FIRING TABLES

FOR

6 INCH GUNS

M1897 MI, M1908, M1908 MI AND M1908 MII

FIRING

SHELL, H. E., MARK II, WEIGHT 90 LBS.

PREPARED BY THE
ORDNANCE DEPARTMENT, U. S. A.
AUGUST, 1938

"6-B-2"

War Department, Ordnance Office,
Washington, June 15, 1938.

The following firing tables for 6" Gun, M1897M1 on

Carriage, disappearing, 6", M1898, 6" Gun, M1908 and

M1908M1 on Carriage, disappearing, 6", M1905M1 and

M1905MII; and Gun, 6", M1908M11 on Carriage, barbette,

6", M1910 and M1910 (Casemate), firing Shell, H. E.,

90-lb., Mk. II; contain the same ballistic data as

FT 6-B-1 as changed by C-1, July 1, 1931.

Air Density Tables, pages 36, 37, 38 and 39, are as

published in the aforementioned changes No. 1.

Therefore, FT 6-B-1 with C-1, and FT 6-B-2 may be

used interchangeably.

On Page I of FT 6-B-1, under "Carriages" change "6"

D. C. Model of M1897" to read "6" D. C. Model of

1898".

On Page V of FT 6-B-1 under "The Meteorological

Message" Message 3 applies.

C. M. WESSON,
Major General, Chief of Ordnance.

FIRING TABLES FOR 6" GUNS, M1897 MI, M1902,
M1904 MI and M1908 MII

FIRING H. E. SHELL, MARK II

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FIRING TABLES FOR 6" GUNS, M1897 MI, M1903, M1908 MI and M1908 MII

FIRING H. E. SHELL, MARK II

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GENERAL INFORMATION

These tables are based on firings conducted at the Aberdeen Proving Ground, Maryland, during September 1919, under O. B. Program No. 7429-2.

6" GUNS, M1897 MI, M1908, M1908 MI and M1908 MII

		1897 MI	1908, 1908 MI and 1908 MII
Diameter of the bore between lands,	inches	6	6
Diameter of the bore between grooves,	inches	6.09	6.10
Total length of gun,	inches	277.85	277
Length of rifled portion,	inches	229.81	231.25
Travel of projectile,	inches	233.65	234.44
Length of powder chamber,	inches	33.92	33.27
Diameter of powder chamber,	inches	7.0	7.0
Capacity of powder chamber,	cubic inches	1289	1291
Number of grooves,		36	54
Character of rifling	Increasing 1 in 50 to 1 in 25 calibers		
Maximum pressure,	lbs./sq. in	38000	

CARRIAGES	6" L.C. Model of 1898	6" P.C. Model of 1910
Total traverse.	170° = 3022.2 mils	360° = 6400 mils when free. 120° = 2133.4 mils for casemate emplacements
Least possible elevation,	-5° = -88.9 mils	-3° = -53.3 mils
Greatest possible elevation,	15° = 266.7 mils	12° = 355.6 mils

FIRING TABLES FOR 6" GUNS, M1897 MI, M1908,
M1908 MI and M1908 MII

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GENERAL INFORMATION

	6" D.C. Model of 1898	6" B.C. Model of 1910
CARRIAGES (cont'd)		
Traverse for one turn of traversing handwheel	0°.386 = 6.86 mils for maneuvering handwheel 3°.873 = 68.85 mils for large handwheel	2°.727 = 48.48 mils
Change in elevation for one turn of elevating handwheel	0°.023 = 0.41 mils for maneuvering handwheel 0.589 = 10.47 mils for large handwheel	Approximately 33 turns to elevate gun 12°

PROJECTILES

H.E. Shell Mark II. See Drawing Page 11
Weight including Short Fuze (Mark IV*) 89.3 lbs.
Variations in weight are indicated by markings
punched on the body of the shell as follows:

Marking	Weight (pounds)	Mean weight (pounds)	Percentage Deviation
■	87.2 to 88.6	87.9	-1.6%
■■	88.6 to 90.0	89.3	0.0
■■■	90.0 to 91.4	90.7	+1.6%

FUZES

Mark	Position	Size	Color of Head	Action
IV*	Point detonating	short	white	non delay
IV*	Point detonating	short	black	short delay

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When standard Coast Artillery fire control
instruments are available for preparing data for
firing on moving or fixed targets, the battery
commander will have little need for these firing
tables. They become useful only for reference,
since mechanical devices apply the necessary corrections for the various effects on range and
deflection. Standard panoramic sights for Coast
Artillery are designed to utilize azimuths in
laying for directions.

EXPLANATION OF THE TABLES

This firing table has been divided into two
parts. Part 1 comprises data applicable to any
possible combination of projectile, fuze, and
powder charge, and will serve equally well for all
firing tables. It is printed on white paper.
Part 2 gives data pertaining to a particular combination of projectile, fuze and powder charge.
It is readily distinguished from Part 1 by a difference in the color of the paper upon which it is
printed.

Throughout the tables, certain conditions are
assumed as standard. Mention may be made of the
following:

Wind, none.
Muzzle velocity, as listed in table.
Air density at battery, (59° F. and 29.53
in. of mercury)
525.9 grains per cubic foot.
Temperature of air at battery (for elasticity effect) 59° F.
Temperature of powder 70° F.
Weight of projectile, as listed in table.

In addition to the standard air conditions at the
battery a standard atmospheric structure aloft
has been assumed. The observed ranges, obtained
from test firings, upon which these tables are
based, were corrected on the basis of a comparison of observed muzzle velocity, weight of projectile, air conditions at all altitudes with
the assumed standards and for rotation of the
earth.

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In connection with Part 1, it is to be noted that the azimuth of a wind is indicated by reference to the direction _from_ which it blows. Since the meteorological message gives the azimuth of the wind as measured clockwise from the true north, it is necessary to find the equivalent tabular direction before proceeding with the use of the wind component chart. This tabular azimuth or chart direction of the wind is therefore measured in mils (6400 to the circle) clockwise from the plane of fire, that is from the direction toward which the gun is fired. The choice of signs for cross wind effects accords with the deflection graduations upon the standard panoramic sight. For example, a wind from the left, when the target is viewed from the position of the gun, will carry the projectile to the right. To correct for this, it is necessary to traverse the gun to the left, and this corresponds to an increased deflection setting on the sight. The effect of such a wind, being opposite in sign to the correction, is thus seen to be negative.

Although the maximum wind speed noted on this chart is only ten miles per hour, it is not to be understood that this figure is in any way intended as a restricting limit on the use of the data of the chart itself. Thus to obtain the components of a 12 mi/h wind the components of a 10 mi/h wind can be added to the corresponding components of a 2 mi/h wind.

The other tables, formulae and charts of Part 1 require no individual discussion. The principal use of the information contained in Part 1 is in the conversion of the data of the meteorological message into a form that is directly applicable to a particular battery.

Table A of Part 2 gives the range elevation relation, maximum ordinate, ballistic coefficient with respect to G, and the characteristics of the trajectory at the point of fall or at the point of burst. The range listed in column (1) and throughout the tables are "curved" ranges; that is, they are regarded as measured along the surface of the sphere concentric with the earth and passing through the gun. Such measurements are understood to be made from the gun to the points where the

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trajectories pierce this spherical surface; or in case of the correction tables for the height of target, to points on this surface directly above or below the target. These points are all at the same height above sea level as the gun, and hence may be called "level points". It should be emphasized that no correction for curvature of the earth should be applied to these ranges. Whenever the level points concerned are at the target or directly above or below it, it is evident that these ranges are equal to the geographical distance from muzzle to target such as would be read from an accurate map, and they will later be referred to as "map ranges". Such ranges are sensibly equal to the rectilinear distances between gun and level point, through the straight line joining these points would not be exactly horizontal at the gun. In connection with range settings in general, and with especial reference to cases where gun and target are at different levels, the term "range" is sometimes used less exactly to refer to distances from gun to level points not related to the target.

The tabular elevations, given in columns (2) and (3) are strictly exact only when the gun and target are at the same level. In this case the elevation coincides with the quadrant elevation. For other cases see tables B and C. The word "change" in the headings (4) and (5), (6) and (7) is employed because in each of these columns there are tabulated mean values to be used for decreases as well as increases. In case of ballistic air temperature other than 59° F. Table H is to be used. The deflection due to drift columns (13) and (14) of Table A includes the effect of lateral jump. In the case of gun designed with trunnion axis not level with respect to the carriage the effect of deflection of this "permanent cant" is included in the tabular drift. Thus, with no cross wind, and in the absence of accidental disturbance, these columns give the total deviation of the projectile from the plane of fire, (the vertical plane containing the axis of the piece when laid for firing). The signs used are in accord with the deflection graduations upon the standard panoramic sight. The negative sign indicates that the projectile is carried to the

right and the positive sign indicates that the
combination of the effects of drift and lateral
jump has resulted in a deviation of the projectile
to the left of the plane of fire.

It is to be noted that in this case and
throughout the tabulation of differential varia-
tions, the signs given are those of the effects
and not of the correction. For example the ef-
fect is given as positive if the trajectory is so
altered that the projectile is caused to fall be-
yond its normal objective point. The probable
errors in range and deflection are given in col-
umns (16) and (17). These, as noted at the bot-
tom of each page, are Proving Ground Probable
Errors.

The characteristics of the trajectory at the
point of fall are given in columns (9), (10), (11)
and (12). The ballistic coefficient column (15)
is the so-called "normal" or "short arc" C. Its
value is such that when it is used with the stand-
ard muzzle velocity and angle of departure for
the computation of the trajectory by the method
of numerical integration, the resulting range will
be that tabulated.

The effect of the earth's rotation on range
and deflection is a function of the latitude of
the gun and of the azimuth of the plane of fire.
It cannot, therefore, be incorporated in the ele-
vation and drift columns. This effect becomes
quite appreciable in the case of long range guns.
The effect of Rotation of the Earth on Range is
given in Table E, and the effect on Deflection
is given in Table K. It is to be noted that the
azimuth is measured from the true North.

Tables B and C are for use when the target
is below or above the level of the gun. For ex-
ample in the table for target below gun, (Table
B), for any given map range and height of target,
the quantity appearing as the "range effect" is
the distance by which the map range for the given
target exceeds the "range to level point", when
the latter range is determined for that standard
trajectory whose continuation passes through the
target. These "effects", then, are given positive
signs so that the correction may be made by sub-
tracting them from the map range. The resulting

corrected range is that range whose corresponding
angle of elevation (as listed in the table) is to
be used as the elevation required to strike the
target, (provided we assume for the moment that
there are no other variations from standard).

Tables D to J inclusive give the various
differential effects; thus Table F gives the
range effects corresponding to increase or de-
crease in muzzle velocity 10, 20, 30, 40, 50,
60, 70, 80, 90 up to 150 feet per second.

Table K gives the deflection effects in
mils due to Rotation of the Earth for varying
latitudes and azimuths.

Although cant of the carriage axle, by
changing the angle of departure, has some effect
upon the range, that effect is here disregarded;
for, at low elevations, a fairly large cant will
produce only a very small change, in the angle
of departure, and at high elevations, where a
large cant will produce a somewhat larger change
in angle of departure than at low elevations,
it requires a quite large change in departure to
produce a small change in range.

Among the symbols and abbreviations used
are the following:

ω (read: "omega"), meaning the quadrant
angle of fall for gun and target at
the same level.

P. E. the probable error.

in.   inches.

ft.   feet.

y. or yds.   yards.

f/s   feet per second.

F.   Fahrenheit.

m.d.p.   meteorological datum plane.

%   percent.

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$\not{0}$ mils.

M. V.   muzzle velocity.

V - V₀   Velocity adjustment.

THE METEOROLOGICAL MESSAGE

The Meteorological Message consists of groups of symbols arranged in codified form. The message starts with the repetition of the so-called "address of the sending station", consisting of three letters, the first of which is always M and the other two serve to identify the station. All the groups subsequent to the first group, which plays a special role, are similar in type and significance; they differ only in that they refer to different altitudes. They consist of seven digits.

With reference to the first group, if the meteorological message applies to antiaircraft or other high angle fire, the first figure is 2; if it applies to terrestrial fire other than high angle, the first figure is 3. For the 6" Guns firing 90 lb. shells, use message 3 at all elevations. The second and third digits of this first group give, in hundreds of feet, the altitude of the meteorological datum plane (m.d.p.) above sea level. The position of the m.d.p. is chosen by the Meteorological Service of the Army and should be little, if any, higher than the lowest battery to be served by the message. The fourth and fifth digits of this group give the temperature at the m.d.p. in degrees Fahrenheit.

The groups subsequent to the first have digits assigned to them as symbols, beginning with zero and refer to altitudes as follows:

0	The level of the m.d.p.							
1	An altitude of	600 ft.	(200 yds.)	above m.d.p.				
2	"	"	" 1500	" (500	"	)	"	"
3	"	"	" 3000	" (1000	"	)	"	"
4	"	"	" 4500	" (1500	"	)	"	"
5	"	"	" 6000	" (2000	"	)	"	"
6	"	"	" 9000	" (3000	"	)	"	"
7	"	"	" 12000	" (4000	"	)	"	"
8	"	"	" 15000	" (5000	"	)	"	"
9	"	"	" 18000	" (6000	"	)	"	"
0	"	"	" 24000	" (8000	"	)	"	"
1	"	"	" 30000	" (10000	"	)	"	"
2	"	"	" 36000	" (12000	"	)	"	"

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Each further increase by unity in the symbol of the altitude zone corresponds to an increase of 6000 feet in altitude above the m.d.p. It is evident that no confusion can arise from using for 10, 11, 12, etc. the symbol 0, 1, 2, etc., in order to preserve the 7 digit character of the group. The first digit of each of these groups is the group symbol mentioned above and designates the altitude zone to which the group refers. The second and third indicate the direction from which the ballistic wind blows. For this purpose the angular deviation is measured clockwise from the true north in hundreds of mils (64 points to the circle). The fourth and fifth digits in each of these groups constitute a two figure symbol for the speed of the wind in miles per hour. The sixth and seventh digits serve to designate the ballistic density in per cent of normal.

The particular group of the meteorological message appropriate for use with a particular trajectory is that group of which the altitude is nearest to, but not less than, the maximum ordinate. When extreme accuracy is necessary and the meteorological data justify the procedure, it is possible to interpolate between groups of the meteorological message, making use of the exact maximum ordinate.

The above mentioned is a special case of the general method dealing with the Meteorological data for battery and m.d.p. at any levels. The Meteorological Message is designed primarily for batteries in or near the m.d.p. When serious differences in level occur, the data of the Meteorological Message must be corrected to the level of the battery. Maximum ordinates will be measured from the battery level, for all purposes. Such corrections as are made, utilize that 7 digit group of the message which corresponds to the maximum ordinate so defined. The wind at a given altitude above the battery is assumed to be identical with that at an equal altitude above the m.d.p., but the temperature and ballistic density need separate consideration. The temperature at the battery is obtained either by direct observation or by correcting to the level of the battery the temperature given in

the first group of the meteorological message. This correction is made by means of the Thermo-metric Formula, Part 1B.

The ballistic density depends upon the maximum ordinate considered. Anyone of the 7 figure groups of the message gives the ballistic density for a certain maximum ordinate measured from the m.d.p. This density when corrected by means of the Density Formula, Part 1B, becomes the ballistic density for that maximum ordinate measured from the battery.

When standard Coast Artillery instruments are not available, it is necessary to prepare firing data by computations, using the firing tables as explained hereafter.

USE OF THE TABLES

For convenience in reference, the differential variations and the corresponding corrections will be considered in three groups. The designation of the groups of corrections, in the order in which they will be treated, are:

      (a) Position corrections,
      (b) Materiel corrections, and
      (c) Weather corrections.

This grouping corresponds in a general way to the order in which the data for the corrections are obtained. When the corrections refer to changes in deflection or in height of burst, they are so indicated. Otherwise they refer to changes in range. When all the variations from standard are numerically small, and hence comparable in magnitude, it is known that a slight increase in formal accuracy is secured by making these corrections successively; that is, by correcting the map range to account for the first variation considered, and using the resulting first corrected range as a basis for determining the magnitude of the second variations, and so forth. In most cases which will occur in practice, this increase in formal accuracy is meaningless, since the data themselves are seldom known with sufficient refinement to warrant the slight apparent gain in accuracy. Consequently, for general use with this table, all corrections may be calculated on

the basis of the same fundamental quantity, namely, the map range. At the same time should it prove more convenient, there is no objection to imposing the corrections successively, except where someone of the corrections is much larger than the others. The only case which occurs frequently enough to warrant particular consideration is that of a large correction due to height of target. For this situation it has been verified that greater accuracy is secured by imposing simultaneously the velocity and height of site corrections than by imposing these corrections successively in either order.

(a) Position Corrections are determinable as soon as the relative location of gun and target is known. For land firing, their geographical location would determine both the map range and the difference in altitude; for seacoast batteries, the height of the tide may also be required. Position corrections consist of those for difference in altitude of gun and target. Corrections for Rotation of the Earth may be regarded as Position Corrections. The drift may be regarded as necessitating a position correction in deflection, the cant effect due to the carriage not being level also necessitates a position correction in deflection since it is determinable from a knowledge of the map range. Tables B and C giving "Position effects", may be entered with "Map ranges" as one argument and "Height of Target" as the other argument. The position effect must be algebraically subtracted from the map range to determine the geographical distance to the level point on that trajectory, or its continuation, which, under standard conditions, passes through the target.

(b) Materiel Corrections are determinable, for a given range, when the weight and the markings of the projectile and the relatively permanent characteristics of the particular piece and powder lot are known. These corrections consist of those for (1) variations from normal in weight of projectile, (2) estimated change in muzzle velocity, $(V - V_s)$, due to the conditions of the piece or of the powder when the powder is at standard powder temperature (70° F.). The correction on account of variation in weight of projectile is usually obtained from Table D, Part 2, for any given marking. The estimated

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change in muzzle velocity is called the velocity adjustment, V - V$_s$, and is made by reference to the record of performance of the particular piece and powder lot, or other empirical methods. Usually the results of observation of previous firings are available. The necessary correction is then found by the use of the effects tabulated in Part 2, Table F.

(c) Weather Corrections are determinable only upon receipt of the regular meteorological message or other reports of observation made at or near the time of firing. These corrections consist of those for (1) air density, (2) air temperature (elasticity effect), (3) range wind, (4) variation of the powder temperature from standard. The deflection effect of the cross wind may be regarded as leading to weather corrections. The air density, air temperature, range wind, and cross wind, to be used in any case are, respectively, the ballistic density, temperature at the battery, ballistic range wind, and ballistic cross wind, all as given in or obtained from the meteorological message. In the absence of such information it will ordinarily be necessary to utilize such observation of air conditions as can be made at the battery. The maximum ordinate corresponding to the map range for use with the Meteorological Message is found in Part 2, Table A, column (8).

The ballistic wind, given in speed and direction, is resolved into components along and across the line of fire by means of the chart of Part 1A. The range component is the ballistic range wind to be used with Part 2, Table I. The cross component is the ballistic cross wind, and the resulting deflection effects are found by reference to Part 2, Table J. The effect of the variations of the powder temperature from the standard powder temperature is found as the effect of an equivalent change in muzzle velocity. This muzzle velocity change may be read from Part 1, I.

The algebraic sum of all of the range effects hitherto mentioned, namely, of those due to position variations, materiel variations, weather variations, are added together algebraically and this algebraic sum subtracted from the map range. This amounts to changing the signs

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of the effects, thus converting them into the corrections desired, and then adding the corrections to the map range. When these calculations are made previous to a series of firings, the result is known as the initial range, being the range at which firing is begun. With it, entry is made in Part 2, Table A, and the corresponding angle of elevation is read from either columns (2) or (3). The deflection effects, when added algebraically give the total deflection effect, and a change of sign gives the deflection corrections to be used with the panoramic sight.

When observation of fire is possible, the center of impact for succeeding rounds is adjusted to the center of target on the basis of rounds already observed, and the range corresponding to the resultant setting is called the adjusted range. The difference between the adjusted range and the initial range as defined above is assumed to be due to a variation which necessitates a correction to be applied upon V - V$_s$. The value of V - V$_s$ thus continually revised, is called the velocity adjustment and requires reference to Part 2, Table F. It is used in the next firing or in firing at a different range, and is then considered as a materiel correction.

The following example illustrates the use of the tables:

Given: 6" Gun, M1897 MI, mounted on the Disappearing Carriage.
      Tabular Muzzle Velocity = 2700 f/s.
      Projectile, H. E. Shell, Mark II.

Data as to Position

      Altitude of battery = 450 ft. above sea level.
      Map range to target = 11930 yards.
      Height of target = -432 ft. (432 ft. below gun).
      Azimuth of target (measured clockwise from the North) = 437 mils (24°.6).
      Latitude of gun = 42° North.

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Data as to Materiel

Marking of projectile ▬
Preliminary Velocity Adjustment $(V - V_o) =$
-18 f/s (18 f/s below tabular velocity)

Weather Data

Temperature of Powder = 62° F.
Meteorological Message: MSL MSL 30162 0620799
1620898 2600997 3591195 4600992

Required: Quadrant Elevation and Deflection Set-
ting.

Solution: The tables Parts 1 and 2 are used
throughout.

(a) Position Corrections for Range

Entering Table B, for target
below gun, we find corresponding to a
map range of 11930 yards and a height of
target of -432 ft. a range effect of   +332 yds.

Entering Table E, for effect
on range due to Rotation of the Earth,
we find, corresponding to a latitude of
42° and an azimuth of 24°.6 a range ef-
fect of   +14 yds.

(b) Materiel Corrections for Range

Entering Table D, we find the
effect on range for a marking of ▬ on
the projectile to be   -30 yds.

In a similar manner, from
Table F, we find the effect on range
for an estimated decrease of -18 f/s
in muzzle velocity to be   -83 yds.

(c) Weather Corrections for Range

The actual or estimated tem-
perature of powder at the time of firing
being 62° F., instead of the standard
temperature for powder at 70° F., a cor-
rection must be introduced. The effect
on muzzle velocity is obtained from

Part 1, I and is -18 f/s. The effect on
range thus occasioned is found in the
same manner as above from Table F, to be -83 yds.

To obtain the effects of the re-
maining variations the meteorological
message must be deciphered and such in-
formation as is applicable to the par-
ticular trajectory considered must be
utilized.

From column (8) of Table A, the
maximum ordinate is found to be about
2900 ft. so that in addition to the in-
troductory information obtained in the
meteorological message only that group
of the message numbered 3 and which
gives data for a maximum ordinate of
3000 ft. will be used.

From the Meteorological Message
the following information is obtained:

Altitude of the m.d.p. above mean
  sea level   100 ft.
Temperature at the m.d.p.   62° F.
Azimuth of the ballistic wind (for
  group "3")   5900 mils
Velocity of the ballistic wind
  (for group "3")   11 mi/h
Ballistic Density (for group "3")   95%

To obtain the components of the ballistic
wind, it is necessary to secure from the
recorded azimuths of target and ballistic
wind, the chart direction of the wind for
which the line of fire is the reference
direction. Subtracting 437 mils from
5900 mils, we have for the chart di-
rection from which the wind is blowing 5463 mils

Using the Wind Component Chart,
Part 1A, with 11 mi/h as the wind vel-
ocity we have corresponding to 5463
mils a range component, W_x of   -6.6 mi/h
and a cross component, W_y of   -8.8 mi/h

The components of 1 mi/h are
added to the corresponding compon-
ents of 10 mi/h to obtain the com-
ponents of 11 mi/h

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Entering Table I, we find the effect on range for -6.6 mi/h range wind (the negative sign indicates a head wind) to be   -62 yds.

The temperature at the m.d.p. given in the Meteorological Message cannot be used directly since the battery is not situated in the m.d.p. but is seen to be above the m.d.p.   350 ft.

Using the Thermometric Formula, Part 1B, the decrease in temperature for this height is 1° F., so that the temperature for the battery is 61° F.

Entering Table H, we find the temperature (elasticity) effect on range for a temperature of 61° F. (or 2° Fahrenheit above the normal temperature of 59° F.) to be   -1 yds.

The ballistic density given in the meteorological message for this trajectory cannot be used directly since the battery is 350 ft. above the m.d.p.

Using the density formula, Part 1B, the decrease in density for this height is 1% so that the ballistic density for the battery is   94%

Entering Table Ga, we find the effect on range for the ballistic air density of 94% (6% below normal) to be +385 yds.

The total range effect is now obtained by adding the separate range effects algebraically. It has the value of +332+14-30-83-83-62-1+385 =   +472 yds.

The total range correction is obtained by merely changing the sign of the total range effect. It is   -472 yds.

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The corrected range, found by adding algebraically the total correction to the map range (or what is the same thing, subtracting the total effect), is 11930 yds. - 446 yds., i.e.   11458 yds.

The elevation corresponding to the corrected range of 11458 yds. is found in either columns 2 or 3 of Table A. It is 207.0 mils = 11°39'

The deflection effects are found in a similar manner.

The deflection effect due to a -8.8 mi/h cross wind (from left to right) is found from Table J to be   -4.6 mils = 0°.26

The drift is found from columns (13) or (14) of Table A to be -17+ mils = -1°.00

The deflection effect due to rotation of the earth for a latitude of 42° North and an azimuth of 24°.6 is found from Table K to be   -1.0 mils = 0°.06

The total deflection effect is obtained by adding algebraically the separate deflection effects. It has the value of -4.6 -17-1.0 = -23 mils or -0°.26-1°.00-0°.6 = -1.30 (to nearest 0.05 of a degree)

The total deflection correction is obtained by merely changing the sign of the total deflection effect. It is +23 mils or +1°.30

The deflection set off at the gun will be +23 mils (23 mils to the left) when the target is used as aiming point. For any other aiming point 23 mils must be added to the deflection of the target. To obtain the azimuth setting it must be recalled that deflections and azimuths are measured in opposite senses. The correction of +23 mils in deflection is the

6" GUNS, M1897 MI, M1908, M1908 MI and M1908 MII

same as a correction of -23 mils in azimuth. The azimuth setting then is 437 mils - 23 mils = 414 mils or 24°.6 - 1°.3 = 23°.3

PART 1

6" GUNS, M1897 MI, M1908, M1908 MI and M1908 MII

FIRING

H. E. SHELL, MARK II

PART 1A WIND COMPONENT CHART

WIND DIMINISHES THE
RANGE AND CARRIES
THE PROJECTILE
TO THE RIGHT.

6200 6400 6000 5800 5600 5400 5200 5000

CROSS WIND (Wy) 4800 -9 -8 -7 -6 -5 -4 -3 -2

4600

4400

4200

4000

3800

3600

3400

3200

WIND INCREASES THE
RANGE AND CARRIES
THE PROJECTILE
TO THE RIGHT.

LINE OF FIRE

-10 -9 -8 -7 -6 -5 -4 -3 -2

RANGE WIND (Wx)

DIRECTIONS:-
1st. Subtract azimuth of plane
of fire from azimuth of wind
adding 6400 to azimuth of WIND
if necessary, thus obtaining
chart direction of wind.
2nd. Find intersection of chart direction of
wind with wind velocity circle. Read Wx for range
component or Wy for deflection component.
3rd. The signs ± are for the signs of the
effects in range and deflection.

WIND COMPONENT CHART PART 1A

LINE OF FIRE

0 -10 -9 -8 -7 -6 -5 -4 -3 -2

200 400 600 800 1,000 1,200 1400

WIND DIMINISHES THE
RANGE AND CARRIES
THE PROJECTILE
TO THE LEFT.

$+2$ $+3$ $+4$ $+5$ $+6$ $+7$ $+8$ $+9$ 1600 CROSS WIND (Wy)

1800

2000

2200

2400

2600

2800

3000

3200

WIND INCREASES THE
RANGE AND CARRIES
THE PROJECTILE
TO THE LEFT

RANGE WIND (Wx)

$+2$ $+3$ $+4$ $+5$ $+6$ $+7$ $+8$ $+9$ $+10$

EXAMPLE:-
given { Azimuth of target = 6200 (mils)
Azimuth of wind = 450 (mils)
Velocity of wind = 5 (mi/hr)

Chart direction of wind 450+6400
-6200 = 650

Hence from chart
Range wind (Wx) = -4 (mi/hr)
Cross wind (Wy) = $+3$ (mi/hr)

PART 1B.

THERMOMETRIC FORMULA

$\frac{1}{5}$° F. = DECREASE IN TEMPERATURE FOR 100 FT. INCREASE IN ALTITUDE

$\frac{1}{5}$° F. = INCREASE IN TEMPERATURE FOR 100 FT. DECREASE IN ALTITUDE

DENSITY FORMULA

0.3% = DECREASE IN AIR DENSITY FOR 100 FT. INCREASE IN ALTITUDE

0.3% = INCREASE IN AIR DENSITY FOR 100 FT. DECREASE IN ALTITUDE

PART 1C.   YARDS TO METERS

1 yd = 0.91440 meters

YARDS	0	10	20	30	40	50	60	70	80	90
0	0	9.1	18.3	27.4	36.6	45.7	54.9	64.0	73.2	82.3
100	91.4	100.6	109.7	118.9	128.0	137.2	146.3	155.4	164.6	173.7
200	182.9	192.0	201.2	210.3	219.5	228.6	237.7	246.9	256.0	265.2
300	274.3	283.5	292.6	301.8	310.9	320.0	329.2	338.3	347.5	356.6
400	365.8	374.9	384.0	393.2	402.3	411.5	420.6	429.8	438.9	448.1
500	457.2	466.3	475.5	484.6	493.8	502.9	512.1	521.2	530.4	539.5
600	548.6	557.8	566.9	576.1	585.2	594.4	603.5	612.7	621.8	630.9
700	640.1	649.2	658.4	667.5	676.7	685.8	695.0	704.1	713.2	722.4
800	731.5	740.7	749.8	759.0	768.1	777.2	786.4	795.5	804.7	813.8
900	823.0	832.1	841.2	850.4	859.5	868.7	877.8	887.0	896.1	905.3
1000	914.4	923.6	932.7	941.8	951.0	960.1	969.3	978.4	987.6	996.7

PART 1D.   METERS TO YARDS

1 meter = 1.0936 yds.

METERS	0	10	20	30	40	50	60	70	80	90
0	0	10.9	21.9	32.8	43.7	54.7	65.6	76.6	87.5	98.4
100	109.4	120.3	131.2	142.2	153.1	164.0	175.0	185.9	196.8	207.8
200	218.7	229.7	240.6	251.5	262.5	273.4	284.3	295.3	306.2	317.4
300	328.1	339.0	350.0	360.9	371.8	382.8	393.7	404.6	415.6	426.5
400	437.4	448.4	459.3	470.2	481.2	492.1	503.1	514.0	524.9	535.8
500	546.8	557.7	568.7	579.6	590.6	601.5	612.4	623.4	634.3	645.2
600	656.2	667.1	678.0	689.0	699.9	710.8	721.8	732.7	743.7	754.6
700	765.5	776.5	787.4	798.3	809.3	820.2	831.1	842.1	853.0	864.0
800	874.9	885.8	896.8	907.7	918.6	929.6	940.5	951.4	962.4	973.3
900	984.2	995.2	1006.1	1017.1	1028.0	1038.9	1049.9	1060.8	1071.7	1082.7
1000	1093.6	1104.6	1115.5	1126.4	1137.4	1148.3	1159.2	1170.2	1181.1	1192.1

PART 1E

Angular Conversion Table - Degrees to mils

Degrees	0	1	2	3	4	5	6	7	8	9
00	0	18	36	53	71	89	107	124	142	160
10	178	196	213	231	249	267	284	302	320	338
20	356	373	391	409	427	444	462	480	498	516
30	533	551	569	587	604	622	640	658	676	693
40	711	729	747	764	782	800	818	836	853	871
50	889	907	924	942	960	978	996	1013	1031	1049
60	1067	1084	1102	1120	1138	1156	1173	1191	1209	1227
70	1244	1262	1280	1298	1316	1333	1351	1369	1387	1404
80	1422	1440	1458	1476	1493	1511	1529	1547	1564	1582
90	1600	(Conversion Factor, 1° = 17.77778 mils)								

PART 1F

Natural Trigonometric Functions

Mils	N.Sin.	N.Cos.	N.Tan.	N.Cot.	Mils	N.Sin.	N.Cos.	N.Tan.	N.Cot.
0	0.0000	1.0000	0.0000	------	800	0.7071	0.7071	1.000	1.000
50	.0491	.9988	.0491	20.355	850	.7410	.6344	1.219	.9063
100	.0980	.9952	.0985	10.153	900	.7730	.6344	1.219	.8207
150	.1467	.9892	.1483	6.741	950	.8032	.5957	1.348	.7416
200	.1951	.9808	.1989	5.027	1000	.8315	.5556	1.497	.6682
250	.2430	.9700	.2505	3.992	1050	.8577	.5141	1.668	.5994
300	.2903	.9569	.3033	3.297	1100	.8819	.4714	1.871	.5345
350	.3369	.9415	.3578	2.795	1150	.9040	.4276	2.114	.4730
400	.3827	.9239	.4142	2.414	1200	.9239	.3827	2.414	.4142
450	.4276	.9040	.4730	2.114	1250	.9415	.3369	2.795	.3578
500	.4714	.8819	.5345	1.871	1300	.9569	.2903	3.297	.3033
550	.5141	.8577	.5994	1.668	1350	.9700	.2430	3.992	.2505
600	.5556	.8315	.6682	1.497	1400	.9808	.1931	5.027	.1989
650	.5957	.8032	.7416	1.348	1450	.9892	.1467	6.741	.1483
700	.6344	.7730	.8207	1.219	1500	.9952	.0980	10.153	.0985
750	.6716	.7410	.9063	1.103	1550	.9988	.0491	20.355	.0491
800	0.7071	0.7071	1.0000	1.000	1600	1.0000	0.0000	------	0.0000

PART 1G

TABLE OF PROBABILITY FACTORS.

$$\text{"Prob"} = \frac{2}{\sqrt{\pi}}\int_0^t e^{-t^2}\, dt \quad \text{where} \quad \frac{t}{.476936} = \text{Factor}$$

Factor	Prob.	Factor	Prob.	Factor	Prob.	Factor	Prob.
0.00	0.0000	1.00	0.5000	2.00	0.8227	3.00	0.9570
0.05	0.0269	1.05	0.5212	2.05	0.8332	3.05	0.9603
0.10	0.0538	1.10	0.5410	2.10	0.8433	3.10	0.9635
0.15	0.0806	1.15	0.5621	2.15	0.8530	3.15	0.9664
0.20	0.1073	1.20	0.5817	2.20	0.8622	3.20	0.9691
0.25	0.1339	1.25	0.6008	2.25	0.8709	3.25	0.9716
0.30	0.1604	1.30	0.6194	2.30	0.8792	3.30	0.9740
0.35	0.1867	1.35	0.6375	2.35	0.8871	3.35	0.9762
0.40	0.2127	1.40	0.6550	2.40	0.8945	3.40	0.9782
0.45	0.2385	1.45	0.6719	2.45	0.9016	3.50	0.9817
0.50	0.2640	1.50	0.6883	2.50	0.9083	3.60	0.9848
0.55	0.2893	1.55	0.7042	2.55	0.9146	3.70	0.9874
0.60	0.3143	1.60	0.7195	2.60	0.9205	3.80	0.9896
0.65	0.3389	1.65	0.7343	2.65	0.9261	3.90	0.9915
0.70	0.3632	1.70	0.7485	2.70	0.9314	4.00	0.9930
0.75	0.3871	1.75	0.7621	2.75	0.9364	4.20	0.9954
0.80	0.4106	1.80	0.7753	2.80	0.9411	4.40	0.9970
0.85	0.4336	1.85	0.7879	2.85	0.9454	4.60	0.9981
0.90	0.4562	1.90	0.8000	2.90	0.9495	4.80	0.9988
0.95	0.4783	1.95	0.8116	2.95	0.9534	5.00	0.9993

Explanation: "Prob." is the probable proportion of shots falling
in an interval of width F times the fifty per cent zone (or
2 F times the probable error) with center of impact in the
middle of the interval; F is the "probability factor".

Example:

Given: Zone, normal to line of fire, 40 yds. wide, 60 yds.
from center of impact.
Probable Error in Range, 50 yds.

To determine probable proportion of hits in zone.

For (60 + 40) - zone, $F = \frac{2(60 + 40)}{2(50)} = 2$, hence from table,
Prob. = .82;

For (60)-zone, $F = \frac{2(60)}{2(50)} = 1.2$, hence from table, Prob. = .58

Subtracting, Prob. for the two zones which together satisfy the
condition, is .82 - .58. Hence, Prob. for either one of the two
possible zones defined, is 1/2 (.82 - .58) = 12%.

A less accurate but frequently more convenient approximation is
given by the "Dispersion Ladder":

Center of Impact

4 P.E.	3 P.E.	2 P.E.	1 P.E.	1 P.E.	2 P.E.	3 P.E.	4 P.E.
1/2%	1 1/2%	7%	16%	25%	25%	16%	7%	1 1/2%	1/2%

This gives differences in Prob. for even integral multiples
of the probable error.

PART 1H   TABLE OF SLOPE COEFFICIENTS

sin ω/sin (ω+n).

ω = angle of fall (mils) (measured from line of site).

n, positive (relative forward slope)										
%	1	2	3	5	10	15	20	30	40	50
mil	10	20	31	51	102	152	201	297	388	472	1,600
50	.81	.71	.62	.50	.33	.25	.20	.15	.12	.10	.05
100	.93	.83	.77	.66	.50	.40	.34	.26	.21	.18	.10
150	.94	.88	.83	.75	.60	.50	.43	.36	.29	.26	.15
200	.95	.91	.87	.80	.67	.58	.51	.42	.36	.32	.20
250	.96	.93	.89	.83	.72	.63	.57	.48	.41	.37	.25
300	.97	.94	.91	.86	.75	.68	.61	.52	.46	.42	.30
350	.97	.95	.92	.88	.79	.71	.65	.57	.51	.47	.36
400	.98	.95	.93	.89	.81	.74	.69	.61	.55	.51	.41
500	.98	.96	.95	.92	.85	.79	.74	.67	.62	.58	.53
600	.99	.97	.96	.93	.87	.83	.78	.72	.67	.64	.67
700	.99	.98	.97	.94	.90	.85	.82	.76	.72	.69	.82
800	.99	.98	.97	.95	.91	.88	.85	.80	.77	.75	1.00
900	.99	.98	.98	.96	.93	.90	.88	.84	.81	.79	1.22
1000	.99	.99	.98	.97	.94	.92	.90	.87	.85	.84	1.50
1100	.99	.99	.98	.98	.95	.94	.92	.90	.89	.88	1.87
1200	1.00	.99	.99	.98	.97	.95	.94	.93	.92	.93	2.41

-n, positive (relative reverse slope)										
%	1	2	3	5	10	15	20	30	40	50
mil	10	20	31	51	102	152	201	297	388	472
50	1.26	1.69	2.57							
100	1.11	1.26	1.44	2.03						
150	1.07	1.16	1.25	1.51	3.08					
200	1.05	1.11	1.18	1.34	2.02	4.11				
250	1.04	1.09	1.14	1.25	1.67	2.52	5.06			
300	1.03	1.07	1.11	1.20	1.50	2.00	2.99	94.86		
350	1.03	1.06	1.09	1.16	1.39	1.74	2.31	6.46		
400	1.02	1.05	1.08	1.14	1.32	1.59	1.97	3.78	31.39	
500	1.02	1.04	1.06	1.10	1.24	1.41	1.63	2.38	4.33	17.31
600	1.02	1.03	1.05	1.08	1.18	1.30	1.46	1.89	2.68	4.44
700	1.01	1.03	1.04	1.07	1.14	1.24	1.35	1.65	2.10	2.86
800	1.01	1.02	1.03	1.05	1.12	1.19	1.27	1.49	1.80	2.24
900	1.01	1.02	1.03	1.04	1.09	1.15	1.22	1.39	1.60	1.90
1000	1.01	1.01	1.02	1.04	1.08	1.12	1.18	1.31	1.47	1.68
1100	1.01	1.01	1.02	1.03	1.06	1.10	1.14	1.24	1.37	1.53
1200	1.00	1.01	1.01	1.02	1.05	1.08	1.11	1.19	1.29	1.41

n = Slope with respect to line of site (per cent and mils)(n = n'-s+300).
Directions. Multiply range probable error (from range table) by
coefficient shown above. Here ω denotes the angle of fall (measured
to line of site)(for practical purposes equal to the range table angle
of fall which is its value for site 300 ∮, i.e. for a level trajectory);
n', the quadrant angle of slope, positive for forward slope (ground
rising in enemy direction), and negative for reverse slope (ground falling
in enemy direction); s-300, the angle of site, positive for target
above gun, negative for target below gun; n(n=n'-s+300), the slope re-
lative to the line of site. NOTE. The quadrant angle of fall, ω'=ω-s+300.
Example: Given target on reverse slope between contour lines 130 ft.,
and 140 ft., mean distance between contours = 67 ft., site = -20 mils,
angle of fall (tabulated) = 250 mils, range probable error
(in range table)= 83 yd.
Then, n'(in per cent) = 100 $\frac{130-140}{67}$ = -15(%) or -152 mils, n'-s+300 =

-152-(-20) = -132 mils. Interpolating between 1.67(for 102 mils) and 2.52
(for 152 mils), slope coefficient = 1.67 $+\frac{30}{50}$ x 0.85 = 2.18. Hence, range

probable error to be used = 2.18 x 83 yd. = 181 yd.

CHART FOR CHANGE IN MUZZLE VELOCITY
FOR TEMPERATURE OF POWDER
DIFFERENT FROM NORMAL
$$\Delta V = 1.68\,(T - 70°)$$

TEMPERATURE - DEGREES FAHRENHEIT
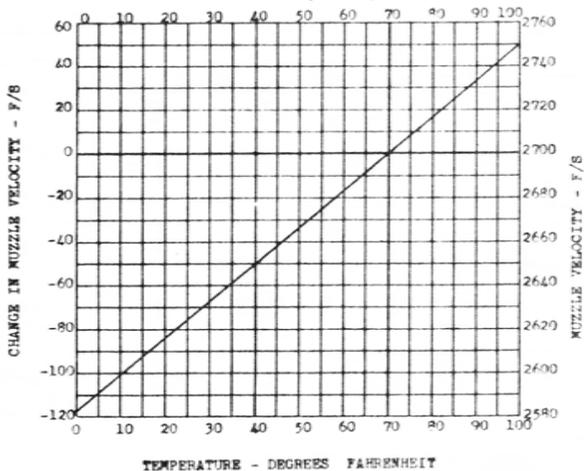
Directions:- Enter chart with temperature of powder. Follow vertical line to the slanting line: from there follow the horizontal line either to the left edge of the chart, where the change in muzzle velocity may be read or to the right edge where the corrected muzzle velocity may be read.

EXAMPLE:- Suppose temperature of powder = 59° F. Standard muzzle velocity = 2700 f/s. From the chart, the change in Muzzle Velocity is -18 f/s and the muzzle velocity to be expected is 2682 f/s.

PART 2

PROPELLING CHARGE

6" GUNS, M1897 MI, M1908, M1908 MI and M1908 MII

SINGLE SECTION CHARGE - MUZZLE VELOCITY 2700 F/S

DRAWING OF PROPELLING CHARGE

I CHARGE 6" G. 1897-1908
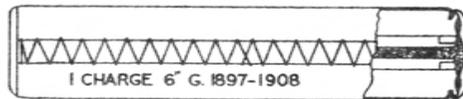
Weight of Charge 29 lbs. 3 oz. Smokeless Powder.

Drawing No. 71-9-30

PART 2

6" GUNS, M1897 MI, M1908, M1908 MI and M1908 MII

MOUNTED ON DISAPPEARING CARRIAGE

H. E. SHELL, MARK II

FUZE, SHORT (MARK IV*)

MUZZLE VELOCITY = 2700 F/S

JUMP VARIABLE

TABLES A - K INCLUSIVE

H. E. SHELL, MARK II USED IN RANGE FIRING UPON WHICH THESE TABLES ARE BASED.
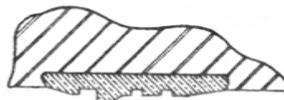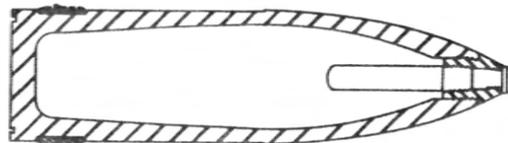
Class 75 - Div. 7 - Drawing 75-20-3.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table A.

Range	*Elevation		Change in Elev. for 100 yds. change in Range		Change in Range for		Maximum Ordinate	Terminal Velocity
					1 mil change in Elev.	1 min change in Elev.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
yards	mils	° '	mils	min	yards	yards	feet	f/s
0	-1.6	-0 05	0.7	2.3	150.0	44.4	0	2700
100	-0.8	-0 03	0.7	2.3	147.6	43.7	0	
200	-0.2	-0 01	0.7	2.3	145.2	43.0	0	
300	+0.6	+0 02	0.7	2.4	142.9	42.3	0	
400	1.2	0 04	0.7	2.4	140.6	41.7	1	2565
500	2.0	0 06	0.7	2.4	138.3	41.0	1	
600	2.6	0 09	0.7	2.5	136.1	40.3	2	
700	3.4	0 12	0.7	2.5	133.9	39.7	2	
800	4.2	0 14	0.8	2.6	131.8	39.1	3	
900	5.0	0 17	0.8	2.6	129.7	38.4	4	
1000	5.8	0 19	0.8	2.6	127.6	37.8	5	2435
1100	6.6	0 22	0.8	2.7	125.6	37.2	6	
1200	7.4	0 25	0.8	2.7	123.6	36.6	7	
1300	8.2	0 27	0.8	2.8	121.6	36.0	9	
1400	9.0	0 30	0.8	2.8	119.7	35.5	10	
1500	9.8	0 33	0.8	2.9	117.8	34.9	12	2310
1600	10.6	0 36	0.9	2.9	115.9	34.3	14	
1700	11.4	0 39	0.9	3.0	114.1	33.8	16	
1800	12.4	0 42	0.9	3.0	112.3	33.3	18	
1900	13.2	0 45	0.9	3.1	110.6	32.8	21	
2000	14.2	0 48	0.9	3.1	108.9	32.3	23	2190
2100	15.0	0 51	0.9	3.2	107.2	31.8	26	
2200	16.0	0 54	0.9	3.2	105.6	31.3	29	
2300	17.0	0 57	1.0	3.2	104.0	30.8	32	
2400	18.0	1 01	1.0	3.3	102.5	30.4	36	
2500	19.0	1 04	1.0	3.3	101.0	29.9	39	2075
2600	20.0	1 07	1.0	3.4	99.5	29.5	43	
2700	21.0	1 11	1.0	3.4	98.1	29.1	47	
2800	22.0	1 14	1.0	3.5	96.7	28.7	51	
2900	23.0	1 18	1.0	3.5	95.3	28.2	55	
3000	24.2	1 21	1.1	3.6	94.0	27.8	60	1965

*For disappearing carriage only.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table A.

Angle of Fall		Slope of Fall	Defl. due to Drift		Ballistic Coefficient	*Probable Error in		Time of Flight	Range
						Range	Defl.		
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
mils	° '	1 on -	mils	°		yds.	yds.	sec.	yds.
0	0 00		0	0.00	3.40	21	0	0.0	0
1	0 02	1495						0.1	100
1	0 05	747						0.2	200
2	0 07	491						0.3	300
3	0 09	362	0	0.00	3.40	21	0	0.4	400
4	0 12	286						0.5	500
4	0 15	235						0.7	600
5	0 17	200						0.8	700
6	0 20	173						0.9	800
7	0 23	152						1.0	900
8	0 25	135	-1	-0.05	3.40	21	1	1.1	1000
8	0 28	121						1.3	1100
9	0 31	109						1.4	1200
10	0 34	99						1.5	1300
11	0 38	91	-1	-0.05	3.40	21	1	1.6	1400
12	0 41	84						1.7	1500
13	0 44	78						1.9	1600
14	0 48	72						2.0	1700
15	0 51	67						2.1	1800
16	0 55	62						2.3	1900
18	0 59	58	-2	-0.10	3.41	21	2	2.4	2000
19	1 03	55						2.6	2100
20	1 07	51						2.7	2200
21	1 11	48						2.8	2300
22	1 16	45						3.0	2400
24	1 20	43	-2	-0.10	3.41	21	2	3.1	2500
25	1 25	41						3.3	2600
26	1 30	39						3.4	2700
28	1 35	37						3.6	2800
30	1 40	35						3.7	2900
31	1 45	33	-3	-0.15	3.41	21	2	3.9	3000

*This is the Proving Ground Probable Error.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table A.

Range	*Elevation		Change in Elev. for 100 yds. change in Range		Change in Range for		Maximum Ordinate	Terminal Velocity
					1 mil change in Elev.	1 min change in Elev.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
yards	mils	° '	mils	min	yards	yards	feet	f/s
3000	24.2	1 21	1.1	3.6	94.0	27.8	60	1965
3100	25.2	1 25	1.1	3.6	92.7	27.4	65	
3200	26.2	1 28	1.1	3.7	91.4	27.0	70	
3300	27.2	1 32	1.1	3.7	90.1	26.7	76	
3400	28.4	1 36	1.1	3.8	88.8	26.3	82	
3500	29.6	1 40	1.1	3.8	87.6	25.9	88	1860
3600	30.8	1 44	1.2	3.9	86.3	25.6	94	
3700	31.8	1 48	1.2	4.0	85.1	25.2	101	
3800	33.0	1 52	1.2	4.0	83.8	24.8	108	
3900	34.2	1 56	1.2	4.1	82.6	24.5	115	
4000	35.4	2 00	1.2	4.1	81.4	24.1	123	1760
4100	36.8	2 04	1.2	4.2	80.2	23.8	131	
4200	38.0	2 08	1.3	4.2	79.0	23.4	139	
4300	39.2	2 12	1.3	4.3	77.8	23.1	148	
4400	40.6	2 17	1.3	4.4	76.6	22.7	157	
4500	41.8	2 21	1.3	4.4	75.4	22.3	166	1665
4600	43.2	2 26	1.3	4.5	74.2	22.0	176	
4700	44.6	2 30	1.4	4.6	73.1	21.7	186	
4800	45.8	2 35	1.4	4.7	71.9	21.3	196	
4900	47.2	2 39	1.4	4.8	70.8	21.0	207	
5000	48.6	2 44	1.4	4.8	69.7	20.7	218	1575
5100	50.2	2 49	1.5	4.9	68.6	20.3	230	
5200	51.6	2 54	1.5	5.0	67.5	20.0	242	
5300	53.2	2 59	1.5	5.1	66.4	19.7	255	
5400	54.6	3 04	1.5	5.2	65.4	19.4	268	
5500	56.2	3 09	1.6	5.3	64.3	19.1	281	1490
5600	57.8	3 15	1.6	5.4	63.3	18.8	295	
5700	59.4	3 20	1.6	5.4	62.3	18.5	309	
5800	61.0	3 26	1.6	5.5	61.3	18.2	324	
5900	62.6	3 31	1.7	5.6	60.3	17.9	340	
6000	64.2	3 37	1.7	5.7	59.3	17.6	356	1411

*For disappearing carriage only.

"6-B-2"

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table A.

Angle of Fall		Slope of Fall	Defl. due to Drift		Ballistic Coefficient	*Probable Error in		Time of Flight	Range
						Range	Defl.		
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
mils	° '	1 on -	mils	°		yds.	yds.	sec.	yds.
31	1 45	33	-3	-0.15	3.41	21	2	3.9	3000
33	1 50	31						4.0	3100
34	1 56	30						4.2	3200
36	2 01	28						4.4	3300
38	2 07	27	-3	-0.15	3.41	22	3	4.5	3400
39	2 13	26						4.7	3500
41	2 19	25						4.9	3600
43	2 25	24						5.0	3700
45	2 32	23						5.2	3800
47	2 38	22						5.4	3900
49	2 45	21	-4	-0.20	3.42	22	3	5.5	4000
51	2 52	20						5.7	4100
53	2 59	19						5.9	4200
55	3 06	18						6.0	4300
57	3 14	18	-4	-0.25	3.42	22	4	6.2	4400
60	3 21	17						6.4	4500
62	3 29	16						6.6	4600
64	3 37	16						6.8	4700
67	3 45	15						7.0	4800
69	3 54	15						7.2	4900
72	4 02	14	-5	-0.25	3.42	22	4	7.3	5000
74	4 11	14						7.5	5100
77	4 20	13						7.7	5200
80	4 29	13						7.9	5300
83	4 39	12						8.1	5400
86	4 48	12	-5	-0.30	3.43	22	4	8.3	5500
88	4 58	12						8.5	5600
91	5 08	11						8.8	5700
94	5 18	11						9.0	5800
97	5 29	10						9.2	5900
101	5 40	10	-6	-0.35	3.43	22	5	9.4	6000

*This is the Proving Ground Probable Error.

"6-B-2"

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table A.

Range	*Elevation		Change in Elev. for 100 yds. change in Range		Change in Range for 1 mil / 1 min change in Elev.		Maximum Ordinate	Terminal Velocity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
yards	mils	° '	mils	min	yards	yards	feet	f/s
6000	64.2	3 37	1.7	5.7	59.3	17.6	356	1411
6100	66.0	3 43	1.7	5.8	58.4	17.3	373	
6200	67.8	3 49	1.7	5.9	57.4	17.0	390	
6300	69.4	3 55	1.8	6.0	56.5	16.7	408	
6400	71.2	4 01	1.8	6.1	55.6	16.5	426	1339
6500	73.0	4 07	1.8	6.2	54.7	16.2	444	
6600	75.0	4 13	1.9	6.3	53.8	15.9	463	
6700	76.8	4 19	1.9	6.4	53.0	15.7	483	
6800	78.6	4 26	1.9	6.5	52.1	15.4	504	
6900	80.6	4 32	2.0	6.6	51.3	15.2	526	
7000	82.6	4 39	2.0	6.7	50.5	15.0	548	1275
7100	84.6	4 46	2.0	6.8	49.7	14.7	571	
7200	86.6	4 53	2.0	6.9	48.9	14.5	595	
7300	88.8	5 00	2.1	7.0	48.2	14.3	619	
7400	90.8	5 07	2.1	7.1	47.4	14.0	644	1220
7500	93.0	5 14	2.1	7.2	46.7	13.8	669	
7600	95.0	5 21	2.2	7.3	46.0	13.6	695	
7700	97.2	5 28	2.2	7.5	45.3	13.4	722	
7800	99.4	5 36	2.2	7.6	44.6	13.2	750	
7900	101.8	5 43	2.3	7.7	43.9	13.0	779	
8000	104.0	5 51	2.3	7.8	43.2	12.8	809	1173
8100	106.4	5 59	2.3	7.9	42.6	12.6	840	
8200	108.8	6 07	2.4	8.1	41.9	12.4	872	
8300	111.2	6 15	2.4	8.2	41.3	12.2	904	
8400	113.6	6 23	2.5	8.3	40.7	12.1	937	1134
8500	116.0	6 32	2.5	8.4	40.1	11.9	971	
8600	118.6	6 40	2.5	8.5	39.5	11.7	1006	
8700	121.2	6 49	2.6	8.7	38.9	11.5	1042	
8800	123.8	6 57	2.6	8.8	38.4	11.4	1079	
8900	126.4	7 06	2.6	8.9	37.8	11.2	1117	
9000	129.0	7 15	2.7	9.0	37.3	11.1	1157	1102

*For disappearing carriage only.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table A.

Angle of Fall		Slope of Fall	Defl. due to Drift		Ballistic Coefficient	*Probable Error in		Time of Flight	Range
(10)	(11)	(12)	(13)	(14)	(15)	(16) Range	(17) Defl.	(18)	(19)
mils	° '	1 on -	mils	°		yds.	yds.	sec.	yds.
101	5 40	10	-6	-0.35	3.43	22	5	9.4	6000
104	5 51	9.8						9.6	6100
108	6 03	9.5						9.8	6200
111	6 14	9.2						10.0	6300
114	6 26	8.9	-6	-0.35	3.43	22	5	10.3	6400
118	6 38	8.6						10.5	6500
121	6 50	8.3						10.7	6600
125	7 03	8.1						10.9	6700
129	7 16	7.8						11.2	6800
133	7 30	7.6						11.4	6900
137	7 44	7.4	-7	-0.40	3.44	22	6	11.6	7000
142	7 58	7.2						11.9	7100
146	8 13	6.9						12.1	7200
150	8 27	6.7						12.3	7300
155	8 42	6.5	-8	-0.45	3.44	22	6	12.6	7400
159	8 57	6.3						12.8	7500
164	9 12	6.2						13.1	7600
168	9 28	6.0						13.3	7700
173	9 44	5.8						13.6	7800
178	10 00	5.7						13.8	7900
183	10 17	5.5	-9	-0.50	3.45	22	7	14.1	8000
188	10 34	5.4						14.3	8100
193	10 51	5.2						14.6	8200
198	11 09	5.1						14.9	8300
203	11 26	4.9	-10	-0.55	3.45	23	7	15.1	8400
209	11 44	4.8						15.4	8500
214	12 02	4.7						15.7	8600
219	12 20	4.6						15.9	8700
225	12 39	4.5						16.2	8800
231	12 58	4.3						16.5	8900
236	13 18	4.2	-11	-0.60	3.46	23	8	16.8	9000

*This is the Proving Ground Probable Error.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table A.

Range	*Elevation		Change in Elev. for 100 yds. change in Range		Change in Range for 1 mil / 1 min change in Elev.		Maximum Ordinate	Terminal Velocity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
yards	mils	° '	mils	min	yards	yards	feet	f/s
9000	129.0	7 15	2.7	9.0	37.3	11.1	1157	1102
9100	131.6	7 24	2.7	9.2	36.8	10.9	1198	
9200	134.4	7 34	2.8	9.3	36.3	10.8	1240	
9300	137.2	7 43	2.8	9.4	35.8	10.6	1282	
9400	140.0	7 52	2.8	9.6	35.3	10.5	1325	
9500	142.8	8 02	2.9	9.7	34.8	10.3	1369	1075
9600	145.8	8 12	2.9	9.8	34.3	10.2	1415	
9700	148.6	8 22	2.9	9.9	33.9	10.0	1462	
9800	151.6	8 32	3.0	10.1	33.4	9.9	1511	
9900	154.6	8 42	3.0	10.2	33.0	9.8	1561	
10000	157.6	8 52	3.1	10.4	32.6	9.6	1612	1051
10100	160.8	9 03	3.1	10.5	32.2	9.5	1665	
10200	164.0	9 13	3.2	10.6	31.7	9.4	1719	
10300	167.0	9 24	3.2	10.8	31.3	9.3	1775	
10400	170.2	9 35	3.2	10.9	30.9	9.2	1832	
10500	173.4	9 46	3.3	11.1	30.5	9.0	1890	1030
10600	176.8	9 57	3.3	11.2	30.1	8.9	1950	
10700	180.2	10 08	3.4	11.4	29.7	8.8	2011	
10800	183.6	10 20	3.4	11.5	29.3	8.7	2074	
10900	187.0	10 31	3.5	11.7	29.0	8.6	2138	
11000	190.4	10 43	3.5	11.8	28.6	8.5	2204	1012
11100	194.0	10 55	3.5	12.0	28.2	8.4	2272	
11200	197.6	11 07	3.6	12.1	27.9	8.3	2341	
11300	201.2	11 19	3.6	12.3	27.5	8.2	2412	
11400	204.8	11 31	3.7	12.4	27.2	8.1	2484	
11500	208.6	11 44	3.7	12.6	26.8	7.9	2558	998
11600	212.4	11 57	3.8	12.8	26.5	7.8	2634	
11700	216.2	12 09	3.8	12.9	26.1	7.7	2711	
11800	220.0	12 22	3.9	13.1	25.8	7.6	2790	
11900	223.8	12 35	3.9	13.3	25.4	7.5	2871	
12000	227.8	12 49	4.0	13.4	25.1	7.4	2954	987

*For disappearing carriage only.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table A.

Angle of Fall		Slope of Fall	Defl. due to Drift		Ballistic Coefficient	*Probable Error in Range	Defl.	Time of Flight	Range
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
mils	° '	1 on -	mils	°		yds.	yds.	sec.	yds.
236	13 18	4.2	-11	-0.60	3.46	23	8	16.8	9000
242	13 38	4.1						17.1	9100
248	13 58	4.0						17.3	9200
254	14 18	3.9						17.6	9300
260	14 38	3.8						17.9	9400
266	14 59	3.7	-12	-0.65	3.46	23	9	18.2	9500
273	15 20	3.6						18.5	9600
279	15 41	3.6						18.8	9700
285	16 02	3.5						19.1	9800
292	16 24	3.4						19.4	9900
298	16 45	3.3	-13	-0.70	3.46	24	9	19.7	10000
304	17 07	3.2						20.0	10100
311	17 29	3.2						20.3	10200
317	17 51	3.1						20.6	10300
324	18 13	3.0						20.9	10400
331	18 35	2.97	-14	-0.75	3.47	24	10	21.2	10500
337	18 57	2.91						21.6	10600
343	19 19	2.85						21.9	10700
350	19 42	2.79						22.2	10800
357	20 04	2.74						22.5	10900
364	20 27	2.68	-15	-0.85	3.47	25	10	22.8	11000
370	20 50	2.63						23.2	11100
377	21 13	2.58						23.5	11200
384	21 36	2.53						23.8	11300
391	21 59	2.48	-16	-0.90	3.47	26	11	24.2	11400
398	22 22	2.43						24.5	11500
404	22 45	2.38						24.8	11600
411	23 08	2.34						25.2	11700
418	23 32	2.30						25.5	11800
425	23 55	2.25						25.9	11900
432	24 19	2.21	-17	-1.00	3.46	27	11	26.2	12000

*This is the Proving Ground Probable Error.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table A.

Range	*Elevation		Change in Elev. for 100 yds. change in Range		Change in Range for		Maximum Ordinate	Terminal Velocity
					1 mil	1 min change in Elev.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
yards	mils	° '	mils	min	yards	yards	feet	f/s
12000	227.8	12 49	4.0	13.4	25.1	7.4	2954	987
12100	231.8	13 02	4.0	13.6	24.8	7.3	3038	
12200	235.8	13 16	4.1	13.8	24.5	7.3	3124	
12300	240.0	13 30	4.1	14.0	24.2	7.2	3212	
12400	244.2	13 44	4.2	14.1	23.9	7.1	3302	
12500	248.4	13 58	4.2	14.3	23.6	7.0	3393	979
12600	252.6	14 13	4.3	14.5	23.3	6.9	3486	
12700	257.0	14 27	4.3	14.6	23.1	6.8	3581	
12800	261.4	14 42	4.4	14.8	22.8	6.8	3678	
12900	265.8	14 57	4.4	15.0	22.6	6.7	3776	
13000	270.2	15 12	4.5	15.2	22.3	6.6	3876	974
13100	274.6	15 27	4.5	15.3	22.1	6.5	3978	
13200	279.2	15 42	4.6	15.5	21.8	6.5	4082	
13300	283.8	15 58	4.6	15.7	21.6	6.4	4188	
13400	288.6	16 14	4.7	15.8	21.3	6.3	4296	
13500	293.2	16 30	4.7	16.0	21.1	6.3	4405	972
13600	298.0	16 46	4.8	16.2	20.9	6.2	4516	
13700	302.8	17 02	4.8	16.4	20.7	6.1	4629	
13800	307.8	17 19	4.9	16.5	20.4	6.0	4745	
13900	312.6	17 35	4.9	16.7	20.2	6.0	4863	
14000	317.6	17 52	5.0	16.9	20.0	5.9	4983	972
14100	322.6	18 09	5.1	17.1	19.8	5.9	5105	
14200	327.8	18 26	5.1	17.2	19.6	5.8	5229	
14300	332.8	18 43	5.2	17.4	19.4	5.7	5355	
14400	338.0	19 01	5.2	17.6	19.2	5.7	5484	
14500	343.2	19 18	5.3	17.8	19.0	5.6	5615	972
14600	348.6	19 36	5.3	18.0	18.8	5.6	5749	
14700	354.0	19 54	5.4	18.1	18.6	5.5	5885	
14800	359.4	20 12	5.4	18.3	18.4	5.5	6024	
14900	364.8	20 31	5.5	18.5	18.3	5.4	6165	
15000	370.2	20 50	5.5	18.7	18.1	5.3	6308	973

*For disappearing carriage only.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table A.

Angle of Fall		Slope of Fall	Defl. due to Drift		Ballistic Coefficient	*Probable Error in		Time of Flight	Range
						Range	Defl.		
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
mils	° '	1 on -	mils	°		yds.	yds.	sec.	yds.
432	24 19	2.21	-17	-1.00	3.46	27	11	26.2	12000
439	24 43	2.17						26.6	12100
446	25 06	2.13						26.9	12200
453	25 30	2.10						27.3	12300
460	25 54	2.06	-19	-1.05	3.45	28	12	27.6	12400
467	26 18	2.02						28.0	12500
475	26 42	1.99						28.4	12600
482	27 06	1.95						28.7	12700
489	27 30	1.92						29.1	12800
496	27 55	1.89						29.5	12900
503	28 19	1.86	-20	-1.15	3.44	30	13	29.8	13000
510	28 43	1.82						30.2	13100
518	29 08	1.79						30.6	13200
525	29 32	1.76						31.0	13300
532	29 57	1.73	-22	-1.20	3.43	32	13	31.4	13400
540	30 22	1.71						31.7	13500
547	30 47	1.68						32.1	13600
555	31 12	1.65						32.5	13700
562	31 37	1.62						32.9	13800
570	32 02	1.60						33.3	13900
577	32 27	1.57	-23	-1.30	3.42	34	14	33.7	14000
584	32 52	1.55						34.1	14100
592	33 17	1.52						34.5	14200
599	33 43	1.50						34.9	14300
607	34 08	1.47	-25	-1.40	3.41	37	15	35.3	14400
615	34 34	1.45						35.7	14500
622	35 00	1.43						36.1	14600
630	35 26	1.41						36.5	14700
638	35 52	1.38						37.0	14800
645	36 18	1.36						37.4	14900
653	36 44	1.34	-26	-1.50	3.40	40	16	37.8	15000

*This is the Proving Ground Probable Error.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table B.

TARGET BELOW GUN - RANGE EFFECTS IN YARDS

Height of Target feet	Map Range - yards							
	1000	1500	2000	2500	3000	3500	4000	4500
-10	463	287	198	145	110	87	70	57
-20	952	585	403	293	222	175	141	115
-30		895	614	445	337	264	212	173
-40		1217	831	600	454	355	284	231
-50			1054	759	574	447	357	290
-60			1284	923	696	541	431	350
-70			1520	1091	820	636	506	411
-80			1762	1263	946	733	582	472
-90				1439	1075	831	659	534
-100				1620	1207	931	737	596
-110				1806	1342	1033	816	659
-120				1996	1480	1137	896	723
-130					1620	1242	977	787
-140					1763	1349	1059	852
-150					1909	1458	1143	918
-160					2058	1569	1228	985
-170					2211	1682	1314	1052
-180					2368	1797	1401	1120
-190					2528	1914	1489	1188
-200					2692	2033	1579	1258
-220						2278	1762	1399
-240						2532	1951	1544
-260						2795	2146	1693
-280						3067	2347	1846
-300						3349	2554	2002
-320							2768	2162
-340							2989	2327
-360							3217	2497
-380							3453	2673
-400							3696	2854
-420								3040
-440								3230
-460								3425
-480								3625
-500								3829

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table B.

TARGET BELOW GUN - RANGE EFFECTS IN YARDS

Map Range - yards							Height of Target feet
5000	5500	6000	6500	7000	7500	8000	
47	40	34	29	25	22	19	-10
95	80	68	58	50	43	38	-20
143	120	102	87	74	64	56	-30
191	161	136	116	99	85	75	-40
240	202	171	145	124	107	94	-50
290	244	206	175	149	129	113	-60
340	285	241	204	174	151	132	-70
390	327	276	234	200	173	151	-80
441	369	311	264	226	195	170	-90
491	411	347	294	251	217	189	-100
542	453	382	324	277	239	208	-110
594	496	418	355	303	261	227	-120
646	539	454	385	329	284	247	-130
699	582	490	416	355	306	266	-140
752	626	527	447	381	328	285	-150
806	670	563	477	407	351	305	-160
860	714	600	508	433	373	325	-170
915	759	637	539	460	396	345	-180
969	804	675	571	487	419	364	-190
1024	849	712	602	513	442	384	-200
1136	940	788	666	567	488	424	-220
1251	1033	865	730	621	534	464	-240
1368	1127	942	795	676	581	504	-260
1487	1222	1020	860	731	627	544	-280
1608	1319	1099	925	786	674	584	-300
1732	1417	1179	992	842	722	625	-320
1859	1517	1260	1060	899	770	666	-340
1989	1619	1342	1128	956	818	707	-360
2122	1723	1426	1197	1014	867	749	-380
2257	1829	1511	1266	1071	915	790	-400
2395	1937	1597	1336	1129	964	832	-420
2536	2047	1684	1407	1189	1015	875	-440
2681	2159	1773	1479	1249	1065	917	-460
2830	2273	1863	1552	1309	1115	960	-480
2983	2388	1955	1627	1370	1166	1003	-500

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table B.

TARGET BELOW GUN - RANGE EFFECTS IN YARDS

Height of Target feet	Map Range - yards						
	8500	9000	9500	10000	10500	11000	11500
-10	17	15	13	11	10	9	8
-20	33	29	26	23	20	18	16
-30	50	44	39	34	30	27	24
-40	66	58	51	45	40	36	33
-50	83	73	64	56	50	45	41
-60	100	88	77	68	60	54	49
-70	116	102	90	79	70	63	57
-80	133	117	103	91	81	73	66
-90	149	131	116	103	91	82	74
-100	166	146	129	114	101	91	82
-110	182	160	141	125	111	100	90
-120	199	175	154	136	121	109	99
-130	216	190	167	148	132	119	107
-140	233	205	181	160	143	128	115
-150	250	220	194	172	153	137	123
-160	267	235	207	183	163	146	132
-170	285	250	220	195	174	156	140
-180	302	265	233	206	184	165	149
-190	319	280	246	218	194	174	157
-200	336	295	259	229	204	183	165
-220	370	325	286	253	225	202	182
-240	405	355	312	276	246	221	199
-260	440	385	339	300	267	239	215
-280	475	416	366	324	288	258	232
-300	510	447	393	347	308	276	249
-320	545	478	420	371	329	294	265
-340	581	509	447	394	350	313	282
-360	616	540	474	418	371	332	299
-380	652	571	501	442	393	351	316
-400	688	602	528	466	414	370	333
-420	724	633	555	490	435	389	350
-440	761	665	583	514	457	408	367
-460	797	696	610	539	478	427	384
-480	834	728	638	563	500	447	402
-500	871	760	666	588	522	466	419

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table B.

TARGET BELOW GUN - RANGE EFFECTS IN YARDS

Map Range - yards							Height of Target feet
12000	12500	13000	13500	14000	14500	15000	
7	7	6	6	5	5	4	-10
15	14	12	11	10	10	9	-20
22	20	19	17	16	15	13	-30
30	27	25	23	21	20	18	-40
37	34	31	28	26	24	22	-50
45	41	37	34	31	29	27	-60
52	48	44	40	37	34	31	-70
60	55	50	46	42	39	36	-80
67	61	56	52	48	44	40	-90
75	68	62	57	53	49	45	-100
82	75	69	63	58	54	50	-110
90	82	75	69	63	58	54	-120
97	88	81	74	68	63	58	-130
104	95	87	80	74	68	63	-140
112	102	93	86	79	73	67	-150
120	109	99	91	84	78	72	-160
127	116	106	97	89	82	76	-170
135	123	112	103	95	87	80	-180
143	130	119	109	100	92	85	-190
150	137	125	114	105	97	90	-200
165	151	138	126	116	107	99	-220
180	164	150	137	126	116	108	-240
195	178	163	149	137	126	117	-260
210	192	175	160	147	136	126	-280
226	206	188	172	158	146	135	-300
241	220	201	184	169	156	144	-320
256	233	213	195	179	165	153	-340
271	247	226	207	190	175	162	-360
287	261	238	218	200	185	172	-380
302	275	251	230	211	195	181	-400
317	289	264	242	222	205	190	-420
333	303	276	253	233	215	199	-440
348	317	289	265	244	225	209	-460
364	331	302	276	254	235	218	-480
379	345	315	288	264	244	227	-500

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table C.

TARGET ABOVE GUN - RANGE EFFECTS IN YARDS

Height of Target feet	Map Range - yards							
	1000	1500	2000	2500	3000	3500	4000	4500
10	-437	-276	-192	-141	-108	-86	-69	-56
20	-848	-539	-378	-279	-214	-170	-137	-112
30		-790	-558	-414	-319	-253	-204	-167
40		-1031	-733	-545	-422	-335	-271	-222
50			-902	-673	-523	-416	-337	-277
60			-1066	-799	-622	-497	-403	-331
70			-1225	-922	-719	-576	-468	-385
80			-1378	-1043	-815	-654	-532	-438
90				-1161	-910	-730	-595	-491
100				-1277	-1003	-805	-657	-543
110				-1391	-1095	-879	-718	-595
120				-1502	-1185	-952	-779	-647
130					-1274	-1025	-840	-698
140					-1361	-1097	-901	-749
150					-1447	-1169	-961	-799
160					-1533	-1240	-1020	-849
170					-1618	-1310	-1078	-899
180					-1701	-1379	-1136	-948
190					-1783	-1447	-1193	-997
200					-1864	-1515	-1250	-1045
220						-1648	-1362	-1141
240						-1779	-1472	-1236
260						-1907	-1581	-1329
280						-2032	-1688	-1420
300						-2155	-1794	-1510
320							-1898	-1599
340							-2000	-1687
360							-2101	-1774
380							-2200	-1859
400							-2297	-1943
420								-2026
440								-2108
460								-2189
480								-2268
500								-2346

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table C.

TARGET ABOVE GUN - RANGE EFFECTS IN YARDS

Map Range - yards							Height of Target feet
5000	5500	6000	6500	7000	7500	8000	
-47	-39	-33	-29	-25	-22	-19	10
-93	-78	-67	-57	-49	-43	-37	20
-139	-117	-100	-86	-74	-64	-56	30
-185	-156	-133	-114	-98	-85	-74	40
-231	-195	-166	-142	-122	-106	-93	50
-276	-233	-199	-170	-146	-127	-111	60
-321	-271	-231	-198	-170	-148	-130	70
-366	-309	-264	-226	-194	-169	-148	80
-411	-347	-296	-253	-218	-190	-166	90
-455	-385	-328	-281	-242	-211	-185	100
-499	-422	-360	-308	-266	-232	-203	110
-543	-459	-391	-335	-290	-253	-221	120
-586	-496	-423	-363	-314	-273	-239	130
-629	-533	-454	-390	-337	-293	-257	140
-671	-569	-485	-416	-360	-314	-275	150
-714	-605	-516	-443	-384	-335	-293	160
-756	-641	-547	-470	-407	-355	-311	170
-798	-677	-578	-497	-430	-375	-329	180
-840	-712	-608	-523	-453	-395	-347	190
-881	-747	-638	-549	-476	-416	-365	200
-963	-817	-698	-601	-522	-456	-400	220
-1044	-886	-757	-662	-567	-496	-435	240
-1124	-955	-817	-704	-612	-535	-470	260
-1202	-1023	-876	-756	-657	-575	-505	280
-1279	-1090	-935	-807	-702	-615	-540	300
-1356	-1157	-993	-858	-746	-653	-574	320
-1432	-1223	-1051	-908	-790	-692	-609	340
-1507	-1288	-1107	-958	-835	-732	-643	360
-1581	-1352	-1164	-1008	-879	-770	-677	380
-1654	-1416	-1220	-1058	-923	-809	-711	400
-1727	-1480	-1276	-1107	-966	-847	-745	420
-1799	-1543	-1331	-1156	-1009	-885	-779	440
-1870	-1605	-1386	-1204	-1051	-922	-812	460
-1940	-1667	-1440	-1252	-1094	-960	-845	480
-2009	-1728	-1494	-1299	-1136	-998	-879	500

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table C.

TARGET ABOVE GUN - RANGE EFFECTS IN YARDS

Height of Target feet	Map Range - yards						
	8500	9000	9500	10000	10500	11000	11500
10	-16	-14	-13	-11	-10	-9	-8
20	-32	-28	-25	-22	-20	-18	-16
30	-49	-43	-38	-34	-30	-27	-24
40	-65	-57	-50	-45	-40	-36	-33
50	-81	-71	-63	-56	-50	-45	-41
60	-97	-85	-75	-67	-60	-54	-49
70	-114	-100	-88	-78	-70	-63	-57
80	-130	-114	-101	-90	-80	-72	-65
90	-146	-129	-114	-101	-90	-81	-73
100	-162	-143	-126	-112	-100	-90	-81
110	-178	-157	-139	-123	-110	-99	-89
120	-194	-171	-151	-134	-120	-108	-97
130	-210	-185	-163	-145	-130	-117	-105
140	-226	-199	-176	-156	-139	-125	-113
150	-242	-213	-188	-167	-149	-134	-121
160	-257	-227	-201	-178	-159	-143	-129
170	-273	-241	-213	-189	-169	-152	-138
180	-289	-255	-225	-200	-179	-161	-146
190	-305	-269	-238	-211	-189	-170	-154
200	-321	-283	-250	-222	-199	-179	-162
220	-352	-310	-274	-244	-219	-197	-178
240	-383	-338	-299	-266	-238	-214	-194
260	-414	-365	-323	-288	-258	-232	-210
280	-444	-392	-347	-309	-277	-250	-226
300	-475	-419	-371	-331	-297	-268	-242
320	-505	-446	-396	-355	-316	-285	-258
340	-536	-473	-420	-375	-336	-303	-274
360	-566	-500	-444	-396	-355	-320	-290
380	-596	-526	-467	-418	-375	-337	-305
400	-626	-553	-491	-439	-394	-355	-321
420	-656	-580	-515	-460	-413	-372	-337
440	-686	-606	-539	-481	-432	-390	-353
460	-716	-633	-562	-502	-451	-407	-368
480	-745	-659	-586	-523	-470	-424	-384
500	-775	-685	-609	-544	-489	-441	-399

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table C.

TARGET ABOVE GUN - RANGE EFFECTS IN YARDS

Map Range - yards							Height of Target feet
12000	12500	13000	13500	14000	14500	15000	
-7	-7	-6	-6	-5	-5	-4	10
-15	-13	-12	-11	-10	-10	-9	20
-22	-20	-19	-17	-16	-14	-13	30
-30	-27	-25	-23	-21	-19	-18	40
-37	-34	-31	-28	-26	-24	-22	50
-44	-40	-37	-34	-31	-29	-26	60
-52	-47	-43	-40	-37	-34	-31	70
-59	-54	-50	-46	-42	-38	-35	80
-66	-61	-56	-51	-47	-43	-40	90
-73	-67	-62	-57	-52	-48	-44	100
-81	-74	-68	-62	-57	-53	-49	110
-88	-80	-74	-68	-63	-58	-53	120
-95	-87	-80	-74	-68	-63	-58	130
-103	-94	-86	-79	-73	-67	-62	140
-110	-100	-92	-85	-78	-72	-67	150
-117	-107	-99	-91	-84	-77	-71	160
-125	-114	-105	-97	-89	-82	-76	170
-133	-121	-111	-102	-94	-87	-80	180
-140	-128	-117	-107	-99	-92	-85	190
-147	-134	-123	-113	-104	-96	-89	200
-162	-148	-135	-124	-114	-105	-98	220
-177	-161	-147	-135	-124	-115	-107	240
-191	-174	-160	-147	-135	-124	-115	260
-205	-187	-172	-158	-145	-134	-124	280
-220	-201	-184	-169	-156	-144	-133	300
-235	-214	-196	-180	-166	-153	-142	320
-249	-227	-208	-191	-176	-163	-151	340
-264	-241	-221	-203	-187	-172	-159	360
-278	-254	-233	-214	-197	-182	-168	380
-292	-267	-245	-225	-207	-191	-177	400
-306	-280	-257	-236	-218	-201	-186	420
-321	-293	-269	-247	-228	-211	-195	440
-335	-306	-281	-259	-239	-220	-203	460
-349	-319	-293	-270	-249	-230	-212	480
-363	-332	-305	-281	-259	-239	-221	500

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table D.

WEIGHT OF PROJECTILE, EFFECTS, IN YARDS OF RANGE, DUE TO VARIATIONS IN

Range	Variations in Weight of Projectile indicated by markings		
	■	■ ■	■ ■ ■
yards	87.9 lbs.	89.3 lbs.	90.7 lbs.
500	+4	0	-4
1000	+8	0	-8
1500	+11	0	-11
2000	+14	0	-14
2500	+16	0	-16
3000	+17	0	-17
3500	+17	0	-18
4000	+17	0	-18
4500	+16	0	-17
5000	+14	0	-15
5500	+12	0	-13
6000	+9	0	-10
6500	+6	0	-7
7000	+3	0	-5
7500	0	0	-2
8000	-3	0	+2
8500	-6	0	+6
9000	-10	0	+10
9500	-14	0	+13
10000	-17	0	+17
10500	-20	0	+20
11000	-24	0	+23
11500	-27	0	+27
12000	-31	0	+30
12500	-35	0	+34
13000	-38	0	+38
13500	-41	0	+41
14000	-45	0	+44
14500	-49	0	+47
15000	-52	0	+51

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table E.

*ROTATION OF THE EARTH, EFFECTS IN YARDS OF RANGE DUE TO

Latitude 0°   Latitude 10° (North or South)

	Azimuth of Target - degrees								Azimuth of Target - degrees						
Range yards	0 180	15 165	30 150	45 135	60 120	75 105	90 90	0 180	15 165	30 150	45 135	60 120	75 105	90 90	Range yards
2000	0	+5-	+10-	+13-	+16-	+18-	+19-	0	+5-	+9-	+13-	+16-	+18-	+19-	2000
4000	0	+8-	+16-	+22-	+27-	+30-	+31-	0	+8-	+15-	+21-	+26-	+29-	+31-	4000
6000	0	+10-	+19-	+27-	+33-	+37-	+38-	0	+10-	+19-	+26-	+32-	+36-	+38-	6000
8000	0	+11-	+21-	+30-	+36-	+40-	+42-	0	+11-	+21-	+29-	+36-	+40-	+41-	8000
10000	0	+11-	+22-	+31-	+38-	+42-	+44-	0	+11-	+22-	+31-	+38-	+42-	+43-	10000
12000	0	+12-	+23-	+32-	+39-	+43-	+45-	0	+11-	+22-	+32-	+39-	+43-	+44-	12000
14000	0	+12-	+23-	+33-	+40-	+44-	+46-	0	+12-	+23-	+32-	+39-	+44-	+45-	14000
15000	0	+12-	+24-	+33-	+41-	+45-	+47-	0	+12-	+23-	+33-	+40-	+45-	+46-	15000
	180 360	195 345	210 330	225 315	240 300	255 285	270 270	180 360	195 345	210 330	225 315	240 300	255 285	270 270	
	Azimuth of Target - degrees								Azimuth of Target - degrees						

Latitude 20° (North or South)   Latitude 30° (North or South)

	Azimuth of Target - degrees								Azimuth of Target - degrees						
Range yards	0 180	15 165	30 150	45 135	60 120	75 105	90 90	0 180	15 165	30 150	45 135	60 120	75 105	90 90	Range yards
2000	0	+5-	+9-	+13-	+15-	+17-	+18-	0	+4-	+8-	+12-	+14-	+16-	+16-	2000
4000	0	+8-	+15-	+21-	+25-	+28-	+29-	0	+7-	+13-	+19-	+23-	+26-	+27-	4000
6000	0	+9-	+18-	+25-	+31-	+34-	+35-	0	+8-	+16-	+23-	+29-	+32-	+33-	6000
8000	0	+10-	+20-	+28-	+34-	+38-	+39-	0	+9-	+18-	+26-	+32-	+35-	+36-	8000
10000	0	+11-	+21-	+29-	+36-	+40-	+41-	0	+10-	+19-	+27-	+33-	+37-	+38-	10000
12000	0	+11-	+21-	+30-	+37-	+41-	+42-	0	+10-	+19-	+28-	+34-	+38-	+39-	12000
14000	0	+11-	+22-	+31-	+37-	+42-	+43-	0	+10-	+20-	+28-	+35-	+38-	+40-	14000
15000	0	+11-	+22-	+31-	+38-	+43-	+44-	0	+11-	+20-	+29-	+36-	+39-	+41-	15000
	180 360	195 345	210 330	225 315	240 300	255 285	270 270	180 360	195 345	210 330	225 315	240 300	255 285	270 270	
	Azimuth of Target - degrees								Azimuth of Target - degrees						

*For argument at top of tables use the sign that is before the number.
*For argument at bottom of tables use the sign that follows the number.
*Azimuth measured clockwise from the North.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table E.

*ROTATION OF THE EARTH, EFFECTS IN YARDS OF RANGE DUE TO

Latitude 40° (North or South)   Latitude 50° (North or South)

	Azimuth of Target - degrees								Azimuth of Target - degrees						
Range yards	0 180	15 165	30 150	45 135	60 120	75 105	90 90	0 180	15 165	30 150	45 135	60 120	75 105	90 90	Range yards
2000	0	+4-	+7-	+10-	+13-	+14-	+15-	0	+3-	+6-	+9-	+11-	+12-	+12-	2000
4000	0	+6-	+12-	+17-	+21-	+23-	+24-	0	+5-	+10-	+14-	+17-	+19-	+20-	4000
6000	0	+7-	+15-	+21-	+25-	+28-	+29-	0	+6-	+12-	+17-	+21-	+23-	+24-	6000
8000	0	+8-	+16-	+23-	+28-	+31-	+32-	0	+7-	+13-	+19-	+23-	+26-	+27-	8000
10000	0	+9-	+17-	+24-	+29-	+32-	+34-	0	+7-	+14-	+20-	+24-	+26-	+28-	10000
12000	0	+9-	+17-	+24-	+30-	+33-	+35-	0	+7-	+14-	+20-	+25-	+28-	+29-	12000
14000	0	+9-	+18-	+25-	+31-	+34-	+35-	0	+8-	+15-	+21-	+26-	+29-	+30-	14000
15000	0	+9-	+18-	+25-	+31-	+35-	+36-	0	+8-	+15-	+21-	+26-	+29-	+30-	15000
	180 360	195 345	210 330	225 315	240 300	255 285	270 270	180 360	195 345	210 330	225 315	240 300	255 285	270 270	
	Azimuth of Target - degrees								Azimuth of Target - degrees						

Latitude 60° (North or South)   Latitude 70° (North or South)

	Azimuth of Target - degrees								Azimuth of Target - degrees						
Range yards	0 180	15 165	30 150	45 135	60 120	75 105	90 90	0 180	15 165	30 150	45 135	60 120	75 105	90 90	Range yards
2000	0	+2-	+5-	+7-	+8-	+8-	+10-	0	+2-	+3-	+4-	+5-	+6-	+6-	2000
4000	0	+4-	+8-	+11-	+13-	+15-	+16-	0	+3-	+5-	+7-	+9-	+10-	+10-	4000
6000	0	+5-	+10-	+13-	+16-	+18-	+19-	0	+3-	+6-	+9-	+11-	+13-	+13-	6000
8000	0	+5-	+11-	+15-	+18-	+20-	+21-	0	+4-	+7-	+10-	+12-	+14-	+14-	8000
10000	0	+6-	+11-	+16-	+19-	+21-	+22-	0	+4-	+8-	+11-	+13-	+15-	+15-	10000
12000	0	+6-	+11-	+16-	+19-	+22-	+23-	0	+4-	+8-	+11-	+13-	+15-	+15-	12000
14000	0	+6-	+12-	+16-	+20-	+22-	+23-	0	+4-	+8-	+11-	+14-	+15-	+16-	14000
15000	0	+6-	+12-	+17-	+20-	+23-	+24-	0	+4-	+8-	+11-	+14-	+16-	+16-	15000
	180 360	195 345	210 330	225 315	240 300	255 285	270 270	180 360	195 345	210 330	225 315	240 300	255 285	270 270	
	Azimuth of Target - degrees								Azimuth of Target - degrees						

*For argument at top of tables use the sign that is before the number.
*For argument at bottom of tables use the sign that follows the number.
*Azimuth measured clockwise from the North.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table F.

MUZZLE VELOCITY, EFFECTS IN YARDS OF RANGE, DUE TO INCREASE IN

Range yards	Increase in Muzzle Velocity - feet per second							
	10	20	30	40	50	60	70	80
500	3	7	10	14	17	21	24	27
1000	7	14	20	27	34	41	47	54
1500	10	20	30	40	50	60	70	80
2000	13	26	39	52	65	78	91	104
2500	16	32	47	63	79	95	111	127
3000	18	37	55	74	92	111	129	148
3500	21	42	63	84	105	126	146	167
4000	23	46	70	93	116	140	163	186
4500	25	51	76	102	127	153	179	204
5000	27	55	82	110	137	165	193	220
5500	29	59	88	118	147	176	206	235
6000	31	62	93	125	156	187	218	249
6500	33	66	98	131	164	197	229	262
7000	34	69	103	137	172	206	240	274
7500	36	72	107	143	179	214	250	285
8000	37	74	111	148	185	222	259	296
8500	38	76	115	153	191	229	268	306
9000	39	78	118	158	197	236	276	315
9500	41	81	122	162	203	243	284	324
10000	42	83	125	166	208	250	291	333
10500	43	86	128	171	214	257	299	342
11000	44	88	131	175	219	263	307	350
11500	45	90	134	179	224	269	314	359
12000	46	92	138	184	230	276	322	367
12500	47	94	141	188	235	282	329	375
13000	48	96	144	192	240	288	336	383
13500	49	98	147	196	245	294	343	391
14000	50	100	149	199	249	299	349	399
14500	51	102	152	203	254	305	356	406
15000	52	104	155	207	259	311	362	414

NOTE: The range decrease due to a decrease in muzzle velocity
is so nearly identical with that for a range increase due
to an increase in muzzle velocity that the above table
may be considered equally applicable to an increase or
decrease in muzzle velocity. When using the above table
for a decrease in muzzle velocity the signs of the range
effects are negative throughout.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table F.

MUZZLE VELOCITY, EFFECTS IN YARDS OF RANGE, DUE TO INCREASE IN

Range yards	Increase in Muzzle Velocity - feet per second						
	90	100	110	120	130	140	150
500	31	34	38	41	44	48	51
1000	61	67	74	81	87	94	101
1500	90	99	109	119	129	139	149
2000	117	130	143	156	169	182	195
2500	142	158	174	190	206	222	238
3000	166	184	203	222	240	259	277
3500	188	209	230	251	272	293	314
4000	209	233	256	279	302	325	349
4500	229	255	280	306	331	356	382
5000	248	275	303	331	358	385	413
5500	265	294	324	354	383	412	442
6000	281	312	343	375	406	437	469
6500	295	328	361	394	427	460	493
7000	308	343	377	412	446	481	515
7500	321	357	393	429	464	500	536
8000	333	371	408	445	482	519	556
8500	344	383	421	459	498	536	574
9000	355	394	433	473	512	552	591
9500	365	405	446	486	527	568	608
10000	374	416	458	500	541	583	625
10500	384	427	470	513	555	598	641
11000	394	438	482	526	569	613	657
11500	404	449	494	539	583	628	673
12000	413	459	505	551	597	643	689
12500	422	469	516	563	610	657	704
13000	431	479	527	575	623	671	719
13500	440	489	538	587	636	685	734
14000	449	499	549	599	648	698	748
14500	457	508	559	610	660	711	762
15000	465	517	569	621	672	724	776

NOTE: The range decrease due to a decrease in muzzle velocity
is so nearly identical with that for a range increase due
to an increase in muzzle velocity that the above table
may be considered equally applicable to an increase or
decrease in muzzle velocity. When using the above table
for a decrease in muzzle velocity the signs of the range
effects are negative throughout.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table Ga.

AIR DENSITY, EFFECTS IN YARDS OF RANGE, DUE TO DECREASE IN (59°F.and 29.5+in.)

Range yards	Decrease in Air Density - per cent							
	1	2	3	4	5	6	7	8
500	1	1	2	2	3	3	4	4
1000	1	2	3	4	6	7	8	9
1500	2	4	6	8	10	12	14	15
2000	3	6	9	12	15	18	20	23
2500	4	8	13	17	21	25	29	33
3000	6	11	17	23	29	35	41	46
3500	8	15	23	31	39	46	54	62
4000	10	20	30	40	50	60	71	81
4500	13	25	38	51	64	77	90	104
5000	16	32	48	64	80	97	113	130
5500	19	39	58	78	98	118	138	159
6000	23	46	69	92	116	140	164	188
6500	26	53	79	106	133	161	189	217
7000	29	59	89	120	151	182	213	245
7500	33	66	99	133	168	202	237	273
8000	36	73	110	147	185	223	261	300
8500	39	79	120	161	202	244	286	329
9000	43	86	130	174	219	265	311	357
9500	46	93	140	188	236	285	335	385
10000	49	99	150	201	253	306	359	413
10500	53	106	160	215	271	327	384	441
11000	56	113	170	229	288	347	408	469
11500	59	119	180	242	304	368	432	497
12000	62	126	190	255	321	388	455	524
12500	66	132	200	268	338	408	479	551
13000	69	139	210	282	354	428	503	579
13500	72	145	220	295	371	449	527	606
14000	75	152	229	308	388	469	551	634
14500	79	158	239	321	404	489	574	661
15000	82	165	249	334	421	509	598	688

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table Ga.

AIR DENSITY, EFFECTS IN YARDS OF RANGE, DUE TO DECREASE IN (59°F.and 29.5+in.)

Range yards	Decrease in Air Density - per cent							
	9	10	11	12	13	14	15	16
500	5	5	6	6	7	7	8	8
1000	10	11	12	14	15	16	17	18
1500	17	19	21	23	25	27	29	31
2000	26	29	32	35	38	41	44	47
2500	38	42	46	51	55	59	64	68
3000	52	58	64	70	76	82	88	94
3500	70	78	86	94	102	111	119	127
4000	91	102	112	123	134	144	155	165
4500	117	131	144	158	171	185	199	213
5000	147	164	181	198	215	233	250	268
5500	179	200	221	242	263	285	306	328
6000	212	237	262	287	313	338	364	390
6500	245	273	302	331	360	390	420	450
7000	277	309	341	374	407	441	475	509
7500	308	344	381	417	454	492	530	568
8000	340	380	420	460	501	543	585	627
8500	372	416	460	504	549	595	641	687
9000	404	451	499	548	597	646	696	747
9500	436	487	539	591	644	698	752	807
10000	468	523	579	635	692	750	808	867
10500	500	559	618	679	740	801	864	927
11000	531	594	657	721	786	852	919	986
11500	562	629	696	764	833	903	944	1045
12000	593	663	735	807	879	953	1028	1103
12500	624	698	773	849	925	1003	1082	1161
13000	655	733	812	892	972	1054	1136	1220
13500	687	768	851	934	1019	1105	1191	1279
14000	718	803	889	976	1065	1155	1245	1337
14500	748	837	927	1019	1111	1204	1299	1395
15000	779	872	966	1061	1157	1254	1353	1453

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table Gb.

AIR DENSITY, EFFECTS IN YARDS OF RANGE, DUE TO INCREASE IN (59°F.and 29.5+in.)

Range yards	Increase in Air Density - per cent							
	1	2	3	4	5	6	7	8
500	-1	-1	-2	-2	-3	-3	-4	-4
1000	-1	-2	-3	-4	-6	-7	-8	-9
1500	-2	-4	-6	-8	-10	-12	-14	-15
2000	-3	-6	-9	-12	-14	-17	-20	-23
2500	-4	-8	-12	-17	-21	-25	-29	-33
3000	-6	-11	-17	-23	-28	-34	-40	-45
3500	-8	-15	-23	-30	-38	-45	-52	-60
4000	-10	-20	-29	-39	-49	-58	-68	-77
4500	-13	-25	-37	-50	-62	-74	-86	-98
5000	-16	-31	-47	-62	-77	-93	-108	-122
5500	-19	-38	-57	-75	-94	-112	-130	-148
6000	-23	-45	-67	-89	-110	-132	-153	-174
6500	-26	-51	-77	-102	-127	-151	-175	-199
7000	-29	-58	-87	-115	-143	-170	-198	-225
7500	-32	-65	-96	-128	-159	-189	-220	-250
8000	-36	-71	-106	-140	-174	-208	-241	-274
8500	-39	-78	-116	-153	-190	-227	-263	-299
9000	-42	-84	-125	-166	-206	-246	-285	-324
9500	-46	-90	-135	-179	-222	-264	-307	-348
10000	-49	-97	-144	-191	-238	-283	-328	-372
10500	-52	-103	-154	-204	-253	-302	-350	-397
11000	-55	-110	-163	-216	-269	-320	-371	-421
11500	-58	-116	-173	-229	-284	-338	-392	-445
12000	-62	-122	-182	-241	-299	-357	-413	-469
12500	-65	-129	-192	-254	-315	-375	-434	-492
13000	-68	-135	-201	-266	-330	-393	-455	-516
13500	-71	-141	-210	-278	-345	-411	-476	-540
14000	-74	-147	-220	-291	-360	-429	-497	-564
14500	-78	-153	-229	-302	-375	-447	-518	-587
15000	-81	-160	-238	-315	-391	-465	-538	-610

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table Gb.

AIR DENSITY, EFFECTS IN YARDS OF RANGE, DUE TO INCREASE IN (59°F.and 29.5+in.)

Range yards	Increase in Air Density - per cent							
	9	10	11	12	13	14	15	16
500	-5	-5	-6	-6	-7	-7	-8	-8
1000	-10	-11	-12	-14	-15	-16	-17	-18
1500	-17	-19	-21	-23	-25	-27	-29	-31
2000	-26	-29	-32	-35	-37	-40	-43	-46
2500	-37	-41	-45	-49	-53	-57	-61	-65
3000	-51	-56	-62	-67	-72	-78	-84	-89
3500	-67	-74	-82	-89	-96	-103	-110	-117
4000	-86	-96	-105	-114	-123	-132	-141	-150
4500	-110	-122	-134	-145	-157	-168	-180	-191
5000	-137	-152	-166	-181	-196	-209	-223	-237
5500	-166	-184	-201	-218	-236	-253	-269	-286
6000	-195	-215	-236	-256	-276	-295	-315	-334
6500	-223	-247	-270	-293	-316	-338	-360	-382
7000	-251	-278	-304	-329	-355	-380	-405	-429
7500	-279	-308	-337	-366	-394	-422	-449	-476
8000	-307	-339	-370	-401	-432	-462	-492	-522
8500	-334	-369	-403	-437	-471	-504	-536	-568
9000	-362	-399	-436	-473	-509	-545	-580	-614
9500	-389	-429	-469	-508	-547	-585	-622	-659
10000	-416	-459	-502	-543	-584	-625	-665	-704
10500	-443	-489	-534	-578	-622	-665	-707	-749
11000	-470	-519	-567	-614	-660	-705	-750	-794
11500	-497	-548	-598	-648	-697	-745	-792	-838
12000	-523	-577	-630	-682	-733	-784	-833	-882
12500	-550	-606	-662	-717	-770	-823	-875	-926
13000	-576	-636	-694	-751	-807	-863	-917	-970
13500	-603	-665	-726	-785	-844	-902	-958	-1014
14000	-629	-693	-757	-819	-880	-940	-999	-1057
14500	-655	-722	-788	-853	-917	-979	-1040	-1100
15000	-681	-751	-819	-886	-952	-1017	-1081	-1143

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table H.

TEMPERATURE (ELASTICITY), EFFECTS IN YARDS OF RANGE (59° F.)

Range yards	Temperature of Air - degrees Fahrenheit											
	0	10	20	30	40	50	59	60	70	80	90	100
500	0	0	0	0	0	0	0	0	0	0	0	0
1000	+1	+1	+1	+1	0	0	0	0	0	-1	-1	-1
1500	+3	+2	+2	+1	+1	0	0	0	-1	-1	-2	-2
2000	+4	+3	+3	+2	+1	+1	0	0	-1	-2	-2	-3
2500	+6	+5	+4	+3	+2	+1	0	0	-1	-2	-3	-4
3000	+9	+7	+6	+4	+3	+1	0	0	-2	-3	-5	-6
3500	+12	+10	+8	+6	+4	+2	0	0	-2	-4	-6	-8
4000	+16	+14	+11	+8	+5	+2	0	0	-3	-6	-8	-11
4500	+21	+18	+14	+11	+7	+3	0	0	-4	-8	-11	-15
5000	+27	+23	+18	+14	+9	+4	0	0	-5	-10	-14	-19
5500	+34	+29	+23	+17	+11	+5	0	-1	-6	-12	-18	-24
6000	+43	+36	+29	+21	+14	+7	0	-1	-8	-15	-23	-30
6500	+52	+43	+34	+25	+17	+8	0	-1	-10	-18	-27	-36
7000	+59	+49	+39	+29	+19	+9	0	-1	-11	-21	-31	-41
7500	+65	+54	+43	+32	+21	+10	0	-1	-12	-23	-34	-45
8000	+68	+56	+45	+33	+22	+10	0	-1	-13	-24	-36	-47
8500	+68	+56	+45	+33	+22	+10	0	-1	-13	-24	-36	-47
9000	+66	+55	+44	+32	+21	+10	0	-1	-12	-24	-35	-46
9500	+61	+51	+41	+30	+20	+9	0	-1	-12	-22	-33	-43
10000	+54	+45	+36	+27	+18	+8	0	-1	-10	-19	-29	-38
10500	+46	+38	+31	+23	+15	+7	0	-1	-9	-16	-24	-32
11000	+39	+32	+26	+19	+12	+6	0	-1	-7	-14	-20	-27
11500	+31	+26	+21	+16	+10	+5	0	-1	-6	-11	-16	-22
12000	+24	+20	+16	+12	+8	+4	0	0	-5	-9	-13	-17
12500	+17	+14	+12	+9	+6	+3	0	0	-3	-6	-9	-12
13000	+11	+9	+8	+6	+4	+2	0	0	-2	-4	-6	-8
13500	+6	+5	+4	+3	+2	+1	0	0	-1	-2	-3	-4
14000	0	0	0	0	0	0	0	0	0	0	0	0
14500	-6	-5	-4	-3	-2	-1	0	0	+1	+2	+3	+4
15000	-12	-10	-8	-6	-4	-2	0	0	+2	+4	+6	+8

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table I.

REAR WIND, EFFECT IN YARDS OF RANGE, DUE TO

Range yards	Rear Wind - miles per hour									
	5	10	15	20	25	30	35	40	45	50
500	0	0	0	0	1	1	1	1	1	1
1000	0	1	1	1	2	2	2	2	3	3
1500	1	1	2	2	3	4	4	5	6	6
2000	1	2	3	4	6	7	8	9	10	11
2500	2	3	5	7	9	11	13	14	16	17
3000	3	5	8	10	13	15	18	20	23	25
3500	4	7	11	14	17	20	24	27	31	34
4000	5	9	14	18	23	27	31	36	41	45
4500	6	11	17	23	29	35	40	46	52	57
5000	7	14	21	29	36	43	50	57	64	71
5500	9	17	26	35	44	52	61	70	78	87
6000	10	21	32	42	52	63	73	84	94	105
6500	12	25	38	50	62	75	87	100	112	125
7000	14	29	44	59	73	88	102	117	131	146
7500	17	34	51	68	85	102	119	136	152	169
8000	19	39	59	78	98	117	137	156	176	195
8500	22	45	67	89	112	134	156	178	201	223
9000	25	51	76	101	127	152	177	202	228	253
9500	28	57	86	114	143	171	199	228	257	285
10000	32	64	96	128	160	191	223	255	287	319
10500	35	71	107	142	177	212	248	284	319	355
11000	39	78	118	157	196	235	274	314	353	392
11500	43	86	130	173	216	259	302	345	388	431
12000	47	95	142	189	237	284	331	378	425	473
12500	52	103	155	206	258	310	361	412	464	516
13000	56	112	168	224	280	336	392	448	504	560
13500	61	121	182	242	303	364	424	485	545	606
14000	65	130	196	261	327	392	457	523	588	653
14500	70	140	211	281	351	421	491	562	632	702
15000	75	150	226	301	376	451	526	602	677	752

NOTE: The range effects due to a head wind are so nearly identical in numerical value with those for a rear wind that the above table with signs changed should be used for such effects.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table J.

CROSS WIND EFFECTS

Range yards	in mils					in degrees				
	Cross Wind - miles per hour									
	10	20	30	40	50	10	20	30	40	50
500	0.0	0.1	0.1	0.2	0.2	0.00	0.01	0.01	0.01	0.01
1000	0.1	0.3	0.4	0.6	0.7	0.01	0.02	0.03	0.03	0.04
1500	0.3	0.6	0.9	1.2	1.5	0.02	0.04	0.05	0.06	0.08
2000	0.5	1.0	1.5	2.0	2.5	0.03	0.06	0.08	0.11	0.14
2500	0.7	1.4	2.1	2.8	3.5	0.04	0.08	0.12	0.16	0.20
3000	0.9	1.8	2.7	3.6	4.5	0.05	0.10	0.16	0.21	0.26
3500	1.1	2.2	3.4	4.5	5.6	0.06	0.13	0.19	0.26	0.32
4000	1.3	2.7	4.0	5.4	6.7	0.08	0.15	0.23	0.30	0.38
4500	1.6	3.1	4.7	6.2	7.8	0.09	0.18	0.26	0.35	0.44
5000	1.8	3.6	5.3	7.1	8.9	0.10	0.20	0.30	0.40	0.50
5500	2.0	4.0	6.0	8.0	10.0	0.11	0.22	0.34	0.45	0.56
6000	2.2	4.5	6.7	9.0	11.2	0.13	0.25	0.38	0.50	0.63
6500	2.5	5.0	7.4	9.9	12.4	0.14	0.28	0.42	0.56	0.70
7000	2.7	5.4	8.2	10.9	13.6	0.15	0.31	0.46	0.62	0.77
7500	3.0	5.9	8.9	11.8	14.8	0.17	0.33	0.50	0.67	0.83
8000	3.2	6.4	9.6	12.8	16.0	0.18	0.36	0.54	0.72	0.90
8500	3.4	6.9	10.3	13.8	17.2	0.19	0.39	0.58	0.78	0.97
9000	3.7	7.4	11.1	14.8	18.5	0.21	0.42	0.62	0.83	1.04
9500	3.9	7.9	11.8	15.8	19.7	0.22	0.44	0.67	0.89	1.11
10000	4.2	8.4	12.6	16.8	21.0	0.24	0.47	0.71	0.94	1.18
10500	4.5	8.9	13.4	17.8	22.3	0.25	0.50	0.75	1.00	1.25
11000	4.7	9.4	14.2	18.9	23.6	0.27	0.53	0.80	1.06	1.33
11500	5.0	9.9	14.9	19.9	24.8	0.28	0.56	0.84	1.12	1.40
12000	5.2	10.4	15.7	20.9	26.1	0.29	0.59	0.88	1.18	1.47
12500	5.5	10.9	16.4	21.8	27.3	0.31	0.62	0.92	1.23	1.54
13000	5.7	11.4	17.1	22.8	28.5	0.32	0.64	0.96	1.28	1.60
13500	5.9	11.9	17.8	23.8	29.7	0.33	0.67	1.00	1.34	1.67
14000	6.2	12.4	18.5	24.7	30.9	0.35	0.70	1.04	1.39	1.74
14500	6.4	12.8	19.2	25.7	32.1	0.36	0.72	1.08	1.45	1.81
15000	6.6	13.3	19.9	26.6	33.2	0.37	0.75	1.12	1.50	1.87

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table K.

*ROTATION OF THE EARTH, DEFLECTION EFFECT IN MILS DUE TO

Latitude 0°

Range yards	Azimuth of Target - degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10000	+0.1-	+0.1-	0.0	0.0	0.0	-0.1+	-0.1+
12000	+0.1-	+0.1-	+0.1-	0.0	-0.1+	-0.1+	-0.1+
14000	+0.2-	+0.2-	+0.1-	0.0	-0.1+	-0.2+	-0.2+
15000	+0.3-	+0.2-	+0.1-	0.0	-0.1+	-0.2+	-0.3+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - degrees
Latitude 0°

Latitude 10° (North)

Range yards	Azimuth of Target - degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
6000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
8000	-0.1+	-0.1+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
10000	-0.1+	-0.2+	-0.2+	-0.2+	-0.2+	-0.3+	-0.3+
12000	-0.2+	-0.2+	-0.2+	-0.3+	-0.3+	-0.4+	-0.4+
14000	-0.1+	-0.2+	-0.3+	-0.4+	-0.5+	-0.6+	-0.6+
15000	-0.1+	-0.2+	-0.3+	-0.4+	-0.6+	-0.7+	-0.7+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - degrees
Latitude 10° (South)

*Negative sign means the effect is to the right. *Positive sign means the effect is to the left.
*For argument at top of table use sign that is (*Azimuth measured before the number.   (clockwise from
*For argument at bottom of table use sign that (the North.
follows the number.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table K.

*ROTATION OF THE EARTH, DEFLECTION EFFECT IN MILS DUE TO

Latitude 20° (North)

Range yards	Azimuth of Target - degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
2000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
4000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
6000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
8000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
10000	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.5+	-0.5+
12000	-0.4+	-0.4+	-0.5+	-0.6+	-0.6+	-0.7+	-0.7+
14000	-0.5+	-0.5+	-0.6+	-0.7+	-0.8+	-0.9+	-0.9+
15000	-0.5+	-0.6+	-0.7+	-0.8+	-0.9+	-1.0+	-1.1+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - degrees
Latitude 20° (South)

Latitude 30° (North)

Range yards	Azimuth of Target - degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
2000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
4000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
6000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
8000	-0.4+	-0.4+	-0.4+	-0.5+	-0.5+	-0.5+	-0.5+
10000	-0.6+	-0.6+	-0.6+	-0.6+	-0.7+	-0.7+	-0.7+
12000	-0.7+	-0.7+	-0.8+	-0.8+	-0.9+	-0.9+	-0.9+
14000	-0.9+	-0.9+	-0.9+	-1.0+	-1.1+	-1.2+	-1.2+
15000	-0.9+	-1.0+	-1.0+	-1.2+	-1.3+	-1.4+	-1.4+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - degrees
Latitude 30° (South)

*Negative sign means the effect is to the right. *Positive sign means the effect is to the left.
*For argument at top of table use sign that is (*Azimuth measured before the number.   (clockwise from
*For argument at bottom of table use sign that (the North.
follows the number.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table K.

*ROTATION OF THE EARTH, DEFLECTION EFFECT IN MILS DUE TO

Latitude 40° (North)

Range yards	Azimuth of Target - degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
2000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
4000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
6000	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+
8000	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+
10000	-0.7+	-0.8+	-0.8+	-0.8+	-0.8+	-0.8+	-0.8+
12000	-0.9+	-1.0+	-1.0+	-1.0+	-1.1+	-1.1+	-1.1+
14000	-1.2+	-1.2+	-1.3+	-1.3+	-1.4+	-1.5+	-1.5+
15000	-1.3+	-1.3+	-1.4+	-1.5+	-1.6+	-1.7+	-1.7+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - degrees
Latitude 40° (South)

Latitude 50° (North)

Range yards	Azimuth of Target - degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
2000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
4000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
6000	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+
8000	-0.7+	-0.7+	-0.7+	-0.7+	-0.7+	-0.7+	-0.7+
10000	-0.9+	-0.9+	-0.9+	-0.9+	-1.0+	-1.0+	-1.0+
12000	-1.2+	-1.2+	-1.2+	-1.2+	-1.3+	-1.3+	-1.3+
14000	-1.5+	-1.5+	-1.5+	-1.6+	-1.7+	-1.7+	-1.7+
15000	-1.6+	-1.6+	-1.7+	-1.8+	-1.9+	-2.0+	-2.0+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - degrees
Latitude 50° (South)

*Negative sign means the effect is to the right. *Positive sign means the effect is to the left.
*For argument at top of table use sign that is (*Azimuth measured before the number. (clockwise from
*For argument at bottom of table use sign that (the North. follows the number.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2, Table K.

*ROTATION OF THE EARTH, DEFLECTION EFFECT IN MILS DUE TO

Latitude 60° (North)

Range yards	Azimuth of Target - degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
2000	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+	-0.1+
4000	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+	-0.3+
6000	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+	-0.5+
8000	-0.7+	-0.7+	-0.8+	-0.8+	-0.8+	-0.8+	-0.8+
10000	-1.0+	-1.0+	-1.1+	-1.1+	-1.1+	-1.1+	-1.1+
12000	-1.3+	-1.3+	-1.4+	-1.4+	-1.4+	-1.5+	-1.5+
14000	-1.7+	-1.7+	-1.7+	-1.8+	-1.8+	-1.9+	-1.9+
15000	-1.9+	-1.9+	-2.0+	-2.0+	-2.1+	-2.2+	-2.2+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - degrees
Latitude 60° (South)

Latitude 70° (North)

Range yards	Azimuth of Target - degrees						
	0 360	30 330	60 300	90 270	120 240	150 210	180 180
2000	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+	-0.2+
4000	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+	-0.4+
6000	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+	-0.6+
8000	-0.8+	-0.8+	-0.8+	-0.9+	-0.9+	-0.9+	-0.9+
10000	-1.1+	-1.1+	-1.1+	-1.2+	-1.2+	-1.2+	-1.2+
12000	-1.5+	-1.5+	-1.5+	-1.5+	-1.6+	-1.6+	-1.6+
14000	-1.9+	-1.9+	-1.9+	-1.9+	-2.0+	-2.0+	-2.0+
15000	-2.1+	-2.1+	-2.2+	-2.2+	-2.3+	-2.3+	-2.3+
	180 180	150 210	120 240	90 270	60 300	30 330	0 360

Azimuth of Target - degrees
Latitude 70° (South)

*Negative sign means the effect is to the right. *Positive sign means the effect is to the left.
*For argument at top of table use sign that is (*Azimuth measured before the number. (clockwise from
*For argument at bottom of table use sign that (the North. follows the number.

PART 2a

RANGE ELEVATION RELATION

6" GUNS, M1908, M1908 MI and M1908 MII

MOUNTED ON BARBETTE CARRIAGE

H. E. SHELL, MARK II

FUZE, SHORT (MARK IV*)

MUZZLE VELOCITY = 2700 F/S

JUMP -.6 MIL

NOTE: Standard Air Temperature for Density and Elasticity is 59°.
Standard Temperature of Powder is 70° F.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2.

Range yards	*Elevation mils	°	'	Range yards	*Elevation mils	°	'	Range yards	*Elevation mils	°	'
0	0.6	0	02	3000	25.8	1	27	6000	65.6	3	41
100	1.4	0	05	3100	27.0	1	31	6100	67.2	3	47
200	2.0	0	07	3200	28.0	1	35	6200	69.0	3	53
300	2.6	0	09	3300	29.2	1	38	6300	70.6	3	58
400	3.4	0	11	3400	30.2	1	42	6400	72.4	4	04
500	4.0	0	14	3500	31.4	1	46	6500	74.2	4	10
600	4.8	0	16	3600	32.4	1	49	6600	76.0	4	16
700	5.6	0	19	3700	33.6	1	53	6700	77.8	4	23
800	6.2	0	21	3800	34.8	1	57	6800	79.8	4	29
900	7.0	0	24	3900	36.0	2	01	6900	81.6	4	35
1000	7.8	0	26	4000	37.2	2	05	7000	83.6	4	42
1100	8.6	0	29	4100	38.4	2	09	7100	85.6	4	49
1200	9.4	0	32	4200	39.6	2	14	7200	87.6	4	55
1300	10.2	0	34	4300	40.8	2	18	7300	89.6	5	02
1400	11.0	0	37	4400	42.2	2	22	7400	91.6	5	09
1500	11.8	0	40	4500	43.4	2	26	7500	93.8	5	16
1600	12.6	0	43	4600	44.6	2	31	7600	95.8	5	23
1700	13.6	0	46	4700	46.0	2	35	7700	98.0	5	31
1800	14.4	0	49	4800	47.4	2	40	7800	100.2	5	38
1900	15.2	0	52	4900	48.8	2	45	7900	102.4	5	46
2000	16.2	0	55	5000	50.2	2	49	8000	104.2	5	53
2100	17.0	0	58	5100	51.6	2	54	8100	107.0	6	01
2200	18.0	1	01	5200	53.0	2	59	8200	109.4	6	09
2300	19.0	1	04	5300	54.6	3	04	8300	111.8	6	17
2400	19.8	1	07	5400	56.0	3	09	8400	114.2	6	25
2500	20.8	1	10	5500	57.6	3	14	8500	116.6	6	33
2600	21.8	1	14	5600	59.0	3	19	8600	119.0	6	42
2700	22.8	1	17	5700	60.6	3	25	8700	121.4	6	50
2800	23.8	1	20	5800	62.2	3	30	8800	124.0	6	59
2900	24.8	1	24	5900	63.8	3	36	8900	126.6	7	07
3000	25.8	1	27	6000	65.6	3	41	9000	129.4	7	16

*For 1908 Guns on Barbette Carriages.

All other range table functions and effects are the same as for the disappearing carriages.

H. E. SHELL, MARK II   M. V. = 2700 F/S   FUZE, SHORT (MARK IV*)

Part 2

Range yards	*Elevation mils	°	'	Range yards	*Elevation mils	°	'
9000	129.4	7	16	12000	226.6	12	45
9100	132.0	7	25	12100	230.6	12	58
9200	134.6	7	34	12200	234.6	13	12
9300	137.4	7	43	12300	238.6	13	25
9400	140.0	7	53	12400	242.6	13	39
9500	143.0	8	02	12500	246.8	13	53
9600	145.8	8	12	12600	251.0	14	07
9700	148.6	8	22	12700	255.2	14	21
9800	151.6	8	32	12800	259.6	14	36
9900	154.6	8	42	12900	264.0	14	51
10000	157.6	8	52	13000	268.4	15	05
10100	160.6	9	02	13100	272.8	15	21
10200	163.6	9	12	13200	277.2	15	36
10300	166.8	9	23	13300	281.8	15	51
10400	170.0	9	34	13400	286.4	16	07
10500	173.2	9	45	13500	291.0	16	22
10600	176.4	9	56	13600	295.8	16	38
10700	179.8	10	07	13700	300.6	16	54
10800	183.0	10	18	13800	305.4	17	10
10900	186.4	10	29	13900	310.2	17	27
11000	189.8	10	41	14000	315.0	17	43
11100	193.2	10	52	14100	320.0	18	00
11200	196.8	11	04	14200	325.0	18	17
11300	200.4	11	16	14300	330.0	18	34
11400	204.0	11	28	14400	335.2	18	51
11500	207.6	11	41	14500	340.4	19	08
11600	211.4	11	53	14600	345.6	19	26
11700	215.2	12	06	14700	350.8	19	44
11800	219.0	12	19	14800	356.2	20	02
11900	222.8	12	32	14900	361.6	20	20
12000	226.6	12	45	15000	367.0	20	38

*For 1908 Guns on Barbette Carriages.

All other range table functions and effects are the same as for the disappearing carriages.