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ORDNANCE PAMPHLET No. 1100

Change Inserted

RANGE TABLE

FOR

16-INCH, 50-CALIBER GUN

2,690 F. S. INITIAL VELOCITY

1,900-POUND, HIGH-CAPACITY PROJECTILE

3/48
53
19/83.12-5

A BUREAU OF ORDNANCE PUBLICATION

8 DECEMBER 1943

RESTRICTED

NAVY DEPARTMENT, BUREAU OF ORDNANCE, WASHINGTON, D.C.

To all holders of Ordnance Pamphlet 1100

Insert change; write on cover "Change 1 entered"

Approved by The Chief of The Bureau of Ordnance

Acting Chief of Bureau

OP 1100 CHANGE 1

24 March 1944

1 Page ——— Page 1

ORDNANCE PAMPHLET 1100
is changed as follows:

RANGE TABLE
FOR
16 INCH 50 CALIBER GUN
2690 F. S. INITIAL VELOCITY
1900 LB. H.C. PROJECTILE

Page 1 Footnote should be changed to read as follows:

The Naval Proving Ground firings upon which this table is based indicate that the angle of departure differs from the angle of elevation by 9.7 minutes; i.e., the projectile apparently leaves the gun at an angle 9.7 minutes less than the angle of elevation. This was taken into account in computing the range table and no corrections are necessary.

Trajectory sheet at end of table. Change note 3 to read as follows:

The angle in degrees indicated on the trajectory is the elevation of the gun. The Naval Proving Ground firings upon which these trajectories are based indicate that the angle of departure differs from the angle of elevation by 9.7 minutes; i.e., the projectile apparently leaves the gun at an angle 9.7 minutes less than the angle of elevation. This was taken into account in computing the trajectories and no corrections are necessary.

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W. H. Purnell
Acting Chief of Bureau

OP 1100 CHANGE 2

24 February 1945

1 Page ——— Page 1

ORDNANCE PAMPHLET 1100
is changed as follows:

RANGE TABLE
FOR
16-INCH 50 CAL. GUN
2690 F.S.I.V.

1. Following page 36, insert the attached erosion data, N.P.G. Photos No. 24081 and 24083 (pages 35a and 35b).

2. Page 1, In Note 15 change 2 f.s. to 2.3 f.s. and add the following sentence:

   Velocity loss due to gun wear may be obtained from the erosion data, pages 35a and 35b.

3. Preceding page 1, insert the following:

CONTENTS

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ORDNANCE PAMPHLET No. 1100

RANGE TABLE

FOR

16-INCH, 50-CALIBER GUN

2,690 F. S. INITIAL VELOCITY

1,900-POUND, HIGH-CAPACITY PROJECTILE

8 DECEMBER 1943

This publication is RESTRICTED and will be handled in accordance with Article 76, United States Navy Regulations, 1920

UNITED STATES GOVERNMENT PRINTING OFFICE
WASHINGTON • 1944

NAVY DEPARTMENT,
BUREAU OF ORDNANCE,
Washington, D. C., 8 December 1943.

ORDNANCE PAMPHLET NO. 1100.

16-INCH RANGE TABLE.

1. Ordnance Pamphlet No. 1100 contains information on the flight of 16-inch high-capacity projectiles, Mark 13, for use in controlling the fire of 16-inch 50-caliber guns against surface targets.

2. This pamphlet does not supersede any existing publication.

3. This publication is RESTRICTED and should be handled in accordance with the provisions of Article 76, U. S. Navy Regulations, 1920.

W. H. P. BLANDY,
Rear Admiral, U. S. Navy,
Chief of the Bureau of Ordnance.

16-Inch 50-Caliber Gun

EXPLANATORY NOTES

1. This range table is applicable to 16-inch high-capacity projectiles, Mark 13, fitted with point detonating fuzes, nose plugs, or mechanical time fuzes. The projectile is 4 calibers long, has a 9-caliber radius of ogive, and a standard weight of 1,900 pounds.

2. Columns 1 to 8 give the elements of the standard trajectories.

3. In computing this range table it was assumed that the earth is motionless and that the gun trunnions and target are in the horizontal plane tangent to the earth's surface at the gun. The effects of the earth's rotation are given in supplementary tables following the range table proper.

4. Column 2 is the elevation of the gun with respect to the horizontal plane.[1]

5. Columns 10 to 19 give the differential effects due to variations from standard conditions. In these columns the effects are proportional to the variations. For example, the effect on range of a 10-knot wind is tabulated in column 13. The effect of a 20-knot wind may be obtained by multiplying the tabular values by 2.

6. Column 10 may be used to determine the change in range due to either plus or minus variations in initial velocity.

7. Column 11 gives the effect on the range of a change of ± 10 pounds in weight of projectile, the charge remaining the same.

8. The standard air density at the surface of 1.2034 kilograms per cubic meter, used in the computation of this range table, corresponds to a temperature of 59° F., a barometric pressure of 29.53 inches and a humidity of 78 percent. The effect on range due to variations from these standard conditions is given in column 12 which is properly entered with ballistic density.

[1] The Naval Proving Ground firings upon which this table is based show an apparent jump of −9.7 minutes, i. e., the projectile leaves the gun at an angle 9.7 minutes less than the quadrant elevation. This was taken into account in computing the range table and no corrections are necessary.

9. When ballistic density is not available but surface temperature and pressure are known, range corrections corresponding to an average ballistic density may be obtained from figure 1.

10. Column 12 also gives the effect on range of ± 10 percent variation in the ballistic coefficient.

11. Columns 13 and 16 gives the effects of a 10-knot ballistic wind. When, however, no measured or estimated ballistic wind is available the surface true wind must necessarily be used in entering these columns.

12. The standard air density aloft and information concerning the preparation of ballistic density and ballistic wind are given in Bureau of Aeronautics publication, N. Aer. 440, 1942, Instructions and Tables for Making Observations and Computing Ballistic Wind and Ballistic Density.

13. Column 19 shows how much the point of impact is raised or lowered on a vertical screen by raising or lowering the sight bar 100 yards, the actual range remaining fixed.

14. The change in range due to a variation of ± 1 minute in the angle of elevation may be deduced from column 2b.

15. The powder is assumed to give normal velocity at 90° F. For each degree increase in temperature the initial velocity is increased approximately 2 f. s. A decrease in temperature causes a corresponding decrease in velocity.

16. When firing high-capacity projectiles with service charges for 2,700-pound projectiles the initial velocity in a new gun with 90° powder will be 2,690 f. s. The trajectories shown on figure 2 are computed for 2,615 f. s., the expected average velocity over the life of the gun.

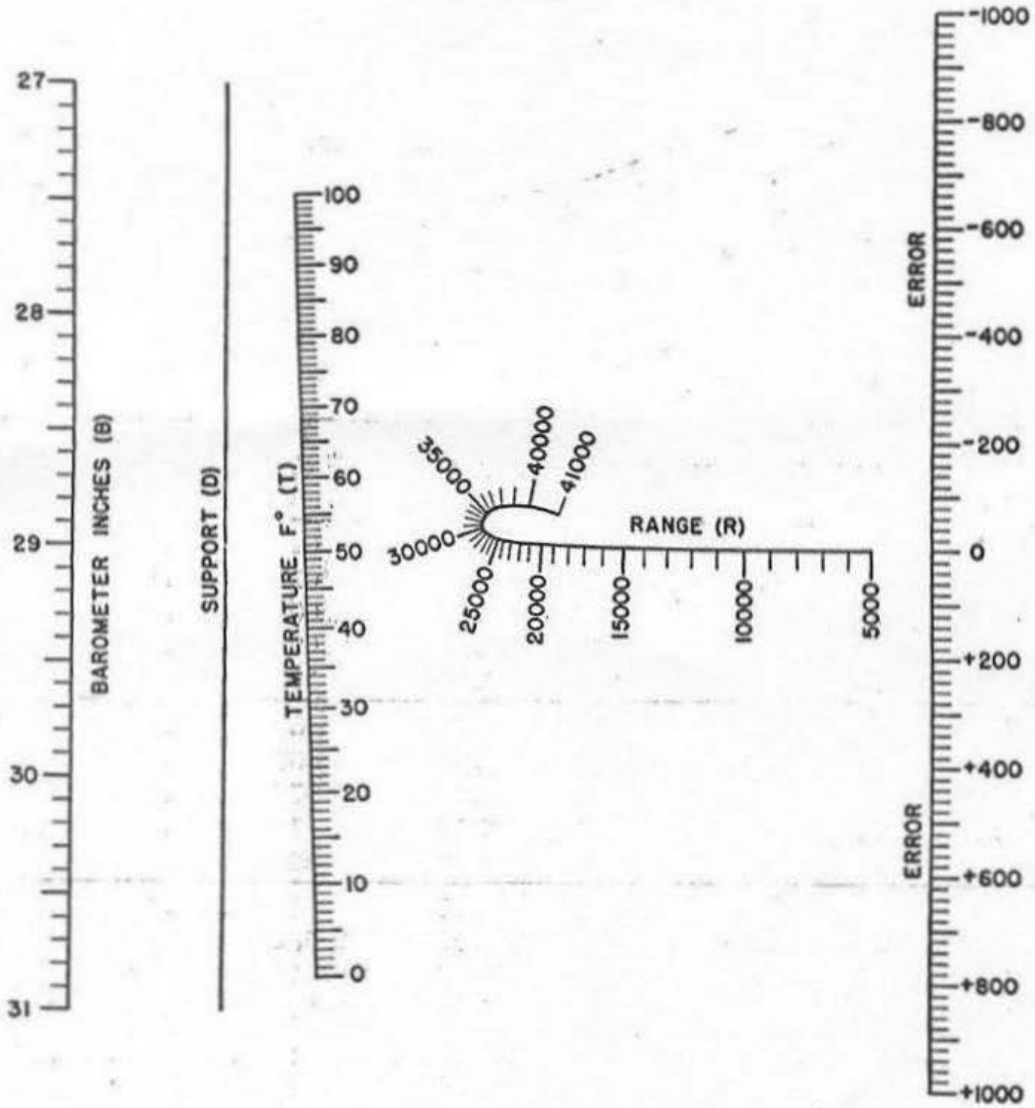
17. A constant ballistic coefficient of 7.98 with the Army J6 resistance function was used in computing this range table.

18. The firings upon which this table is based are summarized on the following page.

16-INCH 50-CALIBER GUN, MARK 7, RIFLING 1/25

Ranging sheet	Number of rounds	Elevation	I. V., f. s.	Fall of shot (actual)		
				Range, yards	Mean error, yards	Pattern, yards
High-Capacity Projectiles Type Ex. 1—1 (now designated as Mark 13)						
361	3	2°	2,668±3	4,804	14	38
364	3	2°	2,637±6	4,618	29	78
361	3	10°	2,658±4	18,149	6	16
364	3	10°	2,617±1	17,684	49	123
361	3	15°	2,665±2	24,090	16	46
364	3	15°	2,633±2	23,457	9	25
364	3	22°30′	2,626±1	30,112	95	219
361	3	30°	2,669±2	35,707	63	186
364	3	30°	2,626±1	35,258	80	226
361	3	40°	2,656±6	40,154	122	350
High-Capacity Projectiles Type Ex. 2—1						
361	3	15°	2,664±3	24,069	45	121
364	3	15°	2,623±2	23,342	79	207

FIGURE 1



CHANGE IN RANGE FOR VARIATION IN DENSITY OF AIR

INSTRUCTIONS

Align B and T to get point on support D.
Align D with R to get error in yards due to change in density of air.

Example:

Given—Barometer	inches	=	30. 5
Temperature	° F.	=	50
Range	yards	=	20, 000
Result—Error	do	=	−300

NOTE.—The best estimate of ballistic density to different altitudes is in very close, but not in exact, agreement with standard density when surface conditions are standard. When surface density is not standard, the disagreement is usually greater and is a function of surface density and maximum ordinate. The use of figure 1 will not give agreement with results obtained from column 12 and surface observations only, but should be a more accurate figure, in that it takes into account the ratio between mean measured and standard density for the actual maximum ordinate obtained.

Range	Angle of elevation		Increase in angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2	2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
1,000		33.0	33.0	2.4		23	1.13	2,627	0.3	1,000	5
1,100		35.4	35.4	2.4		26	1.24	2,621	.3	1,100	6
1,200		37.8	37.8	2.3		28	1.36	2,614	.4	1,200	7
1,300		40.1	40.1	2.4		31	1.47	2,608	.4	1,300	9
1,400		42.5	42.5	2.4		34	1.59	2,602	.5	1,400	10
1,500		44.9	44.9	2.4		36	1.70	2,596	.6	1,500	12
1,600		47.3	47.3	2.4		38	1.82	2,589	.6	1,600	13
1,700		49.7	49.7	2.4		41	1.93	2,583	.7	1,700	15
1,800		52.1	52.1	2.4		44	2.05	2,577	.8	1,800	17
1,900		54.5	54.5	2.5		46	2.17	2,571	.9	1,900	19
2,000		57.0	57.0	2.4		49	2.28	2,564	1.0	771	21
2,100		59.4	59.4	2.5		51	2.40	2,558	1.1	650	23
2,200	1	01.9	61.9	2.4		54	2.52	2,552	1.2	582	25
2,300	1	04.3	64.3	2.5		56	2.64	2,546	1.3	531	28
2,400	1	06.8	66.8	2.5		59	2.75	2,539	1.4	490	31
2,500	1	09.3	69.3	2.5	1	02	2.87	2,533	1.6	456	33
2,600	1	11.8	71.8	2.5	1	05	2.99	2,527	1.7	427	36
2,700	1	14.3	74.3	2.5	1	07	3.11	2,521	1.9	402	39
2,800	1	16.8	76.8	2.5	1	10	3.23	2,514	2.0	380	42
2,900	1	19.3	79.3	2.5	1	13	3.35	2,508	2.2	360	45
3,000	1	21.8	81.8	2.5	1	16	3.47	2,502	2.3	343	48
3,100	1	24.3	84.3	2.6	1	18	3.59	2,496	2	328	52
3,200	1	26.9	86.9	2.5	1	21	3.71	2,489	3	314	55
3,300	1	29.4	89.4	2.6	1	24	3.83	2,483	3	301	59
3,400	1	32.0	92.0	2.5	1	27	3.95	2,477	3	289	63
3,500	1	34.6	94.6	2.6	1	30	4.08	2,471	3	278	66
3,600	1	37.2	97.2	2.6	1	32	4.20	2,465	3	268	70
3,700	1	39.8	99.8	2.6	1	35	4.32	2,459	3	259	74
3,800	1	42.4	102.4	2.6	1	38	4.44	2,452	4	251	79
3,900	1	45.0	105.0	2.6	1	41	4.56	2,446	4	242	84
4,000	1	47.6	107.6	2.6	1	44	4.69	2,440	4	234	88

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
7	3	2	0	6	6.4	0.1	6.3	6.4	2
8	3	2	0	7	7.0	.1	6.9	7.0	2
9	3	2	0	8	7.6	.1	7.5	7.6	2
10	3	3	0	8	8.3	.1	8.2	8.3	3
10	4	3	0	9	8.9	.1	8.8	8.9	3
11	4	4	0	10	9.6	.2	9.4	9.6	3
12	4	4	0	10	10.2	.2	10.0	10.2	3
13	4	5	0	11	10.9	.2	10.7	10.9	4
13	4	5	0	12	11.5	.2	11.3	11.5	4
14	5	6	0	12	12.2	.2	12.0	12.2	4
15	5	7	0	13	12.9	.3	12.6	12.9	4
15	5	7	0	14	13.5	.3	13.2	13.5	4
16	5	8	0	14	14.2	.3	13.9	14.2	5
17	5	9	0	15	14.9	.4	14.5	14.9	5
18	6	10	0	16	15.5	.4	15.1	15.5	5
18	6	11	0	16	16.2	.5	15.7	16.2	5
19	6	11	0	17	16.8	.5	16.3	16.8	6
20	6	12	0	18	17.5	.6	16.9	17.5	6
20	6	13	0	18	18.2	.6	17.6	18.2	6
21	7	14	0	19	18.8	.6	18.2	18.8	6
22	7	15	0	19	19.5	.7	18.8	19.5	6
23	7	16	0	20	20	1	19	20	7
23	7	17	0	21	21	1	20	21	7
24	7	18	1	21	22	1	21	22	7
25	8	19	1	21	22	1	21	22	8
25	8	20	1	22	23	1	22	23	8
26	8	21	1	23	24	1	23	24	8
27	8	23	1	23	24	1	23	24	8
28	8	24	1	24	25	1	24	25	9
28	9	25	1	25	26	1	25	26	9
29	9	26	1	25	26	1	25	26	9

Range	Angle of elevation		Increase in angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
4,000	1	47.6	107.6	2.6	1	44	4.69	2,440	4	234	88
4,100	1	50.2	110.2	2.6	1	47	4.81	2,434	4	226	93
4,200	1	52.8	112.8	2.7	1	50	4.93	2,428	4	219	98
4,300	1	55.5	115.5	2.6	1	53	5.06	2,421	5	213	103
4,400	1	58.1	118.1	2.7	1	56	5.18	2,415	5	206	108
4,500	2	00.8	120.8	2.6	1	59	5.31	2,409	5	200	113
4,600	2	03.4	123.4	2.7	2	02	5.43	2,403	5	194	118
4,700	2	06.1	126.1	2.7	2	05	5.56	2,397	6	189	124
4,800	2	08.8	128.8	2.7	2	09	5.68	2,391	6	184	130
4,900	2	11.5	131.5	2.7	2	12	5.81	2,385	6	179	135
5,000	2	14.2	134.2	2.7	2	15	5.94	2,379	7	174	141
5,100	2	16.9	136.9	2.7	2	18	6.06	2,372	7	170	147
5,200	2	19.6	139.6	2.7	2	22	6.19	2,366	7	166	153
5,300	2	22.3	142.3	2.7	2	25	6.32	2,360	8	162	160
5,400	2	25.0	145.0	2.8	2	28	6.45	2,355	8	158	167
5,500	2	27.8	147.8	2.7	2	31	6.58	2,349	8	154	173
5,600	2	30.5	150.5	2.8	2	35	6.70	2,342	8	151	180
5,700	2	33.3	153.3	2.8	2	38	6.83	2,336	9	147	187
5,800	2	36.1	156.1	2.8	2	41	6.96	2,330	9	144	194
5,900	2	38.9	158.9	2.8	2	44	7.09	2,324	9	140	201
6,000	2	41.7	161.7	2.8	2	48	7.22	2,318	10	137	209
6,100	2	44.5	164.5	2.9	2	52	7.35	2,312	10	134	217
6,200	2	47.4	167.4	2.8	2	55	7.48	2,306	10	131	225
6,300	2	50.2	170.2	2.8	2	58	7.61	2,300	11	128	232
6,400	2	53.0	173.0	2.8	3	02	7.74	2,294	11	126	240
6,500	2	55.8	175.8	2.9	3	05	7.87	2,288	12	123	249
6,600	2	58.7	178.7	2.9	3	08	8.00	2,282	12	121	258
6,700	3	01.6	181.6	2.9	3	12	8.13	2,276	13	119	266
6,800	3	04.5	184.5	2.8	3	16	8.27	2,270	13	117	274
6,900	3	07.3	187.3	2.9	3	19	8.40	2,264	14	115	283
7,000	3	10.2	190.2	3.0	3	23	8.54	2,258	14	113	292

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
29	9	26	1	25	26	1	25	26	9
30	9	28	1	26	27	1	26	27	9
30	9	29	1	27	28	1	27	28	10
31	9	30	1	27	28	1	27	28	10
32	10	32	1	28	29	1	28	29	10
32	10	33	1	29	20	2	28	30	10
33	10	35	1	30	31	2	29	31	11
34	10	36	1	30	31	2	29	31	11
35	10	38	1	31	32	2	30	32	11
35	11	39	1	32	33	2	31	33	12
36	11	40	1	32	33	2	31	33	12
37	11	42	1	33	34	2	32	34	12
37	11	44	2	33	35	2	33	35	12
38	12	46	2	34	36	2	34	36	13
39	12	47	2	34	36	2	34	36	13
39	12	48	2	35	37	2	35	37	14
40	12	50	2	36	38	3	35	38	14
41	12	52	2	36	38	3	35	38	14
41	13	54	2	37	39	3	36	39	14
42	13	56	2	38	40	3	37	40	14
43	13	58	2	39	41	3	38	41	15
43	13	60	2	39	41	3	38	41	15
44	13	62	2	40	42	3	39	42	15
45	13	64	2	41	43	3	40	43	16
45	13	66	2	42	44	3	41	44	16
46	13	68	2	42	44	3	41	44	16
47	13	70	3	42	45	4	41	45	16
47	14	72	3	43	46	4	42	46	17
48	14	74	3	44	47	4	43	47	17
49	14	77	3	44	47	4	43	47	17
49	14	79	3	45	48	4	44	48	18

Range	Angle of elevation		Increase in Angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
7,000	3	10.2	190.2	3.0	3	23	8.54	2,258	14	113	292
7,100	3	13.2	193.2	2.9	3	26	8.67	2,252	15	111	301
7,200	3	16.1	196.1	2.9	3	30	8.81	2,246	15	109	311
7,300	3	19.0	199.0	2.9	3	34	8.94	2,240	16	107	320
7,400	3	21.9	201.9	3.0	3	38	9.08	2,234	16	105	330
7,500	3	24.9	204.9	2.9	3	42	9.21	2,228	17	103	340
7,600	3	27.8	207.8	2.9	3	45	9.34	2,222	17	102	350
7,700	3	30.7	210.7	3.0	3	49	9.48	2,216	18	100	360
7,800	3	33.7	213.7	3.0	3	53	9.61	2,210	18	98	370
7,900	3	36.7	216.7	3.1	3	57	9.75	2,205	19	97	381
8,000	3	39.8	219.8	3.0	4	01	9.89	2,199	19	95	392
8,100	3	42.8	222.8	3.0	4	05	10.02	2,193	20	94	403
8,200	3	45.8	225.8	3.0	4	09	10.16	2,187	20	92	414
8,300	3	48.8	228.8	3.1	4	13	10.30	2,181	21	91	425
8,400	3	51.9	231.9	3.1	4	17	10.44	2,175	21	89	437
8,500	3	55.0	235.0	3.0	4	21	10.58	2,170	22	88	449
8,600	3	58.0	238.0	3.1	4	25	10.72	2,164	22	87	461
8,700	4	01.1	241.1	3.1	4	29	10.85	2,158	23	85	473
8,800	4	04.2	244.2	3.2	4	33	10.99	2,152	24	84	485
8,900	4	07.4	247.4	3.1	4	37	11.13	2,146	24	83	498
9,000	4	10.5	250.5	3.1	4	41	11.28	2,141	25	81	511
9,100	4	13.6	253.6	3.2	4	45	11.42	2,135	25	80	524
9,200	4	16.8	256.8	3.1	4	49	11.56	2,129	26	79	537
9,300	4	19.9	259.9	3.2	4	53	11.70	2,123	27	78	550
9,400	4	23.1	263.1	3.2	4	58	11.84	2,117	27	77	563
9,500	4	26.3	266.3	3.2	5	02	11.99	2,112	28	76	577
9,600	4	29.5	269.5	3.2	5	06	12.13	2,106	28	75	591
9,700	4	32.7	272.7	3.2	5	10	12.27	2,100	29	74	605
9,800	4	35.9	275.9	3.2	5	14	12.42	2,095	30	73	619
9,900	4	39.1	279.1	3.3	5	19	12.56	2,089	31	72	634
10,000	4	42.4	282.4	3.3	5	24	12.71	2,083	32	71	649

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
49	14	79	3	45	48	4	44	48	18
50	14	81	4	45	49	4	45	49	18
51	14	83	4	46	50	5	45	50	18
51	14	86	4	46	50	5	45	50	19
52	15	88	4	47	51	5	46	51	19
53	15	91	4	48	52	5	47	52	19
53	15	93	4	49	53	5	48	53	20
54	15	95	4	49	53	5	48	53	20
55	15	97	4	50	54	5	49	54	20
55	15	100	4	51	55	5	50	55	21
56	15	103	4	52	56	5	51	56	21
57	15	105	4	52	56	5	51	56	21
57	15	107	4	53	57	6	51	57	22
58	15	110	5	53	58	6	52	58	22
58	16	113	5	54	59	6	53	59	22
59	16	116	5	55	60	6	54	60	23
60	16	118	5	55	60	6	54	60	23
60	16	121	6	55	61	6	55	61	23
61	16	123	6	56	62	7	55	62	24
62	16	126	6	57	63	7	56	63	24
63	16	129	6	58	64	7	57	64	24
63	16	132	6	58	64	7	57	64	25
64	16	134	7	58	65	7	58	65	25
64	16	137	7	59	66	7	59	66	26
65	17	140	7	60	67	8	59	67	26
66	17	143	7	61	68	8	60	68	26
66	17	146	7	61	68	8	60	68	27
67	17	149	8	61	69	8	61	69	27
67	17	152	8	62	70	8	62	70	28
68	17	155	8	63	71	9	62	71	28
69	17	158	8	64	72	9	63	72	28

Range	Angle of elevation		Increase in angle of elevation for 100 yards increase in range		Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
10,000	4	42.4	282.4	3.3	5	24	12.71	2,083	32	71	649
10,100	4	45.7	285.7	3.2	5	28	12.85	2,078	32	70	664
10,200	4	48.9	288.9	3.3	5	32	13.00	2,072	33	69	679
10,300	4	52.2	292.2	3.3	5	37	13.14	2,066	33	68	694
10,400	4	55.5	295.5	3.3	5	42	13.29	2,061	34	67	710
10,500	4	58.8	298.8	3.4	5	47	13.44	2,055	35	67	726
10,600	5	02.2	302.2	3.3	5	51	13.58	2,050	35	66	742
10,700	5	05.5	305.5	3.3	5	55	13.73	2,044	36	65	758
10,800	5	08.8	308.8	3.4	6	00	13.88	2,038	37	64	775
10,900	5	12.2	312.2	3.4	6	05	14.03	2,033	38	63	792
11,000	5	15.6	315.6	3.4	6	10	14.18	2,027	39	63	809
11,100	5	19.0	319.0	3.4	6	14	14.33	2,022	39	62	826
11,200	5	22.4	322.4	3.4	6	19	14.48	2,016	40	61	843
11,300	5	25.8	325.8	3.4	6	24	14.63	2,011	41	60	861
11,400	5	29.2	329.2	3.5	6	29	14.78	2,005	42	59	879
11,500	5	32.7	332.7	3.4	6	34	14.93	2,000	43	58	897
11,600	5	36.1	336.1	3.5	6	39	15.09	1,995	44	57	915
11,700	5	39.6	339.6	3.5	6	44	15.24	1,989	45	56	934
11,800	5	43.1	343.1	3.5	6	49	15.39	1,984	46	56	953
11,900	5	46.6	346.6	3.5	6	54	15.54	1,978	47	55	972
12,000	5	50.1	350.1	3.6	6	59	15.70	1,973	48	55	991
12,100	5	53.7	353.7	3.6	7	04	15.85	1,968	49	54	1,010
12,200	5	57.3	357.3	3.5	7	09	16.01	1,962	50	53	1,030
12,300	6	00.8	360.8	3.5	7	14	16.16	1,957	51	53	1,050
12,400	6	04.3	364.3	3.6	7	19	16.32	1,952	52	52	1,070
12,500	6	07.9	367.9	3.6	7	25	16.48	1,946	53	51	1,091
12,600	6	11.5	371.5	3.6	7	30	16.63	1,941	54	51	1,112
12,700	6	15.1	375.1	3.6	7	35	16.79	1,936	55	50	1,133
12,800	6	18.7	378.7	3.6	7	40	16.94	1,931	56	50	1,154
12,900	6	22.3	382.3	3.7	7	46	17.10	1,925	57	49	1,176
13,000	6	26.0	386.0	3.7	7	51	17.26	1,920	58	48	1,198

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
69	17	158	8	64	72	9	63	72	28
69	17	161	8	64	72	9	63	72	29
70	17	165	8	65	73	9	64	73	29
70	17	168	8	66	74	9	65	74	30
71	17	171	9	66	75	10	65	75	30
72	17	174	9	67	76	10	66	76	30
72	17	177	9	67	76	10	66	76	31
73	17	181	10	67	77	10	67	77	31
73	17	184	10	68	78	10	68	78	32
74	18	188	11	68	79	11	68	79	32
75	18	191	11	69	80	11	69	80	32
75	18	195	12	69	81	11	70	81	33
76	18	198	12	70	82	11	71	82	33
76	18	202	12	70	82	11	71	82	34
77	18	205	12	71	83	11	72	83	34
78	18	209	13	71	84	12	72	84	34
78	18	213	13	72	85	12	73	85	35
79	18	216	13	73	86	12	74	86	35
79	18	220	14	73	87	12	75	87	36
80	18	224	14	73	87	12	75	87	36
81	18	228	14	74	88	13	75	88	36
81	18	231	14	75	89	13	76	89	37
82	18	235	15	75	90	13	77	90	38
82	18	239	15	76	91	13	78	91	38
83	18	243	15	77	92	14	78	92	38
83	18	247	16	77	93	14	79	93	38
84	18	251	16	78	94	14	80	94	39
85	18	254	16	79	95	15	80	95	40
85	18	258	16	79	95	15	80	95	40
86	18	262	17	79	96	15	81	96	41
86	18	267	17	80	97	15	82	97	41

Range	Angle of elevation		Increase in Angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
13,000	6	26.0	386.0	3.7	7	51	17.26	1,920	58	48	1,198
13,100	6	29.7	389.7	3.7	7	56	17.42	1,915	60	48	1,220
13,200	6	33.4	393.4	3.7	8	02	17.58	1,910	61	47	1,242
13,300	6	37.1	397.1	3.7	8	08	17.74	1,904	62	47	1,265
13,400	6	40.8	400.8	3.7	8	13	17.90	1,899	63	46	1,288
13,500	6	44.5	404.5	3.8	8	18	18.06	1,894	64	46	1,312
13,600	6	48.3	408.3	3.7	8	24	18.22	1,889	66	45	1,335
13,700	6	52.0	412.0	3.8	8	30	18,38	1,884	67	45	1,359
13,800	6	55.8	415.8	3.8	8	35	18.54	1,879	68	44	1,383
13,900	6	59.6	419.6	3.8	8	41	18.71	1,874	69	44	1,407
14,000	7	03.4	423.4	3.9	8	47	18.87	1,869	70	43	1.432
14,100	7	07.3	427.3	3.8	8	53	19.03	1,864	72	43	1,457
14,200	7	11.1	431.1	3.9	8	59	19.20	1,859	73	42	1,482
14,300	7	15.0	435.0	3.9	9	05	19.36	1,854	74	42	1,507
14,400	7	18.9	438.9	3.8	9	11	19.53	1,849	75	41	1,533
14,500	7	22.7	442.7	3.9	9	17	19.69	1,844	76	40	1,560
14,600	7	26.6	446.6	4.0	9	23	19.86	1,839	78	40	1,586
14,700	7	30.6	450.6	3.9	9	29	20.03	1,834	79	40	1,613
14,800	7	34.5	454.5	4.0	9	35	20.19	1,829	80	39	1,640
14,900	7	38.5	458.5	3.9	9	41	20.36	1,824	81	39	1,667
15,000	7	42.4	462.4	4.0	9	47	20.53	1,820	82	38	1,695
15,100	7	46.4	466.4	4.0	9	53	20.70	1,815	84	38	1,723
15,200	7	50.4	470.4	4.0	9	59	20.87	1,810	85	38	1,751
15,300	7	54.4	474.4	4.1	10	06	21.04	1,805	86	37	1,780
15,400	7	58.5	478.5	4.0	10	12	21.21	1,800	88	37	1,809
15,500	8	02.5	482.5	4.1	10	18	21.38	1,796	89	37	1,838
15,600	8	06.6	486.6	4.1	10	25	21.55	1,791	90	36	1,867
15,700	8	10.7	490.7	4.1	10	31	21.72	1,786	92	36	1,897
15,800	8	14.8	494.8	4.2	10	38	21.89	1,781	93	36	1,927
15,900	8	19.0	499.0	4.1	10	44	22.07	1,777	95	35	1,958
16,000	8	23.1	503.1	4.2	10	50	22.24	1,772	96	35	1,989

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
86	18	267	17	80	97	15	82	97	41
87	18	271	18	80	98	15	83	98	42
87	18	275	18	81	99	16	83	99	42
88	18	279	18	82	100	16	84	100	43
88	18	283	18	83	101	16	85	101	43
89	18	288	19	83	102	16	86	102	44
90	18	292	19	84	103	16	87	103	44
90	18	296	19	84	103	16	87	103	45
91	18	300	20	84	104	17	87	104	45
91	18	304	20	85	105	17	88	105	46
92	18	309	20	86	106	17	89	106	46
93	18	313	21	86	107	17	90	107	47
93	18	318	21	87	108	18	90	108	47
94	18	322	22	87	109	18	91	109	48
94	18	327	22	88	110	19	91	110	48
95	18	331	22	89	111	19	92	111	48
95	18	336	23	89	112	19	93	112	49
96	17	340	23	90	113	20	93	113	50
96	17	345	24	90	114	20	94	114	51
97	17	350	24	91	115	20	95	115	51
97	17	354	24	92	116	20	96	116	51
98	17	359	25	92	117	21	96	117	52
99	17	364	25	93	118	21	97	118	53
99	17	368	25	94	119	21	98	119	53
100	17	373	26	94	120	22	98	120	54
100	17	377	26	95	121	22	99	121	54
101	17	382	26	95	121	22	99	121	55
101	17	387	27	95	122	22	100	122	56
102	17	392	28	95	123	23	100	123	56
102	17	397	28	96	124	23	101	124	57
103	17	401	28	97	125	23	102	125	57

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Range	Angle of elevation		Increase in angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
16,000	8	23.1	503.1	4.2	10	50	22.24	1,772	96	35	1,989
16,100	8	27.3	507.3	4.2	10	57	22.41	1,768	98	34	2,020
16,200	8	31.5	511.5	4.2	11	04	22.59	1,763	99	34	2,051
16,300	8	35.7	515.7	4.2	11	11	22.77	1,758	101	34	2,083
16,400	8	39.9	519.9	4.2	11	17	22.94	1,754	102	33	2,115
16,500	8	44.1	524.1	4.3	11	23	23.11	1,749	104	33	2,148
16,600	8	48.4	528.4	4.2	11	30	23.29	1,745	105	33	2,181
16,700	8	52.6	532.6	4.3	11	37	23.47	1,740	107	32	2,214
16,800	8	56.9	536.9	4.3	11	44	23.65	1,736	109	32	2,248
16,900	9	01.2	541.2	4.3	11	51	23.83	1,731	110	32	2,282
17,000	9	05.5	545.5	4.4	11	58	24.00	1,727	112	31	2,316
17,100	9	09.9	549.9	4.3	12	05	24.18	1,723	114	31	2,351
17,200	9	14.2	554.2	4.4	12	13	24.36	1,718	116	31	2,386
17,300	9	18.6	558.6	4.4	12	20	24.54	1,714	117	30	2,421
17,400	9	23.0	563.0	4.4	12	27	24.72	1,709	119	30	2,457
17,500	9	27.4	567.4	4.4	12	34	24.90	1,705	121	30	2,493
17,600	9	31.8	571.8	4.4	12	41	25.09	1,701	123	30	2,530
17,700	9	36.2	576.2	4.5	12	48	25.27	1,697	125	29	2,567
17,800	9	40.7	580.7	4.5	12	56	25.45	1,692	126	29	2,604
17,900	9	45.2	585.2	4.5	13	03	25.64	1,688	128	29	2,642
18,000	9	49.7	589.7	4.5	13	10	25.82	1,684	130	28	2,680
18,100	9	54.2	594.2	4.5	13	17	26.01	1,680	132	28	2,718
18,200	9	58.7	598.7	4.6	13	25	26.19	1,676	134	28	2,757
18,300	10	03.3	603.3	4.6	13	32	26.38	1,672	136	28	2,796
18,400	10	07.9	607.9	4.6	13	40	26.57	1,668	138	27	2,836
18,500	10	12.5	612.5	4.6	13	47	26.75	1,664	140	27	2,877
18,600	10	17.1	617.1	4.6	13	55	26.94	1,660	142	27	2,917
18,700	10	21.7	621.7	4.7	14	03	27.13	1,656	144	27	2,958
18,800	10	26.4	626.4	4.7	14	11	27.32	1,652	146	26	2,999
18,900	10	31.1	631.1	4.6	14	19	27.51	1,648	148	26	3,041
19,000	10	35.7	635.7	4.7	14	26	27.70	1,644	150	26	3,083

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
103	17	401	28	97	125	23	102	125	57
103	17	406	29	97	126	23	103	126	58
104	17	411	29	98	127	24	103	127	59
104	17	416	30	98	128	24	104	128	59
105	17	421	30	99	129	25	104	129	60
105	17	426	31	99	130	25	105	130	60
106	17	431	31	100	131	25	106	131	61
107	17	436	32	100	132	26	106	132	62
107	16	441	32	101	133	26	107	133	62
108	16	446	32	102	134	27	107	134	63
108	16	451	33	102	135	27	108	135	63
109	16	456	33	103	136	27	109	136	64
109	16	461	34	103	137	28	109	137	65
110	16	466	34	104	138	28	110	138	66
110	16	472	35	104	139	29	110	139	66
111	16	477	35	105	140	29	111	140	66
111	16	482	36	105	141	29	112	141	67
112	16	487	36	106	142	29	113	142	68
112	15	493	37	106	143	30	113	143	69
113	15	498	37	107	144	30	114	144	70
113	15	503	37	108	145	31	114	145	70
114	15	509	38	108	146	31	115	146	71
114	15	514	39	108	147	31	116	147	72
115	15	519	39	110	149	32	117	149	72
115	15	525	40	110	150	33	117	150	73
116	15	530	40	111	151	33	118	151	74
116	15	536	41	111	152	33	119	152	74
117	15	541	41	112	153	34	119	153	75
117	15	547	42	112	154	34	120	154	76
118	14	552	42	113	155	35	120	155	77
118	14	558	43	113	156	35	121	156	77

Range	Angle of elevation		Increase in Angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
19,000	10	35.7	635.7	4.7	14	26	27.70	1,644	150	26	3,083
19,100	10	40.4	640.4	4.8	14	34	27.89	1,640	152	26	3,125
19,200	10	45.2	645.2	4.7	14	42	28.08	1,636	154	25	3,168
19,300	10	49.9	649.9	4.8	14	50	28.27	1,632	156	25	3,211
19,400	10	54.7	654.7	4.7	14	58	28.46	1,628	158	25	3,255
19,500	10	59.4	659.4	4.8	15	06	28.66	1,625	160	25	3,299
19,600	11	04.2	664.2	4.9	15	14	28.85	1,621	162	24	3,344
19,700	11	09.1	669.1	4.8	15	22	29.04	1,617	164	24	3,389
19,800	11	13.9	673.9	4.9	15	30	29.24	1,613	167	24	3,435
19,900	11	18.8	678.8	4.8	15	38	29.43	1,610	169	24	3,481
20,000	11	23.6	683.6	4.9	15	47	29.63	1,606	171	24	3,527
20,100	11	28.5	688.5	5.0	15	55	29.82	1,603	173	23	3,574
20,200	11	33.5	693.5	4.9	16	03	30.02	1,599	176	23	3,621
20,300	11	38.4	698.4	5.0	16	11	30.22	1,595	178	23	3,669
20,400	11	43.4	703.4	4.9	16	20	30.42	1,592	181	23	3,717
20,500	11	48.3	708.3	5.0	16	29	30.62	1,588	183	23	3,766
20,600	11	53.3	713.3	5.1	16	37	30.82	1,585	185	22	3,815
20,700	11	58.4	718.4	5.0	16	45	31.02	1,582	188	22	3,865
20,800	12	03.4	723.4	5.1	16	53	31.22	1,578	190	22	3,915
20,900	12	08.5	728.5	5.1	17	02	31.42	1,574	193	22	3,965
21,000	12	13.6	733.6	5.1	17	11	31.62	1,571	195	22	4,016
21,100	12	18.7	738.7	5.2	17	19	31.82	1,568	198	21	4,068
21,200	12	23.9	743.9	5.1	17	28	32.02	1,565	200	21	4,120
21,300	12	29.0	749.0	5.2	17	37	32.22	1,562	203	21	4,173
21,400	12	34.2	754.2	5.2	17	46	32.42	1,558	205	21	4,226
21,500	12	39.4	759.4	5.2	17	54	32.63	1,555	208	21	4,279
21,600	12	44.6	764.6	5.3	18	03	32.83	1,552	211	20	4,333
21,700	12	49.9	769.9	5.2	18	12	33.04	1,549	213	20	4,388
21,800	12	55.1	775.1	5.3	18	20	33.24	1,546	216	20	4,443
21,900	13	00.4	780.4	5.3	18	29	33.45	1,543	218	20	4,498
22,000	13	05.7	785.7	5.3	18	39	33.66	1,540	221	20	4,554

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
118	14	558	43	113	156	35	121	156	77
119	14	563	43	114	157	35	122	157	78
119	14	569	44	114	158	35	123	158	79
120	14	574	44	115	159	36	123	159	79
121	14	580	45	115	160	36	124	160	80
121	14	586	45	116	161	37	124	161	81
122	14	591	46	116	162	37	125	162	82
122	13	597	47	116	163	37	126	163	82
123	13	603	47	117	164	38	126	164	83
123	13	609	48	118	166	39	127	166	84
124	13	615	48	119	167	39	128	167	85
124	13	620	49	119	168	39	129	168	86
125	13	626	49	120	169	40	129	169	86
125	13	632	50	120	170	40	130	170	87
126	13	638	51	120	171	41	130	171	88
126	13	644	51	121	172	41	131	172	89
127	13	649	52	121	173	41	132	173	89
127	13	655	52	123	175	42	133	175	90
128	12	661	53	123	176	43	133	176	91
128	12	667	53	124	177	43	134	177	92
129	12	673	54	124	178	43	135	178	93
129	12	679	55	124	179	43	136	179	94
130	12	685	55	125	180	44	136	180	94
130	12	691	56	125	181	44	137	181	95
130	12	697	57	126	183	45	138	183	96
131	12	703	57	127	184	45	139	184	97
131	12	709	58	127	185	46	139	185	98
132	11	715	58	128	186	46	140	186	99
133	11	721	59	128	187	47	140	187	99
134	11	727	59	129	188	47	141	188	100
134	11	733	60	129	189	47	142	189	101

Range	Angle of elevation		Increase in angle of elevation for 100 yards increase in range		Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
22,000	13	05.7	785.7	5.3	18	39	33.66	1,540	221	20	4,554
22,100	13	11.0	791.0	5.4	18	48	33.87	1,537	224	20	4,610
22,200	13	16.4	796.4	5.3	18	57	34.07	1,534	227	19	4,667
22,300	13	21.7	801.7	5.4	19	06	34.28	1,531	229	19	4,725
22,400	13	27.1	807.1	5.4	19	15	34.49	1,528	232	19	4,783
22,500	13	32.5	812.5	5.5	19	24	34.70	1,525	235	19	4,842
22,600	13	38.0	818.0	5.4	19	33	34.91	1,522	238	19	4,901
22,700	13	43.4	823.4	5.5	19	42	35.12	1,519	241	19	4,960
22,800	13	48.9	828.9	5.5	19	52	35.34	1,516	243	18	5,020
22,900	13	54.4	834.4	5.5	20	01	35.55	1,513	246	18	5,081
23,000	13	59.9	839.9	5.6	20	10	35.76	1,511	249	18	5,143
23,100	14	05.5	845.5	5.5	20	19	35.97	1,508	252	18	5,205
23,200	14	11.0	851.0	5.6	20	29	36.19	1,505	255	18	5,267
23,300	14	16.6	856.6	5.6	20	38	36.40	1,502	258	18	5,330
23,400	14	22.2	862.2	5.7	20	47	36.62	1,500	261	18	5,393
23,500	14	27.9	867.9	5.6	20	57	36.83	1,497	264	17	5,457
23,600	14	33.5	873.5	5.7	21	07	37.05	1,494	267	17	5,522
23,700	14	39.2	879.2	5.7	21	16	37.27	1,492	270	17	5,587
23,800	14	44.9	884.9	5.7	21	26	37.49	1,490	274	17	5,633
23,900	14	50.6	890.6	5.8	21	35	37.70	1,487	277	17	5,719
24,000	14	56.4	896.4	5.8	21	45	37.92	1,485	280	16	5,786
24,100	15	02.2	902.2	5.8	21	55	38.14	1,482	283	16	5,853
24,200	15	08.0	908.0	5.8	22	04	38.36	1,480	287	16	5,921
24,300	15	13.9	913.8	5.8	22	14	38.58	1,477	290	16	5,990
24,400	15	19.6	919.6	5.9	22	24	38.81	1,475	294	16	6,059
24,500	15	25.5	925.5	5.9	22	34	39.03	1,473	297	16	6,129
24,600	15	31.4	931.4	5.9	22	43	39.25	1,470	300	16	6,199
24,700	15	37.3	937.3	5.9	22	53	39.47	1,468	304	16	6,270
24,800	15	43.2	943.2	6.0	23	03	39.70	1,466	307	16	6,342
24,900	15	49.2	949.2	6.0	23	13	39.92	1,464	311	16	6,415
25,000	15	55.2	955.2	6.0	23	23	40.15	1,461	314	15	6,488

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
134	11	733	60	129	189	47	142	189	101
135	11	739	61	130	191	48	143	191	102
135	11	745	61	131	192	49	143	192	103
136	11	751	62	131	193	49	144	193	104
136	10	757	63	131	194	50	144	194	105
137	10	763	63	132	195	50	145	195	105
137	10	770	64	133	197	51	146	197	106
138	10	776	65	133	198	51	147	198	107
138	10	782	65	134	199	52	147	199	108
139	10	788	66	134	200	52	148	200	109
139	10	794	66	135	201	52	149	201	110
140	10	800	67	136	203	53	150	203	111
140	9	807	68	136	204	54	150	204	112
141	9	813	69	136	205	54	151	205	113
141	9	819	69	137	206	55	151	206	114
142	9	826	70	137	207	55	152	207	115
142	9	832	71	138	209	56	153	209	116
143	9	838	71	139	210	56	154	210	117
143	9	845	72	139	211	57	154	211	118
144	8	851	73	139	212	57	155	212	119
145	8	857	73	140	213	57	156	213	120
145	8	864	74	141	215	58	157	215	121
146	8	870	75	141	216	59	157	216	122
146	8	876	75	142	217	59	158	217	123
147	8	883	76	143	219	60	159	219	124
147	8	889	77	143	220	60	160	220	125
148	8	896	78	143	221	61	160	221	126
148	8	902	78	144	222	61	161	222	127
149	7	909	79	145	224	62	162	224	128
149	7	915	80	145	225	62	163	225	129
150	7	921	80	146	226	62	164	226	130

Range	Angle of elevation		Increase in Angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
25,000	15	55.2	955.2	6.0	23	23	40.15	1,461	314	15	6,488
25,100	16	01.2	961.2	6.0	23	32	40.38	1,459	318	15	6,561
25,200	16	07.2	967.2	6.1	23	43	40.60	1,457	321	15	6,635
25,300	16	13.3	973.3	6.1	23	53	40.83	1,455	325	15	6,710
25,400	16	19.4	979.4	6.1	24	03	41.06	1,453	328	15	6,786
25,500	16	25.5	985.5	6.2	24	13	41.29	1,451	332	15	6,862
25,600	16	31.7	991.7	6.1	24	23	41.52	1,449	335	15	6,939
25,700	16	37.8	997.8	6.2	24	33	41.75	1,447	339	15	7,016
25,800	16	44.0	1,004.0	6.2	24	43	41.98	1,445	343	14	7,094
25,900	16	50.2	1,010.2	6.3	24	53	42.21	1,443	347	14	7,173
26,000	16	56.5	1,016.5	6.3	25	04	42.44	1,441	351	14	7,252
26,100	17	02.8	1,022.8	6.2	25	14	42.67	1,439	355	14	7,332
26,200	17	09.0	1,029.0	6.3	25	25	42.91	1,437	359	14	7,413
26,300	17	15.3	1,035.3	6.4	25	35	43.14	1,435	363	14	7,495
26,400	17	21.7	1,041.7	6.4	25	45	43.37	1,434	367	14	7,577
26,500	17	28.1	1,048.1	6.4	25	56	43.61	1,432	371	13	7,659
26,600	17	34.5	1,054.5	6.4	26	06	43.85	1,431	375	13	7,743
26,700	17	40.9	1,060.9	6.4	26	16	44.08	1,429	379	13	7,827
26,800	17	47.3	1,067.3	6.5	26	26	44.32	1,428	384	13	7,912
26,900	17	53.8	1,073.8	6.5	26	37	44.56	1,426	388	13	7,997
27,000	18	00.3	1,080.3	6.5	26	48	44.80	1,424	392	13	8,083
27,100	18	06.8	1,086.8	6.6	26	58	45.04	1,422	396	13	8,170
27,200	18	13.4	1,093.4	6.5	27	09	45.28	1,420	400	13	8,258
27,300	18	19.9	1,099.9	6.6	27	19	45.52	1,419	405	13	8,346
27,400	18	26.5	1,106.5	6.7	27	30	45.76	1,418	409	13	8,435
27,500	18	33.2	1,113.2	6.6	27	41	46.01	1,417	413	13	8,525
27,600	18	39.8	1,119.8	6.7	27	51	46.25	1,415	418	13	8,616
27,700	18	46.5	1,126.5	6.7	28	02	46.49	1,414	422	13	8,707
27,800	18	53.2	1,133.2	6.8	28	13	46.74	1,413	426	12	8,799
27,900	19	00.0	1,140.0	6.8	28	23	46.98	1,411	431	12	8,892
28,000	19	06.8	1,146.8	6.8	28	34	47.23	1,410	435	12	8,986

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
150	7	921	80	146	226	62	164	226	130
150	7	927	81	146	227	63	164	227	131
151	7	934	82	147	229	64	165	229	132
151	6	941	83	147	230	65	165	230	133
152	6	947	83	148	231	65	166	231	134
152	6	954	84	149	233	65	167	233	135
153	6	961	85	149	234	66	168	234	136
153	6	967	86	149	235	66	169	235	137
154	6	974	86	150	236	67	169	236	138
155	5	981	87	151	238	68	170	238	139
155	5	987	88	151	239	68	171	239	140
156	5	994	88	152	240	69	171	240	141
156	5	1,001	89	153	242	70	172	242	142
157	5	1,008	90	153	243	70	173	243	143
157	5	1,015	91	153	244	71	174	244	144
158	5	1,021	92	154	246	71	175	246	145
158	5	1,028	92	155	247	72	175	247	147
159	4	1,035	93	155	248	73	175	248	148
159	4	1,042	94	155	249	73	176	249	149
160	4	1,049	95	156	251	74	177	251	150
161	4	1,055	96	156	252	74	178	252	151
161	4	1,062	96	157	253	74	179	253	152
162	3	1,069	97	158	255	75	180	255	153
162	3	1,076	98	158	256	76	180	256	155
163	3	1,082	99	159	258	77	181	258	156
163	3	1,089	100	159	259	77	182	259	157
164	3	1,096	101	160	261	78	183	261	158
164	2	1,103	101	161	262	78	184	262	159
165	2	1,110	102	161	263	79	184	263	161
165	2	1,117	103	162	265	80	185	265	162
166	2	1,124	104	162	266	80	186	266	163

Range	Angle of elevation		Increase in angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
28,000	19	06.8	1,146.8	6.8	28	34	47.23	1,410	435	12	8,986
28,100	19	13.6	1,153.6	6.8	28	45	47.47	1,409	440	12	9,080
28,200	19	20.4	1,160.4	6.8	28	56	47.72	1,408	444	12	9,175
28,300	19	27.2	1,167.2	6.9	29	07	47.97	1,406	449	12	9,271
28,400	19	34.1	1,174.1	7.0	29	17	48.22	1,405	454	12	9,368
28,500	19	41.1	1,181.1	6.9	29	28	48.47	1,404	458	11	9,466
28,600	19	48.0	1,188.0	7.0	29	39	48.72	1,403	463	11	9,564
28,700	19	55.0	1,195.0	7.0	29	50	48.97	1,402	468	11	9,663
28,800	20	02.0	1,202.0	7.0	30	01	49.22	1,401	472	11	9,763
28,900	20	09.0	1,209.0	7.1	30	11	49.48	1,400	477	11	9,864
29,000	20	16.1	1,216.1	7.1	30	22	49.73	1,399	482	11	9,966
29,100	20	23.2	1,223.2	7.1	30	32	49.98	1,398	487	11	10,068
29,200	20	30.3	1,230.3	7.2	30	43	50.24	1,397	492	11	10,171
29,300	20	37.5	1,237.5	7.2	30	54	50.50	1,396	497	11	10,274
29,400	20	44.7	1,244.7	7.2	31	05	50.75	1,395	502	11	10,378
29,500	20	51.9	1,251.9	7.2	31	16	51.01	1,395	507	11	10,486
29,600	20	59.1	1,259.1	7.3	31	27	51.27	1,394	512	11	10,590
29,700	21	06.4	1,266.4	7.3	31	38	51.53	1,393	518	11	10,698
29,800	21	13.7	1,273.7	7.3	31	49	51.79	1,392	523	11	10,807
29,900	21	21.0	1,281.0	7.4	32	00	52.05	1,392	528	11	10,917
30,000	21	28.4	1,288.4	7.4	32	11	52.31	1,391	534	11	11,027
30,100	21	35.8	1,295.8	7.4	32	22	52.57	1,390	539	11	11,137
30,200	21	43.2	1,303.2	7.5	32	33	52.83	1,389	545	10	11,248
30,300	21	50.7	1,310.7	7.5	32	44	53.10	1,388	550	10	11,359
30,400	21	58.2	1,318.2	7.5	32	55	53.36	1,388	556	10	11,472
30,500	22	05.7	1,325.7	7.6	33	06	53.63	1,388	561	10	11,589
30,600	22	13.3	1,333.3	7.6	33	17	53.89	1,387	567	10	11,703
30,700	22	20.9	1,340.9	7.6	33	28	54.16	1,387	572	10	11,820
30,800	22	28.5	1,348.5	7.7	33	39	54.43	1,386	578	10	11,938
30,900	22	36.2	1,356.2	7.7	33	50	54.70	1,386	583	10	12,056
31,000	22	43.9	1,363.9	7.7	34	01	54.97	1,385	589	10	12,175

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
166	2	1,124	104	162	266	80	186	266	163
166	2	1,131	105	162	267	80	187	267	164
167	2	1,138	106	163	269	81	188	269	165
168	2	1,145	107	163	270	82	188	270	167
168	1	1,152	108	164	272	83	189	272	169
169	1	1,159	108	165	273	83	190	273	170
169	1	1,167	109	165	274	83	191	274	171
170	1	1,174	110	166	276	84	192	276	172
170	1	1,181	111	166	277	85	192	277	174
171	1	1,188	112	167	279	86	193	279	175
172	1	1,195	112	168	280	86	194	280	176
172	1	1,202	113	168	281	86	195	281	177
173	0	1,209	114	169	283	87	196	283	178
173	0	1,216	115	169	284	88	196	284	180
174	0	1,223	116	170	286	89	197	286	181
175	0	1,230	116	171	287	89	198	287	182
175	0	1,237	117	172	289	90	199	289	183
176	0	1,244	118	172	290	90	200	290	185
176	0	1,251	119	173	292	91	201	292	186
177	−1	1,258	120	173	293	92	201	293	188
178	−1	1,265	121	174	295	93	202	295	189
178	−1	1,272	121	175	296	93	203	296	190
179	−1	1,279	122	175	297	94	203	297	192
180	−1	1,286	123	176	299	95	204	299	193
180	−1	1,293	124	176	300	95	205	300	195
181	−1	1,300	125	177	302	96	206	302	196
182	−1	1,307	125	178	303	97	206	303	197
182	−1	1,314	126	179	305	98	207	305	198
183	−2	1,321	127	179	306	98	208	306	200
184	−2	1,328	128	180	308	99	209	308	201
184	−2	1,335	129	181	310	99	210	310	203

Range	Angle of elevation		Increase in Angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
31,000	22	43.9	1,363.9	7.7	34	01	54.97	1,385	589	10	12,175
31,100	22	51.6	1,371.6	7.8	34	12	55.24	1,385	595	10	12,295
31,200	22	59.4	1,379.4	7.8	34	23	55.51	1,384	601	10	12,416
31,300	23	07.2	1,387.2	7.8	34	34	55.78	1,384	607	10	12,538
31,400	23	15.0	1,395.0	7.9	34	45	56.05	1,383	613	10	12,661
31,500	23	22.9	1,402.9	7.9	34	56	56.33	1,383	619	10	12,785
31,600	23	30.8	1,410.8	7.9	35	08	56.60	1,383	625	9	12,910
31,700	23	38.7	1,418.7	8.0	35	19	56.87	1,383	631	9	13,036
31,800	23	46.7	1,426.7	8.0	35	30	57.15	1,383	638	9	13,163
31,900	23	54.7	1,434.7	8.1	35	41	57.43	1,382	644	9	13,291
32,000	24	02.8	1,442.8	8.1	35	52	57.71	1,382	650	9	13,419
32,100	24	10.9	1,450.9	8.1	36	03	57.99	1,382	656	9	13,549
32,200	24	19.0	1,459.0	8.2	36	14	58.27	1,382	663	9	13,680
32,300	24	27.2	1,467.2	8.2	36	25	58.55	1,382	669	9	13,813
32,400	24	35.4	1,475.4	8.2	36	36	58.83	1,382	675	9	13,947
32,500	24	43.6	1,483.6	8.3	36	48	59.12	1,382	682	9	14,080
32,600	24	51.9	1,491.9	8.3	36	59	59.40	1,383	688	9	14,216
32,700	25	00.2	1,500.2	8.4	37	10	59.69	1,383	695	9	14,352
32,800	25	08.6	1,508.6	8.4	37	22	59.97	1,383	701	9	14,490
32,900	25	17.0	1,517.0	8.4	37	33	60.26	1,383	708	9	14,629
33,000	25	25.4	1,525.4	8.5	37	44	60.55	1,383	715	9	14,769
33,100	25	33.9	1,533.9	8.5	37	55	60.83	1,384	722	9	14,911
33,200	25	42.4	1,542.4	8.6	38	06	61.12	1,384	729	9	15,054
33,300	25	51.0	1,551.0	8.6	38	17	61.42	1,384	736	9	15,197
33,400	25	59.6	1,559.6	8.6	38	28	61.71	1,385	743	9	15,341
33,500	26	08.2	1,568.2	8.7	38	40	62.01	1,385	750	9	15,487
33,600	26	16.9	1,576.9	8.8	38	51	62.30	1,385	757	8	15,634
33,700	26	25.7	1,585.7	8.8	39	02	62.59	1,385	764	8	15,783
33,800	26	34.5	1,594.5	8.8	39	13	62.89	1,386	771	8	15,933
33,900	26	43.3	1,603.3	8.9	39	25	63.19	1,386	779	8	16,084
34,000	26	52.2	1,612.2	8.9	39	36	63.49	1,387	786	8	16,236

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
184	—2	1,335	129	181	310	99	210	310	203
185	—2	1,342	130	181	311	100	211	311	204
186	—2	1,349	131	182	313	101	212	313	205
186	—2	1,356	132	182	314	101	213	314	207
187	—3	1,363	133	183	316	102	214	316	208
188	—3	1,370	133	184	317	102	215	317	210
188	—3	1,378	134	185	319	103	216	319	211
189	—3	1,385	135	185	320	103	217	320	212
190	—3	1,392	136	186	322	104	218	322	214
190	—3	1,399	137	186	323	104	219	323	215
191	—3	1,406	138	187	325	105	220	325	217
192	—3	1,414	139	188	327	106	221	327	218
193	—3	1,421	140	188	328	106	222	328	220
193	—4	1,428	141	189	330	107	223	330	221
194	—4	1,435	142	190	332	108	224	332	223
195	—4	1,442	143	190	333	109	224	333	224
195	—4	1,450	143	191	334	109	225	334	226
196	—4	1,457	144	192	336	110	226	336	227
197	—4	1,464	145	193	338	111	227	338	229
198	—4	1,471	146	193	339	111	228	339	231
199	—4	1,479	147	194	341	112	229	341	232
199	—4	1,486	147	195	342	112	230	342	234
200	—4	1,494	148	196	344	113	231	344	235
201	—5	1,501	149	197	346	114	232	346	237
202	—5	1,509	150	197	347	114	233	347	238
203	—5	1,516	151	198	349	115	234	349	240
203	—5	1,524	152	199	351	116	235	351	242
204	—5	1,531	152	200	352	116	236	352	243
205	—5	1,539	153	201	354	117	237	354	245
206	—5	1,546	154	202	356	118	238	356	247
207	—5	1,553	155	203	358	119	239	358	248

Range	Angle of elevation		Increase in angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
34,000	26	52.2	1,612.2	8.9	39	36	63.49	1,387	786	8	16,236
34,100	27	01.1	1,621.1	9.0	39	47	63.79	1,387	793	8	16,389
34,200	27	10.1	1,630.1	9.0	39	58	64.09	1,388	801	8	16,544
34,300	27	19.1	1,639.1	9.1	40	09	64.39	1,388	808	8	16,700
34,400	27	28.2	1,648.2	9.1	40	20	64.70	1,389	816	8	16,858
34,500	27	37.3	1,657.3	9.2	40	31	65.00	1,390	824	8	17,018
34,600	27	46.5	1,666.5	9.2	40	42	65.31	1,390	832	8	17,178
34,700	27	55.7	1,675.7	9.3	40	53	65.62	1,391	840	8	17,340
34,800	28	05.0	1,685.0	9.4	41	05	65.93	1,392	848	8	17,503
34,900	28	14.4	1,694.4	9.4	41	16	66.24	1,393	856	8	17,668
35,000	28	23.8	1,703.8	9.5	41	27	66.55	1,394	864	8	17,835
35,100	28	33.3	1,713.3	9.5	41	38	66.86	1,394	872	8	18,003
35,200	28	42.8	1,722.8	9.6	41	49	67.18	1,395	881	7	18,173
35,300	28	52.4	1,732.4	9.6	42	00	67.49	1,396	889	7	18,345
35,400	29	02.0	1,742.0	9.7	42	11	67.81	1,397	897	7	18,518
35,500	29	11.7	1,751.7	9.7	42	23	68.13	1,398	906	7	18,692
35,600	29	21.4	1,761.4	9.8	42	34	68.45	1,399	914	7	18,868
35,700	29	31.2	1,771.2	9.9	42	46	68.78	1,399	923	7	19,046
35,800	29	41.1	1,781.1	10.0	42	57	69.10	1,400	931	7	19,226
35,900	29	51.1	1,791.1	10.1	43	08	69.43	1,401	940	7	19,408
36,000	30	01.2	1,801.2	10	43	19	69.76	1,403	949	7	19,592
36,100	30	11	1,811	11	43	30	70.09	1,404	958	7	19,778
36,200	30	22	1,822	10	43	41	70.42	1,405	967	7	19,966
36,300	30	32	1,832	10	43	53	70.75	1,406	977	7	20,156
36,400	30	42	1,842	11	44	04	71.09	1,408	986	7	20,347
36,500	30	53	1,853	10	44	15	71.43	1,409	996	7	20,540
36,600	31	03	1,863	11	44	26	71.77	1,410	1,005	7	20,736
36,700	31	14	1,874	10	44	38	72.11	1,412	1,015	7	20,935
36,800	31	24	1,884	11	44	49	72.45	1,413	1,024	7	21,136
36,900	31	35	1,895	11	45	01	72.80	1,414	1,033	7	21,338
37,000	31	46	1,906	11	45	12	73.15	1,415	1,043	7	21,542

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
207	−5	1,553	155	203	358	119	239	358	248
207	−5	1,561	155	204	359	119	240	359	250
208	−5	1,569	156	205	361	120	241	361	251
209	−6	1,576	157	206	363	121	242	363	253
210	−6	1,584	158	206	364	121	243	364	255
211	−6	1,591	159	207	366	122	244	366	256
212	−6	1,599	160	208	368	123	245	368	258
213	−6	1,606	160	209	369	123	246	369	260
213	−6	1,614	161	210	371	124	247	371	262
214	−6	1,621	162	211	373	125	248	373	263
215	−6	1,629	163	212	375	126	249	375	265
216	−6	1,637	163	213	376	126	250	376	267
217	−6	1,644	164	214	378	127	251	378	268
218	−6	1,652	165	216	380	127	253	380	270
219	−6	1,659	166	215	382	128	254	382	272
220	−6	1,667	167	217	384	129	255	384	274
221	−6	1,675	167	218	385	129	256	385	276
222	−6	1,682	168	219	387	130	257	387	277
222	−6	1,690	169	220	389	130	259	389	279
223	−6	1,698	170	221	391	131	260	391	281
224	−7	1,705	170	223	393	132	261	393	283
225	−7	1,713	171	224	395	133	262	395	285
226	−7	1,721	172	225	397	134	263	397	287
227	−7	1,728	172	226	398	134	264	398	288
228	−7	1,736	173	227	400	134	266	400	290
229	−7	1,744	174	228	402	135	267	402	292
230	−7	1,752	175	229	404	136	268	404	294
231	−7	1,759	176	230	406	137	269	406	296
232	−7	1,767	176	232	408	137	271	408	298
233	−7	1,774	177	233	410	138	272	410	300
234	−7	1,782	178	234	412	139	273	412	302

Range	Angle of elevation		Increase in Angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
37,000	31	46	1,906	11	45	12	73.15	1,415	1,043	7	21,542
37,100	31	57	1,917	11	45	23	73.50	1,417	1,053	7	21,748
37,200	32	08	1,928	11	45	35	73.85	1,418	1,064	7	21,958
37,300	32	19	1,939	11	45	46	74.21	1,420	1,074	6	22,171
37,400	32	30	1,950	12	45	58	74.57	1,421	1,084	6	22,386
37,500	32	42	1,962	11	46	10	74.93	1,422	1,095	6	22,604
37,600	32	53	1,973	11	46	22	75.29	1,424	1,105	6	22,825
37,700	33	04	1,984	12	46	33	75.66	1,426	1,116	6	23,048
37,800	33	16	1,996	12	46	44	76.03	1,428	1,127	6	23,273
37,900	33	28	2,008	12	46	56	76.41	1,430	1,139	6	23,502
38,000	33	40	2,020	12	47	08	76.79	1,431	1,150	6	23,734
38,100	33	52	2,032	12	47	20	77.17	1,433	1,161	6	23,970
38,200	34	04	2,044	12	47	31	77.55	1,435	1,173	6	24,210
38,300	34	16	2,056	13	47	43	77.94	1,437	1,185	6	24,453
38,400	34	29	2,069	12	47	55	78.33	1,439	1,197	6	24,700
38,500	34	41	2,081	13	48	07	78.73	1,441	1,209	6	24,951
38,600	34	54	2,094	13	48	20	79.13	1,444	1,221	6	25,206
38,700	35	07	2,107	13	48	32	79.54	1,446	1,234	6	25,466
38,800	35	20	2,120	14	48	44	79.95	1,448	1,247	6	25,730
38,900	35	34	2,134	13	48	56	80.37	1,450	1,260	6	25,998
39,000	35	47	2,147	14	49	09	80.79	1,452	1,273	6	26,270
39,100	36	01	2,161	14	49	22	81.22	1,454	1,286	6	26,548
39,200	36	15	2,175	14	49	34	81.65	1,456	1,300	6	26,832
39,300	36	29	2,189	15	49	47	82.09	1,458	1,314	6	27,121
39,400	36	44	2,204	15	50	01	82.54	1,462	1,328	6	27,416
39,500	36	59	2,219	15	50	14	83.00	1,465	1,343	6	27,717
39,600	37	14	2,234	15	50	28	83.46	1,467	1,358	6	28,024
39,700	37	29	2,249	16	50	41	83.93	1,470	1,374	5	28,339
39,800	37	45	2,265	16	50	55	84.41	1,473	1,390	5	28,663
39,900	38	01	2,281	17	51	09	84.90	1,476	1,406	5	28,996
40,000	38	18	2,298	17	51	23	85.40	1,479	1,422	5	29,338

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
234	−7	1,782	178	234	412	139	273	412	302
235	−7	1,789	179	235	414	140	274	414	304
236	−7	1,797	180	236	416	141	275	416	306
237	−7	1,805	180	238	418	141	277	418	308
238	−7	1,813	181	239	420	142	278	420	310
239	−7	1,820	182	240	422	143	279	422	312
240	−7	1,828	183	241	424	144	280	424	314
241	−7	1,835	184	242	426	144	282	426	317
242	−7	1,842	185	243	428	145	283	428	319
243	−7	1,850	185	245	430	145	285	430	321
245	−7	1,858	186	246	432	146	286	432	323
246	−7	1,866	187	247	434	147	287	434	325
247	−7	1,874	188	249	437	148	289	437	328
248	−7	1,881	189	250	439	149	290	439	330
249	−7	1,888	190	251	441	149	292	441	332
250	−7	1,896	191	252	443	150	293	443	334
251	−7	1,903	192	254	446	151	295	446	337
252	−7	1,911	193	255	448	152	296	448	340
253	−7	1,919	194	256	450	152	298	450	342
254	−7	1,926	195	257	452	153	299	452	345
256	−7	1,933	196	259	455	154	301	455	347
257	−7	1,941	197	260	457	154	303	457	350
258	−7	1,949	198	262	460	155	305	460	353
259	−7	1,956	199	263	462	156	306	462	355
260	−7	1,963	200	265	465	157	308	465	358
261	−7	1,970	201	266	467	158	309	467	361
262	−7	1,978	202	268	470	159	311	470	364
264	−7	1,985	203	270	473	160	313	473	367
265	−7	1,992	204	271	475	160	315	475	370
266	−7	1,999	205	273	478	161	317	478	373
267	−7	2,006	206	275	481	162	319	481	376

Range	Angle of elevation		Increase in angle of elevation for 100 yards increase in range	Angle of fall		Time of flight	Striking velocity	Drift	Danger space for a target 20 feet high	Maximum ordinate
1	2		2a	2b	3		4	5	6	7	8
Yards	°	′	*Minutes*	*Minutes*	°	′	*Seconds*	*F. S.*	*Yards*	*Yards*	*Feet*
40,000	38	18	2,298	17	51	23	85.40	1,479	1,422	5	29,338
40,100	38	35	2,315	17	51	37	85.91	1,482	1,439	5	29,690
40,200	38	52	2,332	18	51	52	86.44	1,485	1,457	5	30,051
40,300	39	10	2,350	19	52	07	86.98	1,488	1,475	5	30,421
40,400	39	29	2,369	19	52	22	87.53	1,491	1,494	5	30,805
40,500	39	48	2,388	20	52	38	88.10	1,494	1,514	5	31,205
40,600	40	08	2,408	21	52	54	88.69	1,497	1,534	5	31,625
40,700	40	29	2,429	21	53	11	89.30	1,501	1,555	5	32,063
40,800	40	50	2,450	23	53	29	89.94	1,505	1,577	5	32,523
40,900	41	13	2,473	24	53	47	90.61	1,509	1,601	5	33,001
41,000	41	37	2,497	26	54	06	91.32	1,513	1,627	5	33,509
41,100	42	03	2,523	28	54	26	92.08	1,518	1,654	5	34,053
41,200	42	31	2,551	30	54	47	92.89	1,523	1,683	5	34,642
41,300	43	01	2,581	34	55	10	93.76	1,529	1,714	5	35,289
41,400	43	35	2,615	38	55	36	94.71	1,535	1,749	5	36,004
41,500	44	13	2,653	45	56	04	95.77	1,542	1,789	4	36,814
41,600	44	58	2,698	--	56	38	97.06	1,550	1,837	4	37,800
41,604	45	00	2,700	--	56	39	97.11	1,550	1,839	4	37,845
41,622	45	10	2,710	--	56	46	97.38	1,552	1,849	4	38,049

Change of range for variation of +10 feet per second initial velocity	Change of range for variation of −10 pounds in weight of projectile	Change of range for variation in density of air of −10 percent	Change of range for wind component in plane of fire of 10 knots	Change of range for motion of gun in plane of fire of 10 knots	Change of range for motion of target in plane of fire of 10 knots	Deviation for lateral wind component of 10 knots	Deviation for lateral motion of gun perpendicular to line of fire, speed of 10 knots	Deviation for lateral motion of target perpendicular to line of fire, speed of 10 knots	Change in height of impact for variation of 100 yards in sight bar
10	11	12	13	14	15	16	17	18	19
Yards	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Yards*	*Feet*
267	−7	2, 006	206	275	481	162	319	481	376
268	−7	2, 013	207	277	484	163	321	484	379
269	−6	2, 020	209	278	487	164	323	487	383
271	−6	2, 027	210	280	490	164	326	390	386
272	−6	2, 034	211	282	493	165	328	493	390
273	−6	2, 041	212	284	496	166	330	496	393
274	−6	2, 048	213	286	499	166	333	499	397
275	−6	2, 055	215	288	503	167	336	503	402
277	−6	2, 062	216	290	506	168	338	506	406
278	−6	2, 068	218	292	510	169	341	510	410
279	−6	2, 074	220	294	514	170	344	514	414
280	−6	2, 080	222	296	518	170	348	518	420
281	−5	2, 085	224	299	523	171	352	523	427
282	−5	2, 090	226	302	528	173	355	528	433
284	−5	2, 094	228	305	533	174	359	533	440
285	−5	2, 097	231	308	539	176	363	539	446
286	−5	2, 099	234	312	546	178	368	546	456
286	−5	2, 099	234	313	547	178	369	547	456
286	−5	2, 099	235	313	548	178	370	548	458

*EFFECT IN YARDS OF RANGE DUE TO ROTATION OF THE EARTH

True target bearing, degrees							Range, yards	True target bearing, degrees						
0	15	30	45	60	75	90		0	15	30	45	60	75	90
180	165	150	135	120	105	90		180	165	150	135	120	105	90
LATITUDE 0°								LATITUDE 10° (North or South)						
0	11	21	30	37	41	42	4,000	0	11	21	30	36	40	42
0	20	39	54	67	74	77	8,000	0	20	38	54	66	73	76
0	27	53	74	91	101	105	12,000	0	27	52	73	89	100	103
0	33	63	89	110	122	127	16,000	0	32	62	88	107	120	124
0	37	71	100	124	138	143	20,000	0	36	70	99	121	135	140
0	40	77	109	135	150	155	24,000	0	39	76	108	132	147	152
0	42	82	116	143	159	165	28,000	0	42	81	115	140	157	162
0	44	86	121	149	166	172	32,000	0	44	85	120	146	164	169
0	44	87	122	151	169	173	36,000	0	45	86	122	149	166	172
0	42	81	114	140	156	162	40,000	0	41	80	112	138	154	159
LATITUDE 20° (North or South)								LATITUDE 30° (North or South)						
0	10	20	28	35	38	40	4,000	0	9	18	26	32	35	37
0	19	36	51	63	70	73	8,000	0	17	33	47	58	64	67
0	26	49	70	85	95	99	12,000	0	23	45	64	79	87	91
0	31	59	84	102	114	119	16,000	0	28	55	77	95	105	109
0	35	67	95	116	129	134	20,000	0	32	62	87	107	119	123
0	38	73	103	126	141	146	24,000	0	35	67	95	116	130	134
0	40	77	109	134	150	155	28,000	0	37	71	101	124	138	143
0	42	81	114	140	156	161	32,000	0	38	74	105	130	144	149
0	42	82	116	142	157	162	36,000	0	38	75	106	131	146	150
0	39	76	107	132	147	152	40,000	0	36	70	99	121	135	140
180	195	210	225	240	255	270		180	195	210	225	240	255	270
360	345	330	315	300	285	270		360	345	330	315	300	285	270
True Target bearing, degrees								True target bearing, degrees						

*For bearing at top of table the range is increased. For bearing at bottom of table the range is decreased.

*EFFECT IN YARDS OF RANGE DUE TO ROTATION OF THE EARTH

True target bearing, degrees								True target bearing, degrees						
0	15	30	45	60	75	90	Range,	0	15	30	45	60	75	90
180	165	150	135	120	105	90	yards	180	165	150	135	120	105	90
LATITUDE 40° (North or South)								LATITUDE 50° (North or South)						
0	9	17	23	28	31	32	4,000	0	7	14	19	24	26	27
0	16	30	42	51	57	59	8,000	0	13	25	35	43	48	50
0	21	40	57	70	78	80	12,000	0	17	34	48	58	65	68
0	25	48	68	84	94	96	16,000	0	21	41	58	70	78	82
0	28	54	77	95	106	109	20,000	0	24	46	65	79	88	92
0	31	59	84	103	115	119	24,000	0	26	50	70	86	96	100
0	33	63	89	109	122	126	28,000	0	27	53	75	92	102	106
0	34	66	93	114	127	132	32,000	0	28	56	79	96	107	110
0	35	67	95	116	128	134	36,000	0	29	57	80	97	108	111
0	32	62	88	107	119	124	40,000	0	27	52	74	90	100	104
LATITUDE 60° (North or South)								LATITUDE 70° (North or South)						
0	5	10	15	18	20	21	4,000	0	4	7	11	13	14	14
0	10	19	27	33	37	39	8,000	0	7	13	19	23	26	26
0	14	26	37	45	51	53	12,000	0	9	18	25	31	35	36
0	16	32	45	55	61	63	16,000	0	11	22	30	37	42	43
0	18	36	51	62	69	71	20,000	0	13	24	34	42	47	49
0	20	39	55	67	27	77	24,000	0	14	26	37	46	51	53
0	21	41	58	71	80	82	28,000	0	15	28	40	49	54	56
0	22	43	61	74	83	86	32,000	0	15	29	42	51	57	59
0	23	44	62	75	84	87	36,000	0	15	29	42	51	58	60
0	21	40	57	70	78	81	40,000	0	14	28	39	48	53	55
180	195	210	225	240	255	270		180	195	210	225	240	255	270
360	345	330	315	300	285	270		360	345	330	315	300	285	270
True target bearing, degrees								True target bearing, degrees						

*For bearing at top of table the range is increased. For bearing at bottom of table the range is decreased.

*DEFLECTION IN YARDS DUE TO ROTATION OF THE EARTH

True target bearing, degrees								True target bearing, degrees						
0	30	60	90	120	150	180	Range	0	30	60	90	120	150	180
360	330	300	270	240	210	180	yards	360	330	300	270	240	210	180
LATITUDE 0°								LATITUDE 10°						
0	0	0	0	0	0	0	4,000	0	0	0	0	0	0	0
0	0	0	0	0	0	0	8,000	1	1	1	1	1	1	1
0	0	0	0	0	0	0	12,000	2	2	2	2	2	3	3
−1	−1	−1	0	1	1	1	16,000	3	3	4	4	4	5	5
−2	−2	−1	0	1	2	2	20,000	4	5	6	7	8	9	9
−5	−4	−2	0	2	4	5	24,000	5	6	8	10	13	15	15
−10	−8	−5	0	5	8	10	28,000	5	7	10	15	20	23	24
−17	−15	−9	0	9	15	17	32,000	4	6	12	21	29	35	38
−30	−26	−15	0	15	26	30	36,000	−2	2	13	28	43	54	59
−57	−49	−28	0	28	49	57	40,000	−18	−10	10	38	66	87	94
LATITUDE 20°								LATITUDE 30°						
0	0	0	0	0	0	0	4,000	1	1	1	1	1	1	1
2	2	2	2	2	2	2	8,000	3	3	3	3	3	3	3
4	4	4	4	5	5	5	12,000	6	6	7	7	7	7	7
7	7	8	8	9	9	9	16,000	11	11	12	12	13	13	13
11	11	12	13	15	16	16	20,000	17	18	19	20	21	22	22
16	16	18	20	23	25	25	24,000	25	26	28	30	32	34	34
20	21	25	29	34	37	38	28,000	34	36	39	43	47	50	51
24	26	33	41	49	55	57	32,000	44	47	52	59	67	72	74
27	30	41	56	69	80	84	36,000	53	58	67	80	94	103	107
22	29	49	75	102	122	129	40,000	61	68	86	110	135	153	160
180	150	120	90	60	30	0		180	150	120	90	60	30	0
180	210	240	270	300	330	360		180	210	240	270	300	330	360
True target bearing, degrees								True target bearing, degrees						

*Deflections to the right are positive. Deflections to the left are negative. Deflections are tabulated for north latitude, for south latitude use opposite sign. For north latitude use bearing at top of table. For south latitude use bearing at bottom of table.

*DEFLECTION IN YARDS DUE TO ROTATION OF THE EARTH

True target bearing, degrees								True target bearing, degrees						
0	30	60	90	120	150	180	Range,	0	30	60	90	120	150	180
360	330	300	270	240	210	180	yards	360	330	300	270	240	210	180
LATITUDE 40°								LATITUDE 50°						
1	1	1	1	1	1	1	4,000	1	1	1	1	1	1	1
4	4	4	4	4	4	4	8,000	4	4	4	4	4	4	4
8	8	8	9	9	9	9	12,000	10	10	10	10	10	10	10
14	15	15	16	16	16	17	16,000	18	18	18	18	19	19	19
23	24	24	25	26	27	28	20,000	29	29	29	30	31	32	32
34	35	36	38	40	42	43	24,000	42	43	44	46	47	49	49
48	49	51	55	58	62	62	28,000	59	60	62	66	68	71	72
63	65	70	76	82	88	88	32,000	80	81	85	91	96	100	102
80	83	93	103	115	124	127	36,000	104	106	114	123	133	140	143
98	104	120	142	164	180	185	40,000	132	137	151	169	187	201	206
LATITUDE 60°								LATITUDE 70°						
1	1	1	1	1	1	1	4,000	1	1	1	1	1	1	1
5	5	5	5	5	5	5	8,000	5	5	5	5	5	5	5
11	11	11	11	11	11	11	12,000	12	12	12	12	12	12	12
20	20	21	21	21	21	21	16,000	22	22	22	23	23	23	23
33	33	34	34	35	35	35	20,000	36	36	36	37	38	38	38
49	49	51	51	53	54	54	24,000	54	55	55	56	57	58	58
69	70	72	74	76	78	79	28,000	77	78	79	80	82	83	84
94	95	98	103	106	109	111	32,000	105	106	108	111	114	116	117
125	126	132	139	147	152	155	36,000	141	142	146	151	156	160	162
163	166	177	191	205	216	219	40,000	188	190	198	207	217	224	227
180	150	120	90	60	30	0		180	150	120	90	60	30	0
180	210	240	270	300	330	360		180	210	240	270	300	330	360
True target bearing, degrees								True target bearing, degrees						

*Deflections to the right are positive. Deflections to the left are negative. Deflections are tabulated for north latitude, for south latitude use opposite sign. For north latitude use bearing at top of table. For south latitude use bearing at bottom of table.

N.P.G. Photo No. 24081

TENTATIVE EROSION DATA
16/50 CALIBER GUNS MARK 7
SERVICE CHARGE FOR 2700 LB PROJECTILE-2690 F/S
1900 LB HC PROJECTILES
VELOCITY LOSS vs ENLARGEMENT AT ORIGIN

U.S. NAVAL PROVING GROUND
DAHLGREN, VA
MARCH, 1944

INDIVIDUAL INDEX CORRECTION

CERTAIN INDEXES OF POWDER NEED CORRECTION TO BRING THEM TO THE STANDARD USED IN CONSTRUCTION OF THIS CURVE. TO OBTAIN VELOCITY LOSS FOR ANY SPECIFIC INDEX ADD CORRECTION LISTED BELOW TO VELOCITY LOSS GIVEN BY CURVE. [FOR EXAMPLE: GIVEN INDEX 5377 AND A GUN WITH BORE ENLARGEMENT OF 200 THE CORRECT VELOCITY LOSS WILL BE 72+3+75 F/S]

POWDER INDEX	CORRECTION
5237 (CHARGE WT. 660 LBS.)	-75 F/S
5237 (CHARGE WT. 660 LBS.)	-10 F/S
[illegible]	-10 F/S
5377 & 5914	+3 F/S
ALL OTHERS	0

$\Delta V = 605 \Delta Q - 49$

VELOCITY LOSS F/S

BORE ENLARGEMENT AT ORIGIN IN INCHES

SUBMITTED:
[signature] CAPTAIN, U.S.N.
ORDNANCE OFFICER

APPROVED:
[signature] CAPTAIN, U.S.N.
COMMANDING OFFICER

N.P.G. Photo No. 24083

TENTATIVE WEAR CURVE
16/50 CALIBER GUNS MARK 7
BORE ENLARGEMENT AT ORIGIN
VS.
EQUIVALENT SERVICE ROUNDS

BORE ENLARGEMENT AT ORIGIN IN INCHES

460 440 420 400 380 360 340 320 300 280 260 240 220 200 180 160 140 120 100 080 060 040 020

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350

EQUIVALENT SERVICE ROUNDS

RECOMMENDED PROCEDURE:

I ENTER WITH BORE ENLARGEMENT AT ORIGIN OBTAINED ON LAST STARGAUGING OF GUN AND FIND THE CORRESPONDING PSEUDO-E.S.R.

II ADD NUMBER OF E.S.R. FIRED SINCE STARGAUGING TO THIS PSEUDO-E.S.R.

III ENTER CURVE WITH THIS SUM AND GET ESTIMATED PRESENT BORE ENLARGEMENT AT ORIGIN.

IV ENTER PROPER EROSION DATA CURVE WITH THIS BORE ENLARGEMENT AND OBTAIN ALLOWED VELOCITY LOSS.

NOTE:

THIS WEAR CURVE IS FOR AN AVERAGE GUN. ANY PARTICULAR GUN MAY DIFFER FROM IT CONSIDERABLY. THIS, HOWEVER, WILL NOT APPRECIABLY AFFECT THE ACCURACY OF VELOCITY LOSS DETERMINED BY THE ABOVE PROCEDURE.

U.S. NAVAL PROVING GROUND
DAHLGREN, VA
MARCH, 1944

SUBMITTED:
ORDNANCE OFFICER CAPTAIN, U.S.N.

APPROVED:
COMMANDING OFFICER CAPTAIN U.S.N.

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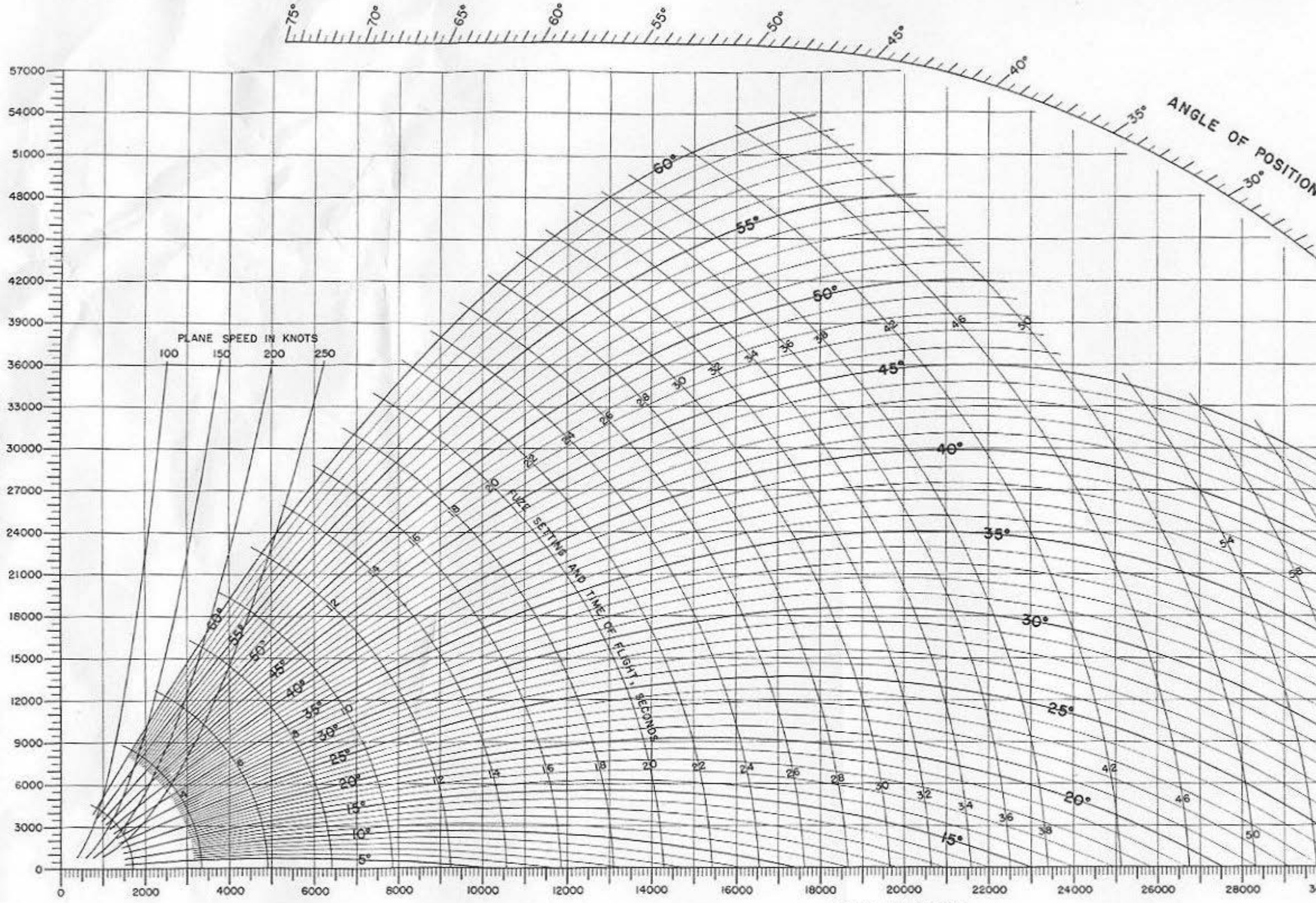

NOTES:

1. THESE TRAJECTORIES ARE APPLICABLE TO 16 INCH HIGH CAPACITY PROJECTILES MK.13, FITTED WITH MECHANICAL TIME FUZES, POINT DETONATING FUZES, OR NOSE PLUGS.

2. IN A NEW GUN WITH 90# POWDER THE INITIAL VELOCITY OF THE 1900 LB. HIGH CAPACITY PROJECTILE WHEN FIRED WITH SERVICE CHARGES FOR 2700 LB. PROJECTILES WILL BE 2690 F.S. THE TRAJECTORIES ARE COMPUTED FOR 2615 F.S., THE EXPECTED AVERAGE VELOCITY OVER THE LIFE OF THE GUN.

3. THE ANGLE IN DEGREES INDICATED ON THE TRAJECTORIES IS THE ELEVATION OF THE GUN WITH RESPECT TO THE HORIZONTAL PLANE. THE ANGLE OF JUMP WAS FOUND TO BE -9.7 MINUTES FROM THE NAVAL PROVING GROUND FIRINGS UPON WHICH THESE TRAJECTORIES ARE BASED; I.E. THE JUMP IS DOWNWARD. THIS WAS TAKEN INTO ACCOUNT IN COMPUTING THE TRAJECTORIES AND NO CORRECTIONS ARE NECESSARY.

4. THE CURVES FOR PLANE SPEEDS OF 100, 150, 200, AND 250 KNOTS ARE THE LOCI OF RELEASE POINTS FOR A 1000 LB. BOMB HAVING A BALLISTIC COEFFICIENT OF 2.75.

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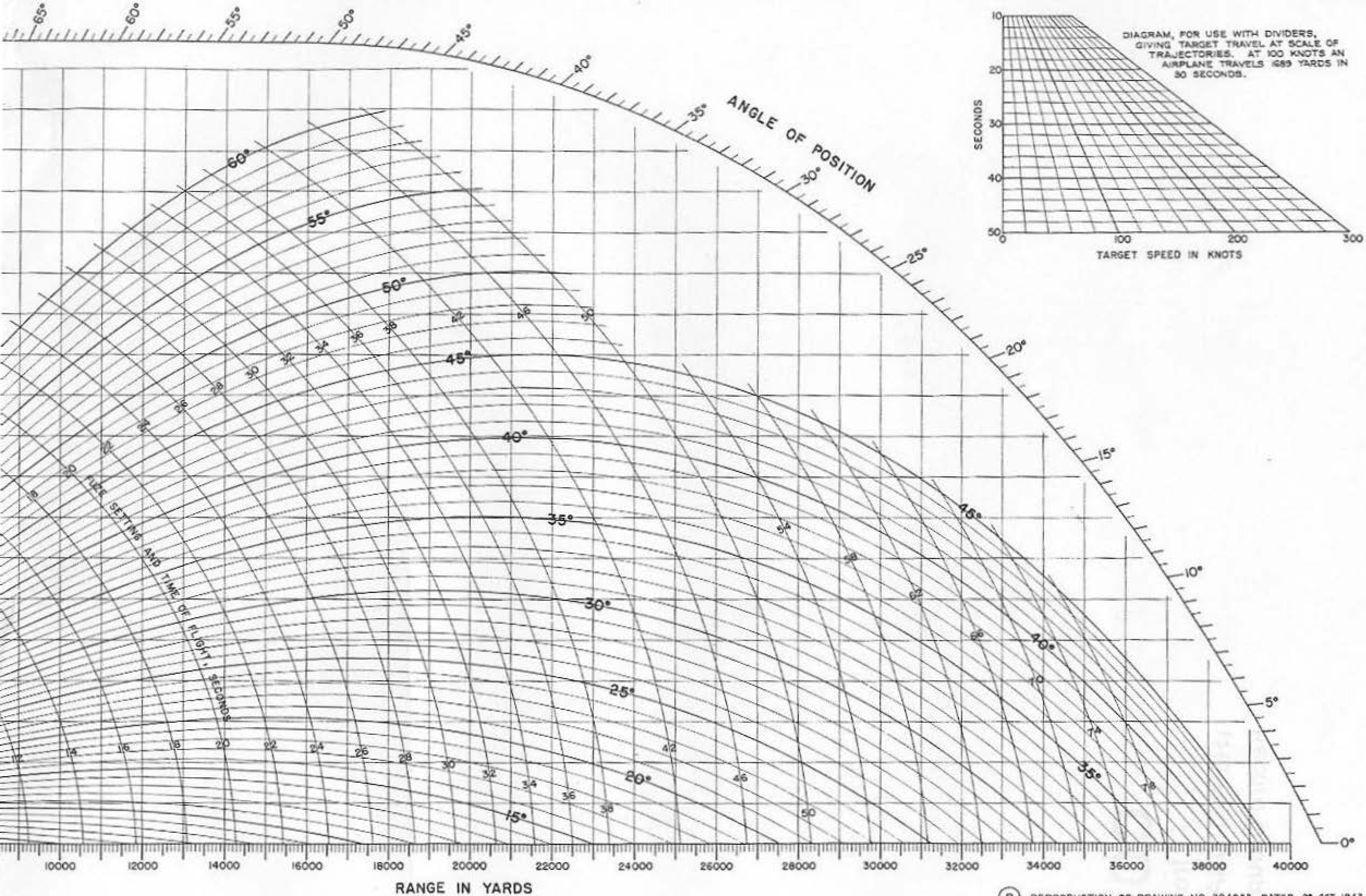

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4. THE CURVES FOR PLANE SPEEDS OF 100, 150, 200, AND 250 KNOTS ARE THE LOCI OF RELEASE POINTS FOR A 1000 LB. BOMB HAVING A BALLISTIC COEFFICIENT OF 2.75.

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16 IN. 50 CAL. GUN

TRAJECTORIES

I. V. = 2615 F. S.

1900 LB. H. C. PROJECTILE

NAVY DEPARTMENT
BUREAU OF ORDNANCE
WASHINGTON, D. C.
1 Dec. 1943

W. R. Moore
BY DIRECTION OF THE CHIEF OF BUREAU

CHECKED: J.W.G. | J.W.G.

1627

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