DEFK DF DLY DMD DNL DOF DS ELEV EOM FA FBCB2 FC FCS	deflection correction deflection delay digital message device do not load direction of fire direct support elevation end of mission field artillery Force XXI battle command—brigade and below fires cell frame check sequencing
DEFK DF DLY DMD DNL DOF DS ELEV EOM FA FBCB2 FC FCS FDC	deflection correction deflection delay digital message device do not load direction of fire direct support elevation end of mission field artillery Force XXI battle command—brigade and below fires cell frame check sequencing fire direction center
DEFK DF DLY DMD DNL DOF DS ELEV EOM FA FBCB2 FC FCS FDC FDCCP	deflection correction deflection delay digital message device do not load direction of fire direct support elevation end of mission field artillery Force XXI battle command—brigade and below fires cell frame check sequencing fire direction center Fire Direction Center Certification Program

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
	6
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
1121	Individual Training and Evaluation Program
JMEM	joint munitions effectiveness manual
INDT	how we want to a series of the MDC
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
LED 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
MIDQ	meenamear time superquiek
NCO	noncommissioned officer
NFA	no-fire area
NGF	naval gunfire
NiMH	nickel metal hydride
	meker metar nyanac
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	
01	observer-target
PD	point detensing
PDA	point-detonating
	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
D	right used in conjugation with fire control equipment
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
DCE	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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	For use o	COMPU f this form, see FM	JTER'S RE 3-22.91; the pro		is TRADOC			
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A FORM 2399-R, FEB 2005		REPLACES DA FORI						

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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