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U. S. NAVAL PROVING GROUND:
DAHLGREN, VIRGINIA
REPORT NO. 1070

JUN 7 1957

TEST AND DEVELOPMENT OF 3"/70 A.A. PROJECTILES
50th Partial Report

TEST AND DEVELOPMENT OF 3"/70 CALIBER GUN BARRELS
55th Partial Report

COMPARATIVE RANGING TEST OF 3"/70 A.A. PROJECTILES
TYPES EX 24 MOD 7, EX 24 MOD 9, EX 24 MOD 12 AND
MK 34 MOD 1, IN GUNS TYPE G MOD 7 AND 11

Task NPG-Re3b-210-1-52
Assignment NPG-Re5a-21-1-52

FINAL Report
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Comparative Ranging Tests of 3"/70 A.A. Projectiles
Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
Mk 34 Mod 1, in Guns Type G Mod 7 and 11

PART A

SYNOPSIS

1. This is a report of tests conducted for the purpose of investigating the comparative ranging performance of 3"/70 A.A. Projectiles Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and Mk 34 Mod 1, in Guns Type G Mod 7 Serial No. 26741 and Type G Mod 11 Serial No. 24930, and to substantiate the previous firings in the Type G Mod 7 Barrel Serial No. 24579.

2. The results of the tests indicate that:

a. When fired from the 3"/70 Caliber Type G Mod 7 Gun:

(1) The EX 24-9 projectiles gave better range performance than either the EX 24-12 or Mk 34-1 projectiles.

(2) The Mk 34-1 projectiles gave decidedly better range performance than the EX 24-12 projectiles.

b. When fired from the 3"/70 Caliber Type G Mod 11 Gun:

(1) The EX 24-9 projectiles gave better range performance than either the EX 24-7, EX 24-12 or Mk 34-1 projectiles.

(2) The Mk 34-1 projectiles gave decidedly better range performance than either the EX 24-7 or EX 24-12 projectiles.

(3) The British complete rounds assembled with Primer Groups No. 1 and No. 2 and with projectiles of similar design to the EX 24-9 projectiles gave range performance comparable to the EX 24-9 projectiles.

c. The EX 24-7 projectiles gave much better range performance in the worn Type G-7 Gun No. 24579 than in the new Type G-11 Gun No. 24930.

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Comparative Ranging Tests of 3"/70 A.A. Projectiles
 Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
 Mk 34 Mod 1, in Guns Type G Mod 7 and 11

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Comparative Ranging Tests of 3"/70 A.A. Projectiles
Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
Mk 34 Mod 1, in Guns Type G Mod 7 and 11

PART B

INTRODUCTION

1. AUTHORITY:

The tests described in this report were authorized by reference (a), modified by references (b), (c), (d) and (e), and by the authority of reference (f).

2. REFERENCES:

- a. BUORD Conf ltr Re5a-FBW:cmj NP9 Ser 32545 of 15 Jan 1952
- b. BUORD Conf ltr Re5a-FBW:cmj S74-1(3") Ser 33544 of 5 Feb 1952
- c. BUORD Conf ltr Re5a-FBW:cmj NP9 Ser 36937 of 28 Mar 1952
- d. BUORD Conf ltr Re5a-JW:svl S74-1(3") Ser 41265 of 19 Jun 1952
- e. BUORD Conf ltr Re5a-FBW:sf S74-1(3") Ser 41255 of 25 Jun 1952
- f. BUORD Conf ltr Re3b-MAS/MRH:mt S78-1(56-3") Ser 41202 of 24 Jun 1952
- g. NPG Report No. 942 of 7 May 1952
- h. NPG Report No. 1011 of 18 Aug 1952
- i. NAVPROV 3"/70 Ranging Data Sheet No. 137 of 12 Mar 1952
- j. NAVPROV 3"/70 Ranging Data Sheet No. 138 of 7 Apr 1952
- k. NAVPROV 3"/70 Ranging Data Sheet No. 139 of 3 Jun 1952
- l. NAVPROV 3"/70 Ranging Data Sheet No. 142 of 16 Jul 1952
- m. NAVPROV 3"/70 Ranging Data Sheet No. 143 of 5 Aug 1952

3. BACKGROUND:

a. Reference (g) reported in detail the initial programs of comparative ranging of 3"/70 A.A. Projectiles Types EX 24 Mods 7, 8, and 9 in new and worn guns Type G Mod 7. Reference (h) reported in detail additional comparative ranging tests which were intended to determine what design features were responsible for the superior range performance of the Projectile Type EX 24 Mod 9 compared to the Type EX 24 Mods 7 and 8 projectiles in new and worn Type G Mod 7 3"/70 caliber guns.

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Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
Mk 34 Mod 1, in Guns Type G Mod 7 and 11

b. Reference (a) modified by references (b), (c), (d) and (e) authorized comparative ranging tests using EX 24 Mod 7 projectiles to substantiate the previous firings in the Type G Mod 7 Barrel Serial No. 24579 and to conduct a ranging comparison test of 3"/70 A.A. Projectiles Type EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and Mk 34 Mod 1, in Guns Type G Mod 7 Serial No. 26741 and Type G Mod 11, Serial No. 24930.

4. OBJECT OF TEST:

a. The object of the comparative ranging programs described in this report was to establish a ranging comparison of 3"/70 A.A. Projectiles Type EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and Mk 34 Mod 1, in guns Type G Mod 7 Serial No. 26741 and Type G Mod 11 Serial No. 24930, and to substantiate the previous firings in the Type G Mod 7 Barrel Serial No. 24579.

5. PERIOD OF TEST:

a. Date Project Letter	15 Jan 1952
Dates Project Modification	5 Feb 1952
	28 Mar 1952
	19 Jun 1952
	25 Jun 1952
b. Date Commenced Test	12 Mar 1952
c. Test Completed	5 Aug 1952

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Comparative Ranging Tests of 3"/70 A.A. Projectiles
Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
Mk 34 Mod 1, in Guns Type G Mod 7 and 11

PART CDETAILS OF TEST

6. DESCRIPTION OF ITEMS UNDER TEST:

a. Projectiles:

<u>Type</u>	<u>Rear Band Metal</u>	<u>Rear Band Design</u>	<u>Front Band Metal</u>	<u>Front Band Design</u>	<u>Remarks</u>
EX 24-7	Gilding Metal	Figure 2 Appendix (B)	Gilding Metal	Figure 2 Appendix (B)	EX 24-7 Stand- ard Projectile.
EX 24-9	Copper	Figure 1 Appendix (B)	Steel	Figure 1 Appendix (B)	EX 24-9 Stand- ard Projectile.
EX 24-12	Gilding Metal	Figure 4 Appendix (B)	Gilding Metal	Figure 2 Appendix (B)	EX 24-7 Stand- ard Projectile with four (4) cannelures machined into the rear band and straight- ening of the slope on the large rear-band rib.
Mk 34 Mod 1	Gilding Metal	Figure 3 Appendix (B)	Gilding Metal	Figure 2 Appendix (B)	EX 24-7 Stand- ard Projectile with four (4) cannelures machined into the rear band.

Comparative Ranging Tests of 3"/70 A.A. Projectiles
Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
Mk 34 Mod 1, in Guns Type G Mod 7 and 11

7. DESCRIPTION OF TEST EQUIPMENT:

- a. Guns: 3"/70 Cal. Type G Mod 11 Serial No. 24930
Rifling - 1 turn in 20 calibers, Uniform Twist
Rounds before test: 37 actual rounds
37.65 ESR Δ Do 0!002
Rounds after test: 281 actual rounds
281.65 ESR Δ Do 0!003
- 3"/70 Cal. Type G Mod 7 Serial No. 26741
Rifling - 1 turn in 20 calibers, Uniform Twist
Rounds before test: 33 actual rounds
32.77 ESR Δ Do 0!003
Rounds after test: 108 actual rounds
107.77 ESR Δ Do 0!0055
- b. Charges: Cases: Steel, Experimental No. 5 for U.S. Rounds;
British Cases Lot 5 for British Primer
Group Nos. 1 and 2 (Table II, Appendix (A)).
- Primers: XC-M11 for U.S. Rounds; XC-M11 Modified
for British Primer Group No. 1 and Primer
No. 13 for British Primer Group No. 2
(Table II, Appendix (A)).
- Powder: 10.11 lbs. Powder Index HKPC-1 for Gun
Serial No. 24930, 9.95 lbs. Powder Index
HKPC-1 for Gun Serial No. 26741 on U.S.
Rounds, 10.00 lbs. 2 oz. 15 grams, Index
RNP-293 for British Rounds in Primer
Group Nos. 1 and 2 (Table II, Appendix (A)).
- c. Velocity Measuring
Devices: Standard oscillograph and chronograph
equipment.
- d. Pressure Gages: 1/30 sq. in. area copper crusher type.

Comparative Ranging Tests of 3"/70 A.A. Projectiles
Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
Mk 34 Mod 1, in Guns Type G Mod 7 and 11

8. PROCEDURE:

a. The following programs were fired in accordance with reference (a) modified by reference (b):

Date: 12 March 1952 - Elevation: 15 degrees

Gun: Type G Mod 11 No. 24930

<u>No.</u> <u>Rds.</u>	<u>Loading</u> <u>and Fuzing</u>	<u>Type Projectiles - fired in alternating five</u> <u>(5) round groups (Table I, Appendix (A))</u>
---------------------------	-------------------------------------	--

20	Salts and DNP 238911	Standard EX 24-7 (Figure 2, Appendix (B)).
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20	Salts and DNP 238911	Mk 34-1 Projectile like EX 24-7 with four (4) cannelures machined into the rear band (Figure 3, Appendix (B)). BUORD Dwg. 982549, No Revision, Mk 34 Mod 1.
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20	Salts and DNP 238911	Standard EX 24-9 (Figure 1, Appendix (B)).
----	-------------------------	--

Date: 7 April 1952 - Elevation: 15 degrees

Gun: Type G Mod 11 No. 24930

<u>No.</u> <u>Rds.</u>	<u>Loading</u> <u>and Fuzing</u>	<u>Type Projectiles - fired in five (5) round</u> <u>groups (Table II, Appendix (A))</u>
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40	Salts and DNP 238911	Mk 34-1 Projectile like EX 24-7 with four (4) cannelures machined into the rear band (Figure 3, Appendix (B)). BUORD Dwg. 982549, No Revision, Mk 34 Mod 1.
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5		British assembled Primer Group No. 1.
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5		British assembled Primer Group No. 2.
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Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
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b. Reference (c) modified the comparative ranging tests authorized by reference (a) modified by reference (b) to substitute EX 24 Mod 12 projectiles, Bureau of Ordnance Sketch 329480, (Figure 4, Appendix (B)) for the unmodified EX 24-7 projectiles (Figure 2, Appendix (B)) throughout the remainder of the comparative ranging tests. The following program was fired in accordance with reference (c):

Date: 3 June 1952 - Elevation: 15 degrees

Gun: Type G Mod 11 No. 24930

No. Rds.	Loading and Fuzing	Type Projectiles - fired in five (5) round groups (Table III, Appendix (A))
40	Salts and DNP 238911	EX 24-12 Projectile like EX 24-7 with four (4) cannellures machined into the rear band and straightening of the slope on the large rear band rib, BUORD Sketch 329480 (Figure 4, Appendix (B)).
5	Salts and DNP 239269	

c. References (e) and (f) further modified the comparative ranging tests authorized by reference (a) modified by references (b), (c) and (d) in order that the relatively larger dispersions obtained on 3 June 1952 (Table III, Appendix (A)) using Projectiles Type Ex 24-12 Bureau of Ordnance Sketch 329480 (Figure 4, Appendix (B)), compared to the lower dispersions obtained on 7 April 1952 (Table II, Appendix (A)), using Projectile Mk 34-1 Bureau of Ordnance Dwg. 982549, No Revision, (Mk 34 Mod 1) (Figure 3, Appendix (B)) might be clarified. The following programs were fired in accordance with references (e) and (f):

Comparative Ranging Tests of 3"/70 A.A. Projectiles
Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
Mk 34 Mod 1, in Guns Type G Mod 7 and 11

Date: 16 July 1952 - Elevation: 15 degrees

Gun: Type G Mod 11 No. 24930

<u>No.</u>	<u>Loading</u>	<u>Type Projectiles - fired in alternating five</u>
<u>Rds.</u>	<u>and Fuzing</u>	<u>(5) round groups (Table IV, Appendix (A))</u>
25	Salts and DNP 238911	EX 24-9 Standard (Figure 1, Appendix (B)).
25	Salts and DNP 238911	EX 24-12 Projectile like EX 24-7 with four (4) cannelures machined into the rear band and straightening of the slope on the large rear band rib, BUORD Sketch 329480 (Figure 2, Appendix (B)).
25	Salts and DNP 238911	Mk 34-1 Projectile like EX 24-7 with four (4) cannelures machined into the rear band. BUORD Dwg. 982549, No Revision, Mk 34 Mod 1. (Figure 3, Appendix (B)).

Date: 5 August 1952 - Elevation: 15 degrees

Gun: Type G Mod 7 No. 26741

<u>No.</u>	<u>Loading</u>	<u>Type Projectiles - fired in alternating five</u>
<u>Rds.</u>	<u>and Fuzing</u>	<u>(5) round groups (Table V, Appendix (A))</u>
25	Salts and DNP 238911	EX 24-9 Standard (Figure 1, Appendix (B)).
25	Salts and DNP 238911	Mk 34-1 Projectile like EX 24-7 with four (4) cannelures machined into the rear band. BUORD Dwg. 982549, No Revision, Mk 34 Mod 1. (Figure 3, Appendix (B)).
25	Salts and DNP 238911	EX 24-12 Projectile like EX 24-7 with four (4) cannelures machined into the rear band and straightening of the slope on the large rear band rib, BUORD Sketch 329480 (Figure 4, Appendix (B)).

Comparative Ranging Tests of 3"/70 A.A. Projectiles
 Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
 Mk 34 Mod 1, in Guns Type G Mod 7 and 11

9. RESULTS:

a. The following table indicates the mean corrected range dispersions (D/R) for five (5) round groups of each projectile type for the five (5) comparative ranging programs conducted in accordance with reference (a) modified by references (b), (c), (d), (e), and in accordance with reference (f). Detailed results were reported by references (i) to (m) inclusive, summaries of which are included as Appendix (A), Tables I through V respectively.

<u>Program</u>	<u>Projectile Type (Type letter corresponding to type letters in Tables - Appendix (A))</u>	<u>Gun</u>	<u>Five (5) Round Groups</u>	<u>D/R (%)</u>
1	EX 24-7 (Type A Table I)	Type G-11	4	1.81
	Mk 34-1 (Type B Table I)	24930	4	0.80
	EX 24-9 (Type C Table I)	"	4	0.42
2	Mk 34-1 (Type A Table II)	Type G-11	8	0.49
	British Assembled Primer Group #1 (Type B Table II)	24930	1	0.35
	British Assembled Primer Group #2 (Type C Table II)	"	1	0.34
3	EX 24-12 (Type A Table III)	Type G-11	8	0.96
	EX 24-12 (Type B Table III) (Short Nose Plug)	24930	1	1.18
4	EX 24-9 (Type A Table IV)	Type G-11	5	0.44
	EX 24-12 (Type B Table IV)	24930	5	0.81
	Mk 34-1 (Type C Table IV)	"	5	0.54
5	EX 24-9 (Type A Table V)	Type G-7	5	0.35
	Mk 34-1 (Type B Table V)	26741	5	0.57
	EX 24-12 (Type C Table V)	"	5	1.16

Comparative Ranging Tests of 3"/70 A.A. Projectiles
Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
Mk 34 Mod 1, in Guns Type G Mod 7 and 11

PART D

CONCLUSIONS

10. As a result of the tests conducted it is concluded that:

a. When fired from the 3"/70 Caliber Type G Mod 7 Gun:

(1) The EX 24-9 projectiles gave better range performance than either the EX 24-12 or Mk 34-1 projectiles.

(2) The Mk 34-1 projectiles gave decidedly better range performance than the EX 24-12 projectiles.

b. When fired from the 3"/70 Caliber Type G Mod 11 Gun:

(1) The EX 24-9 projectiles gave better range performance than either the EX 24-7, EX 24-12 or Mk 34-1 projectiles.

(2) The Mk 34-1 projectiles gave decidedly better range performance than either the EX 24-7 or EX 24-12 projectiles.

(3) The British complete rounds assembled with Primer Groups No. 1 and No. 2 and with projectiles of similar design to the EX 24-9 projectiles gave range performance comparable to the EX 24-9 projectiles.

c. The EX 24-7 projectiles gave much better range performance in the worn Type G-7 Gun No. 24579 than in the new Type G-11 Gun No. 24930.

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Comparative Ranging Tests of 3"/70 A.A. Projectiles
Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
Mk 34 Mod 1, in Guns Type G Mod 7 and 11

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U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

Fiftieth Partial Report

on

Test and Development of 3"/70 A.A. Projectiles

Fifty-Fifth Partial Report

on

Test and Development of 3"/70 Caliber Gun Barrels

Final Report

on

Comparative Ranging Tests of 3"/70 A.A. Projectiles

Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and

Mk 34 Mod 1, in Guns Type G Mod 7 and 11

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Comparative Ranging Tests of 3"/70 A.A. Projectiles Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12, and Mk 34 Mod 1, in Guns Type G Mod 7 and 11

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TABLE I

Summary of Results of Comparative Ranging of 3"/70 A.A. Projectiles Mk 34 Mod 1, Compared with Standard Type EX 24 Mod 7, and EX 24 Mod 9 Projectiles, Reported in Detail on NPG Ranging Data Sheet No. 137 of 12 March 1952

Elevation: 15 degrees
 Propellant: 10.11 lbs. Powder Index HKPC-1
 Projectile Epsom Salts
 Loading: DNP 238911
 Nose: DNP 238911

Gun Data: 3"/70 Caliber Type G Mod 11 Serial No. 24930
 Rifling - 1 turn in 20 calibers, Uniform Twist
 Rounds before test: 37 actual rounds
 37.65 ESR
 Δ Do at 37.65 ESR; 0"002

Projectile Type: A - Standard EX 24-7 (Figure 2, Appendix (B)).
 B - Mk 34 Mod 1 (Figure 3, Appendix (B)).
 (BUORD DWG. No. 932549, No Revision, Mk 34 Mod 1).
 C - Standard EX 24-9 (Figure 1, Appendix (B)).

Rds. Fired	Rds. Ranged	Rd. Nos. in Program	Projectile Type	Muzzle Velocity (ft./sec.)	Uncorrected Range (yds.)	Uncorrected Drift (yds.)	Corrected Range (yds.)	Uncorrected D/R (%)	Corrected D/R (%)
5	5	3-7	A	3406±12	13534±273	161±11	13719±218	2.02	1.59
5	5	8-12	B	3411±8	14046±35	142±15	14209±30	0.25	0.21
5	5	13-17	C	3380±14	14027±74	174±11	14328±26	0.53	0.18
5	5	18-22	A	3432±18	13542±351	189±50	13616±306	2.59	2.25
5	5	23-27	B	3433±12	14217±187	192±23	14287±163	1.32	1.14
5	5	28-32	C	3384±8	14096±98	217±29	14378±80	0.70	0.56
5	4	34-37	A	3437±6	13563±224	179±14	13614±208	1.65	1.53
5	5	38-42	B	3422±10	14241±131	179±28	14359±97	0.92	0.68
5	5	43-47	C	3406±9	14211±62	189±8	14398±45	0.44	0.31
5	5	48-52	A	3443±12	13889±193	162±11	13913±200	1.39	1.44
5	5	53-57	B	3447±26	14370±106	149±7	14376±85	0.74	0.59
5	5	58-62	C	3399±20	14113±59	170±10	14328±57	0.42	0.40

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APPENDIX A

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Comparative Ranging Tests of 3"/70 A.A. Projectiles Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12, and Mk 34 Mod 1, in Guns Type G Mod 7 and 11

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TABLE II

Summary of Results of Comparative Ranging of 3"/70 A.A. Projectiles Mk 34 Mod 1, Compared with British Assembled Rounds, Primer Group Nos. 1 and 2, Reported in Detail on NPG Ranging Data Sheet No. 138 of 7 April 1952

Elevation: 15 degrees
 Propellant: 10.11 lbs. Index HKPC-1 for Mk 34 Mod 1
 10.00 lbs. 2 oz. Index FNP-293 for British Rounds
 Primer Group Nos. 1 and 2

Gun Data: 3"/70 Caliber Type G Mod 11 Serial No. 24930
 Rifling - 1 turn in 20 calibers, Uniform Twist
 Rounds before test: 99 actual rounds
 99.65 ESR

Projectile Loading: Epsom Salts for Mk 34 Mod 1
 Nose: DNP 238911 for Mk 34 Mod 1

△ Do at 99.65 ESR; 0%003

Projectile Type: A - Mk 34 Mod 1 (Figure 3, Appendix (B))(BUORD DWG. 982549,
 No Revision, Mk 34 Mod 1)
 B - British Assembled Round - Primer Group No. 1.
 C - British Assembled Round - Primer Group No. 2.

Rds. Fired	Rds. Ranged	Rd. Nos. in Program	Projectile Type	Muzzle Velocity (ft./sec.)	Uncorrected Range (yds.)	Uncorrected Drift (yds.)	Corrected Range (yds.)	Uncorrected D/R (%)	Corrected D/R (%)
5	5	2-6	A	3435±19	14142±114	121±10	14547±58	0.61	0.40
5	5	7-11	A	3432±15	14071±184	123±9	14289±130	1.31	0.91
5	5	12-16	A	3427±7	14169±57	135±10	14207±18	0.40	0.33
5	5	17-21	A	3442±19	14146±60	130±19	14418±79	0.42	0.55
5	5	22-26	B	3404±5	13914±50	92±10	14253±50	0.36	0.35
5	5	27-31	C	3405±2	13899±42	93±10	14233±48	0.30	0.34
5	5	32-36	A	3442±9	14178±48	123±14	14349±17	0.34	0.12
5	5	37-41	A	3439±21	14098±146	129±18	14284±56	1.04	0.39
5	5	42-46	A	3446±10	14140±89	114±14	14296±83	0.63	0.58
5	5	47-51	A	3434±16	14124±61	107±11	14333±38	0.43	0.27

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TABLE III

Summary of Results of Comparative Ranging of 3"/70 A.A. Projectiles Type EX 24 Mod 12, Compared with Type EX 24 Mod 12 Having Short Nose Plugs, Reported in Detail on NPG Ranging Data Sheet No. 139 of 3 June 1952

Elevation: 15 degrees
 Propellant: 10.11 lbs. Powder Index HKPC-1
 Projectile
 Loading: Epsom Salts
 Nose: DNP 238911
 DNP 239269 (short)

Gun Data: 3"/70 Caliber Type G Mod 11 Serial No. 24930
 Rifling - 1 turn in 20 calibers, Uniform Twist
 Rounds before test: 160 actual rounds
 160.65 ESR
 Δ Do at 157.65 ESR; 0.0003

Projectile Type: A - EX 24-12 (BUORD Sketch 329480) (Figure 4, Appendix (B))
 B - EX 24-12 (BUORD Sketch 329480) (Figure 4, Appendix (B)) using Short Nose Plug #239269.

Rds. Fired	Rds. Ranged	Rd. in Program	Projectile Type	Muzzle Velocity (ft./sec.)	Uncorrected Range (yds.)	Uncorrected Drift (yds.)	Corrected Range (yds.)	Uncorrected D/R (%)	Corrected D/R (%)
5	5	2-6	A	3439±6	14315±93	104±15	14109±115	0.65	0.82
5	5	7-11	A	3438±14	14090±179	91±7	13892±170	1.27	1.22
5	5	12-16	A	3453±2	14374±61	79±8	14110±52	0.42	0.37
5	5	17-21	A	3447±17	14168±137	70±9	13934±149	0.97	1.07
5	5	22-26	B	3426±17	8431±46	103±14	8292±98	0.55	1.18
5	5	27-31	A	3471±9	14443±119	66±14	14100±119	0.82	0.84
5	5	32-36	A	3479±17	14513±74	69±13	14135±50	0.51	0.21
5	5	37-41	A	3454±10	14361±143	71±11	14088±182	1.00	1.29
5	5	42-46	A	3458±14	14266±124	45±15	13974±116	0.87	0.83

NOTE: Projectile Type EX 24 Mod 12 (BUORD Sketch 329480) was formerly designated Mk 34-1 (Modified) BUORD Design Study Re3b-18-March-52.

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Comparative Ranging Tests of 3"/70 A.A. Projectiles Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12, and Mk 34 Mod 1, in Guns Type G Mod 7 and 11

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TABLE IV

Summary of Results of Comparative Ranging of 3"/70 A.A. Projectiles Type EX 24 Mod 9, Compared to EX 24 Mod 12 and Mk 34 Mod 1 3"/70 A.A. Projectiles, Reported in Detail on NPG Ranging Data Sheet No. 142 of 16 July 1952

Elevation: 15 degrees
Propellant: 10.11 lbs. Powder Index HKPC-1
Projectile
Loading: Epsom Salts
Nose: DNF 238911

Gun Data: 3"/70 Caliber Type G Mod 11 Serial No. 24930
Rifling - 1 turn in 20 calibers, Uniform Twist
Rounds before test: 206 actual rounds
206.65 ESR

△ Do at 0.003 ESR: 157.65

Projectile Type: A - Standard EX 24-9 (Figure 1, Appendix (B)).
B - EX 24-12 (BUORD Sketch 329480)(Figure 4, Appendix (B)).
C - Mk 34 Mod 1 (BUORD DWG. 982549, No Revision, Mk 34 Mod 1) (Figure 3, Appendix (B)).

Rds. Fired	Rds. Ranged	Rd. Nos. in Program	Projectile Type	Muzzle Velocity (ft./sec.)	Pressure	Uncorrected Range (yds.)	Uncorrected Drift (yds.)	Corrected Range (yds.)	Uncorrected D/R (%)	Corrected D/R (%)
5	5	1-5	A	3419±8	21.4±.3	14475±57	82±10	14163±47	0.39	0.33
5	5	6-10	B	3449±5	21.5±.4	14580±62	55±8	14118±54	0.43	0.38
5	5	11-15	C	3488±23	22.3±.5	14789±107	56±11	14157±104	0.72	0.73
5	5	16-20	A	3441±12		14498±87	66±14	14076±82	0.60	0.58
5	5	21-25	B	3472±14		14526±185	50±9	13967±162	1.27	1.16
5	5	26-30	C	3482±20		14736±70	59±26	14129±64	0.48	0.45
5	5	31-35	A	3438±8		14491±20	81±7	14081±47	0.14	0.33
5	5	36-40	B	3478±28		14597±144	63±11	14007±143	0.99	1.02
5	5	41-45	C	3480±20		14702±136	55±20	14108±72	0.93	0.51
5	5	46-50	A	3422±12		14482±59	84±9	14148±57	0.41	0.40
5	5	51-55	B	3471±14		14666±32	52±10	14115±71	0.22	0.50
5	5	56-60	C	3475±11		14714±106	81±11	14141±66	0.72	0.47
5	5	61-65	A	3417±15	20.7±.5	14462±97	74±6	14152±58	0.67	0.41
5	5	66-70	B	3478±11	21.9±.8	14626±91	60±14	14034±96	0.62	0.68
5	5	71-75	C	3462±6	21.6±.3	14623±90	87±14	14106±81	0.62	0.57

NOTE: Projectile Type EX 24 Mod 12 (BUORD Sketch 329480) was formerly designated Mk 34-1 (Modified) BUORD Design Study Re3b-18-March-52.

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Comparative Ranging Tests of 3"/70 A.A. Projectiles Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12, and Mk 34 Mod 1, in Guns Type G Mod 7 and 11

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TABLE V

Summary of Results of Comparative Ranging of 3"/70 A.A. Projectiles Type EX 24 Mod 9, Compared to EX 24 Mod 12, and Mk 34 Mod 1, 3"/70 A.A. Projectiles, Reported in Detail on NPG Ranging Data Sheet No. 143 of 5 August 1952

Elevation: 15 degrees
 Propellant: 9.95 lbs. Powder Index HKP0-1
 Projectile Loading: Epsom Salts
 Nose: DNP 238911

Gun Data: 3"/70 Caliber Type G Mod 7 Serial No. 26741
 Rifling - 1 turn in 20 calibers, Uniform Twist
 Rounds before test: 33 actual rounds
 32.77 ESR
 Δ Do at 16.77 ESR; 0.0003

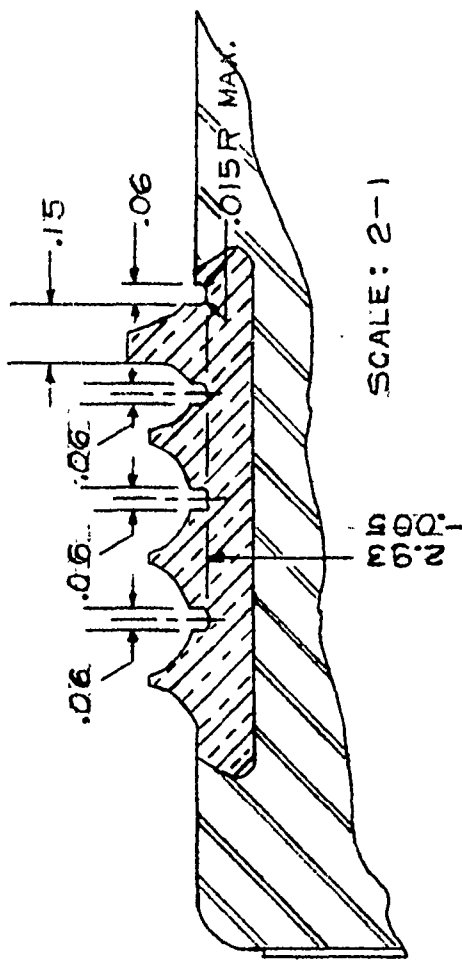
Projectile Type: A - Standard EX 24-9 (Figure 1, Appendix (B)).
 B - Mk 34 Mod 1 (BUORD DWG. 982549, No Revision, Mk 34 Mod 1) (Figure 3, Appendix (B)).
 C - EX 24-12 (BUORD Sketch 329480) (Figure 4, Appendix (B)).

Rds. Fired	Rds. Ranged	Rd. Nos. in Program	Projectile Type	Muzzle Velocity (ft./sec.)	Pres-sure	Uncorrected Range (yds.)	Uncorrected Drift (yds.)	Corrected Range (yds.)	Uncorrected D/R (%)	Corrected D/R (%)
5	5	2-6	A	3358±16	20.2±.7	14245±74	8±14	14160±13	0.52	0.09
5	5	7-11	B	3411±21	21.6±.6	14488±111	23±11	14175±119	0.77	0.84
5	4	12-16	C	3416±7	21.6±.2	13998±70	21±20	13658±96	0.50	0.70
5	5	17-21	A	3362±13		14352±61	18±10	14250±16	0.43	0.11
5	5	22-26	B	3409±17		14420±94	52±7	14112±56	0.65	0.40
5	5	27-31	C	3413±9		14071±114	22±12	13751±141	0.81	1.03
5	5	32-36	A	3369±19		14314±66	26±20	14184±63	0.46	0.44
5	5	37-41	B	3413±9		14562±57	46±13	14241±37	0.39	0.26
5	5	42-46	C	3404±9		14073±163	22±18	13786±197	1.16	1.43
5	5	47-51	A	3355±16		14275±77	44±10	14214±45	0.54	0.32
5	5	52-56	B	3414±6		14482±78	49±4	14155±93	0.54	0.66
5	5	57-61	C	3421±21		13968±110	8±10	13612±181	0.79	1.33
5	5	62-66	A	3377±8	20.0±.4	14360±58	35±12	14196±48	0.40	0.34
5	5	67-71	B	3409±8	20.3±.5	14500±66	34±2	14193±48	0.46	0.34
5	5	72-76	C	3418±9	20.8±.6	14230±105	-11±15	13891±110	0.74	0.79

NOTE: Projectile Type EX 24 Mod 12 (BUORD Sketch 329480) was formerly designated Mk 34-1 (Modified) BUORD Design Study Re3b-18-March-52.

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3/70 AA PROJECTILE TYPE EX.24 MOD.7
 REAR BAND WITH CANNELURES

REF.: BUORD DWG. NO. 982349 NO. REV.
 3/70 PROJECTILE (A.A) MK. 34 MOD.1

DWG. NO.
 APL-370

6-24-52 CURTIS

FIGURE 8

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Comparative Ranging Tests of 3"/70 A.A. Projectiles
Types EX 24 Mod 7, EX 24 Mod 9, EX 24 Mod 12 and
Mk 34 Mod 1, in Guns Type G Mod 7 and 11

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