TECHNICAL MANUAL

OPERATOR'S MANUAL

AREA PREDICTOR, RADIOLOGICAL FALLOUT,

ABC-M5A2

(NSN 6665-00-106-9595)

This reprint includes all changes in effect at the time of publication See inside front cover for details

H E A D Q U A R T E R S , D E P A R T M E N T O F T H E A R M Y

3 0 J A N U A R Y 1 9 7 5

In this edition of TM 3-6665-304-10, all material from Change 1 has been incorporated into the text of the publication The next change to this publication will be Change 2 and will print as "remove—and—insert" looseleaf pages. At that time, changed material will be indicated by vertical bars In the margin.

TECHNICAL MANUAL
No. 3-6665-304-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *30 January 1975*

OPERATOR'S MANUAL

AREA PREDICTOR, RADIOLOGICAL FALLOUT, ABC-M5A2 (NSN 6665-0-106-9595)

***This manual supersedes TM 3-6665-277-10, 28 Oct. 69, including all changes.**

SECTION I
INTRODUCTION

1. Scope

This manual is for your use in operating and maintaining the Area Predictor, Radiological Fallout, ABC-M5A2.

2. Recommending Improvements

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to Commander, Edgewood Arsenal, Attn: SAREA-DE-ET, Aberdeen Proving Ground, MD, 21010.

3. Description

a. ABC-M5A2 Radiological Fallout Area Predictor. The ABC-M5A2 radiological fallout area predictor (fig. 1) is a transparent sheet of plastic that contains information for outlining potential fallout hazard zones resulting from surface or near surface bursts when superimposed on maps scaled 1:50,000 or 1:250,000 The plastic sheet is approximately

23½ inches wide and 40 inches long. An azimuth dial, whose center represents ground zero (GZ), is located at the left side of the area predictor. Two radial lines, 40 degrees apart, extend from the dial center and are marked in kilometers for a 1:50,000 scale map. A second azimuth dial with radial lines marked in kilometers for a 1:250,000 scale map is located to

AREA PREDICTOR, RADIOLOGICAL FALLOUT, ABC, M5A2

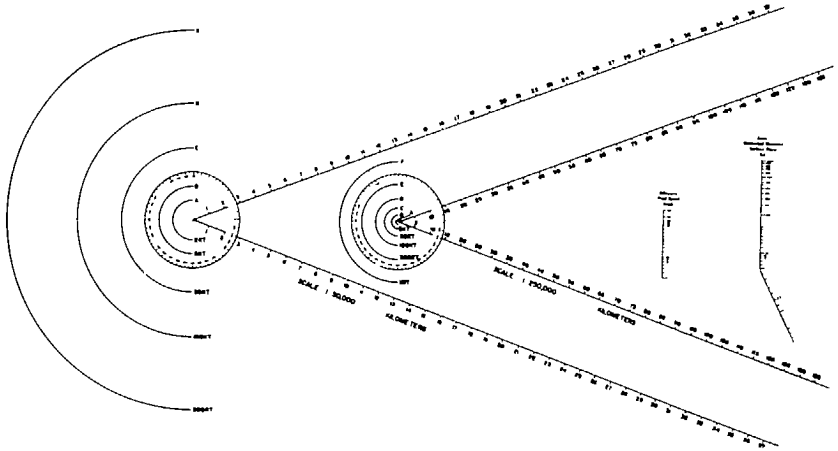

Figure 1. ABC-M5A2 radiological fallout area predictor.

the right of the first dial Semicircles (A, B, C, D, E), representing stabilized nuclear cloud radii for preselected yield groups (2, 5, 30, 100, and 300 KT), are centered with the azimuth dials around ground zero. An additional semicircle (F) for a 1 MT yield group is provided for the 1:250,000 kilometer scale. A nomograph (fig. 2) is located on the right side of the area predictor. The nomograph consists of three logarithmic scales indicating effective windspeed in kilometers per hour, yield of detonation in kilotons (KT), and downwind distance in kilometers. The effective windspeed is normally obtained from the effective downwind message, and the yield can be estimated by using the cloud parameters, flash-to-bang time, and the M4A1 nuclear yield calculator. From these two points on the nomograph, the downwind distances for two predicted fallout zones can be determined. The area predictor is packaged in a plastic case with a copy of this manual.

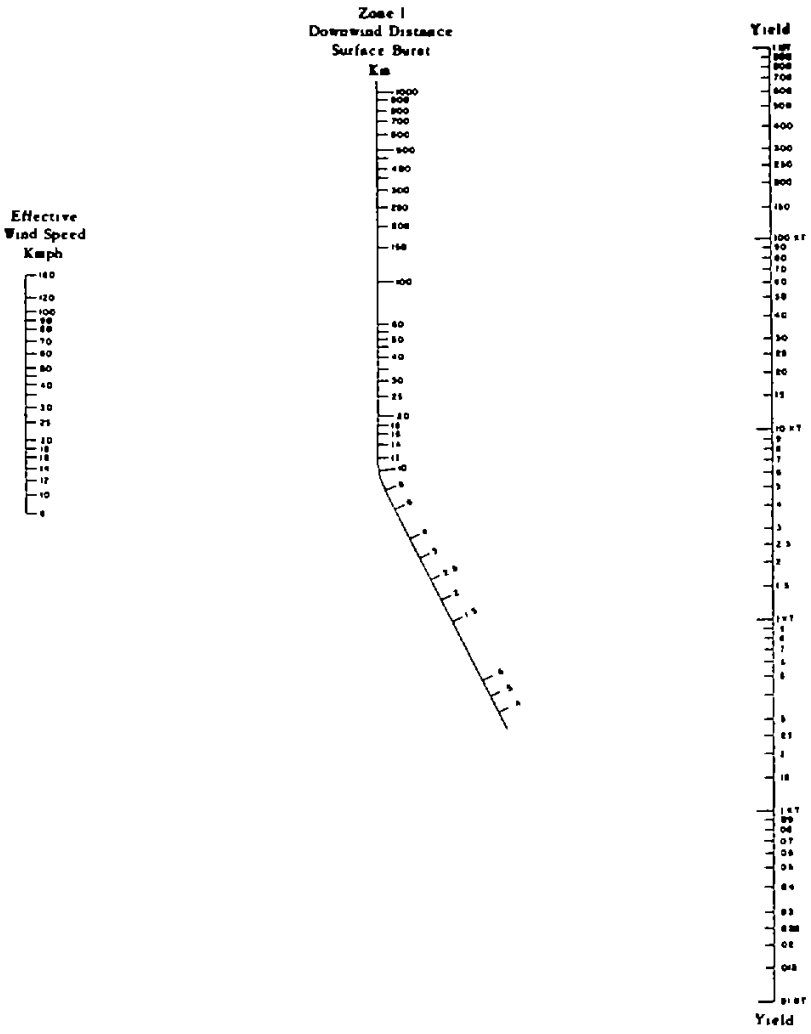

Figure 2. Zone 1 downwind distance nomogram on the M5A2 fallout predictor.

b. Predicted Fallout Zones. The predicted fallout zones (FM 3-22) are those areas in which exposed, unprotected personnel may receive significant doses of nuclear radiation within 1 to 4 hours after actual arrival of fallout. A primary zone of hazard and a secondary zone of hazard are predicted.

(1) Zone I is a primary zone of hazard and is called the Zone of Immediate Operational Concern. In this zone personnel may receive doses greater than 150 rad (the emergency risk dose) in less than 4 hours after actual arrival of fallout.

(2) Zone II is the area of secondary hazard and is called the Zone of Secondary Hazard. In this zone the total dose to personnel is expected to be less than 150 rad in the first four hours after the arrival of fallout, but is expected to exceed 50 rad (the negligible risk dose) within the first 24 hours after the arrival of fallout.

(3) Outside the predicted area, exposed unprotected personnel may receive a total dose that does not exceed 50 rad in the first day (24 hours) after actual arrival of fallout. The total dose for an indefinite time of stay outside the predicted area should not exceed 150 rad (the emergency risk dose).

SECTION II

INSTRUCTIONS FOR USE

4. General

Use of the area predictor requires a knowledge of windspeed and wind direction, actual or estimated yield of the nuclear weapon detonated, and location of ground zero (GZ). Normally, the user of the area predictor will have to estimate the yield and determine the location of ground zero (FM 3-12). Nuclear burst data may also be derived from nuclear burst reports that are transmitted by units observing the burst. Windspeed and wind direction are obtained from the effective downwind message.

5. Effective Downwind Message

a. The effective downwind message is prepared in the Tactical Operations Center of major commands. It is transmitted to subordinate units each time new upper air data are received. The last effective downwind message is used for fallout prediction. Effective downwind messages that are more than 12 hours old should not be used.

b. The format for the effective downwind

message will be a series of seven lines, preceded by the phrase "Effective Downwind Message," as follows:

	Effective Downwind Message
ZULU	DDtttt (local or ZULU, state which)
ALFA	dddsss
BRAVO	dddsss
	Effective Downwind Message
CHARLIE	dddsss
DELTA	dddsss
ECHO	dddsss
FOXTROT	dddsss

c. The significance of each line is indicated below.

(1) ZULU DDtttt is the date-time at which the winds were measured DD is the day and tttt the hour in local or ZULU time (GCT).

(2) The remaining lines provide data for the six preselected yield groups, where ddd is the effective downwind direction in degrees from grid north and sss is the effective windspeed in kilometers per hour.

(a) ALFA dddsss is the data line for the 2kiloton (KT) or less yield group.

(b) BRAVO dddsss is the data line for the over 2-KT to 5-KT yield group.

(c) CHARLIE dddsss is the data line for the over 5-KT to 30-KT yield group.

(d) DELTA dddsss is the data line for the over 30-KT to 100-KT yield group.

(e) ECHO dddsss is the data line for the over 100-KT to 300-KT yield group.

(f) FOXTROT dddsss is the data line for the over 300-KT to 1-megaton (MT) yield group.

(3) *For example.* The data line of an effective downwind message reads DELTA 090025. The term DELTA indicates that the yield of the weapon is in the over 30-KT to 100-KT yield group. The numerical data of this line represent an effective downwind direction of 90 degrees and an effective windspeed of 25 kilometers per hour.

(4) A data line may contain only three digits when a special case applies (para 7).

6. Fallout Prediction Procedure

The following procedure can be used for predicting the fallout area from a single detonation when the location of GZ, the time of burst, and the estimated or actual yield of the weapon detonated are known.

a. Record location of GZ and time of burst on the area predictor for map scale to be used. The

area predictor and map scales must be the same.

b. Determine the yield group in which the estimated or actual yield lies.

c. Obtain effective windspeed and direction from data line of effective wind message for yield group selected.

d. Draw a line from center of azimuth dial through the azimuth (degrees) that corresponds to the wind direction obtained in step (c) above Label the line GN (grid north).

e. Determine the downwind distance of Zone I from the area predictor nomogram (fig. 2) as follows.

(1) Locate a point on the YIELD (right-hand) scale corresponding to the estimated or actual nuclear yield. DO NOT use yield group.

(2) Locate a point on the EFFECTIVE WIND SPEED (left-hand) scale corresponding to windspeed obtained from effective wind message (c above).

(3) Connect points located on the YIELD and EFFECTIVE WIND SPEED scales with a straight edge.

(4) Read the downwind distance for Zone I at the intersection of the straightedge and the center scale.

f. Use the downwind distance of Zone I to

calculate the downwind distance of Zones I and II Zone II is twice that of Zone I.

g. Using GZ as center, draw arcs between the two radical lines with radii equal to the two downwind distances.

h. Draw tangent lines from the cloud radius semicircle of yield group selected (*b* above) to the points of intersection between radial lines and Zone I arc.

i. Darken perimeter of fallout zones with a grease pencil to emphasize the area of hazard Label the zones.

j. Estimate downwind distances for fallout times-of-arrival after burst (H-hour) by multiplying the effective windspeed by the hour of interest. Fallout time-of-arrival at a specific distance from GZ is estimated by dividing that distance by the effective windspeed.

k. Draw as many dashed arcs for time-of-arrival distances (*j* above) as will fall within the predicted zones. Label each time-of-arrival arc as hours after H-hour. If a time-of-arrival arc coincides with a zone boundary, extend the zone boundary with a dashed line and label it with the appropriate time of arrival.

I. Place the area predictor on the map so that GZ on the predictor is over the actual or assumed GZ point on the map Rotate the area

predictor until the GN line is pointing toward grid north of the map.

m. Evaluate the effect of fallout on tactical operations or plans. For operational purposes, the following rules of thumb may be applied to the actual arrival of fallout:

(1) The actual arrival of fallout may occur as early as one-half the estimated time of arrival. That is, if the estimated time of arrival of fallout is H + 4 hours, actual arrival of fallout may occur as early as H + 2 hours.

(2) If actual arrival of fallout has not occurred at twice the estimated arrival time, or 12 hours, whichever is earlier, then it may be assumed that the area will not receive fallout. That is, if the estimated time of arrival of fallout in an area is H + 4 hours and fallout has not occurred at H + 8 hours, then it may be assumed that the area will not receive fallout.

7. Special Cases

a. Low Winds. The situation may arise when the effective windspeed and direction cannot be reliably defined for a particular yield. This occurs when the effective windspeed drops below 8 kilometers per hour and the winds are light and constantly changing direction. In such cases, fallout may occur at almost any location around

ground zero, and the predicted area hazard will be a circle around group zero. When this special case applies, the data line on the effective downwind message for the particular yield group will contain only three digits. The three digits represent the downwind distance of Zone I in kilometers. A circle of this radius drawn around ground zero will define Zone I. A second circle of twice this radius will define Zone II . Fallout time-of-arrival will have no meaning. In this case and will not be represented on the prediction plot.

b. Warning Area Angle Increased. A fixed warning area angle of 40 degrees is formed by the radial lines on the area predictor. In very infrequent instances, the fallout wind vector plot prepared by the Tactical Operations Center may indicate a warning area angle greater than 40 degrees. In these instances, the effective downwind message will indicate the greater angle in parentheses at the end of the line of the yield group affected. Subordinate units must expand the warning area beyond the fixed 40-degree angle of the area predictor to correspond with the angle given.

8. Sample Problem

a. Situation. The 2d Bn, 62d, Inf is operating

in the field. Unit location and forward edge of battle area (FEBA) are portrayed on a 1:50,000 scale operation map. The operations and training officer has the following effective downwind message available.'

ZULU	240600Z
ALFA	080015
BRAVO	085015
CHARLIE	090016
DELTA	100010
ECHO	110025
FOXTROT	120020

At about 240730Z a nuclear burst occurred at a point estimated to be MN553298. A measurement of the flash-to-bang time and nuclear burst cloud width indicates an estimated yield of 16 KT.

b. Action. Prepare a fallout prediction using the area predictor. Figure 3 shows the completed fallout prediction superimposed on the operational map data for this sample problem.

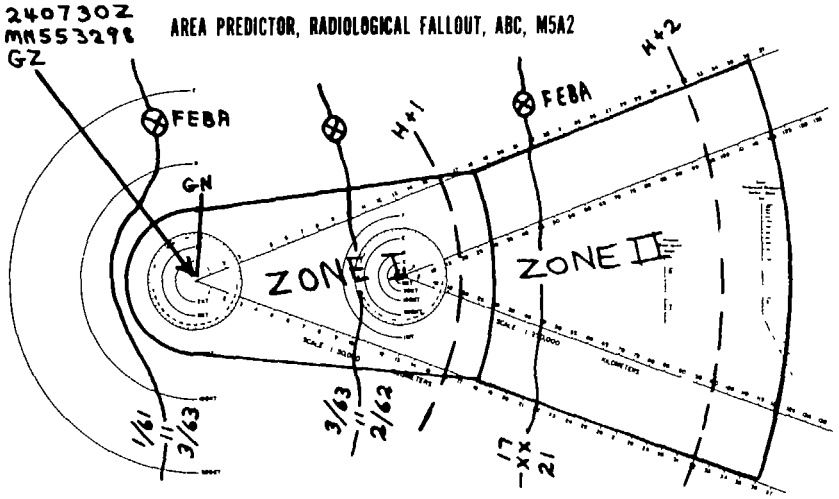

Figure 3. Example problem—Preparation of a simplified fall-out prediction for a 16-KT yield burst.

(1) Label azimuth dial center on the predictor 1:50,000 scale as GZ Record time of burst (240730Z) and its location (MN553298) next to label.

(2) Determine CHARLIE (over 5 to 30 KT) as the yield group in which the estimated yield (16 KT) lies. Use the effective downwind direction (90 degrees) and windspeed (16 KM/HR) from line CHARLIE of the effective downwind message, and use the "C" semi-circle on the predictor.

(3) Construct a grid north line using the back azimuth of effective wind direction. Draw the line from center of azimuth dial through the azimuth graduation of 90 degrees Label the line GN.

(4) Use the predictor nomogram to determine the downwind distance of Zone I. Align a straightedge with 16-KT on yield scale and 16 KM/HR on effective windspeed scale. Read the downwind distance of Zone I to be 18 kilometers.

(5) Draw an arc between the predictor radial lines at a distance of 18 kilometers from GZ. Double this distance and draw a second arc between the radial lines at a distance of 36 kilometers.

(6) Draw tangent lines from semicircle C to

radial line points of intersection with 18-kilometer arc.

(7) Darken perimeter of fallout zones with a grease pencil. Label the zones. Zone I is the area inclosed by semicircle C, the tangent lines, and the 18-kilometer arc. Zone II is the area inclosed by the 18 and 36-kilometer arcs and the radial lines.

(8) Estimate the fallout time-of-arrival distance for 1 hour after burst to be 16 kilometers (effective windspeed times the hour of interest). Draw a dashed arc between the radial lines at a distance of 16 kilometers. Label the arc as H + 1. Draw a dashed arc between the radial lines at a distance of 32 kilometers. Label the arc as H + 2.

(9) Place the area predictor on the operations map so that GZ on the predictor is over GZ (MN553298) on the map. Rotate the predictor until the GN line is pointing toward grid north on the map. The predictor is now oriented for a downwind direction of 90 degrees. Evaluate the effect of potential fallout on unit operations in the predicted area.

APPENDIX

REFERENCES

FM 3-12	Operational Aspects of Radiological Defense (FMPM 11-15).
FM 3-22	Fallout Prediction.
FM 21-30	Military Symbols.
FM 21-40	Chemical, Biological, Radiological, and Nuclear Defense.
DA PAM 738-750	The Army Maintenance Management System (TAMMS).

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THE METRIC SYSTEM AND EQUIVALENTS

NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

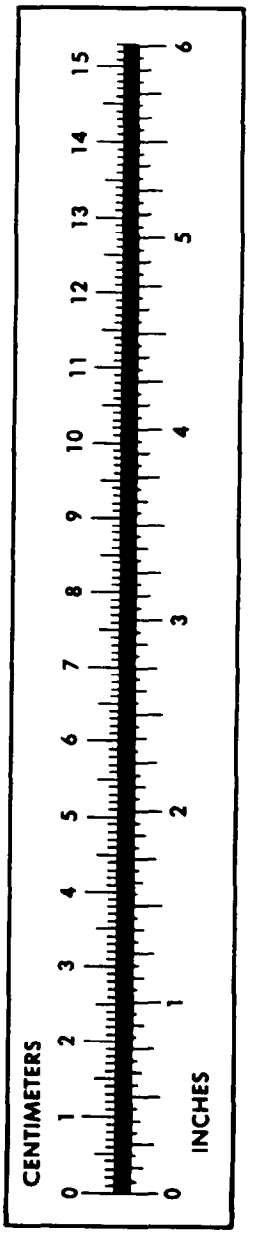
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



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