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Aberdeen Proving Ground
MARYLAND REFERENCE COPY
CODE SHEET INCLUDED

CARTRIDGE, HEAT, 57MM, M307Al (MOD)

WITH MODIFIED COPPER LIMERS (U)

77 09 ... 574.72 ... PAGES

D.A. Project No. 504-07-001

DEVELOPMENT AND PROOF SERVICES

OCC Project No. TA3-520

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AUTHORITY: ORD PF-TJ1, 471.5/6-91 AFG (C) 471/307 Culterineer raj 26 September 1957

CARTRIDGE, HEAT, 5704, M307A1 (MCC)

WITH MODIFIED OCFFER LINERS (U)

FIRST REFORT ON ORDINANCE OURFS PROJECT NO. 743-5204

DATES OF TEST: 26 FEFRUARY 1957 TO 12 JUNE 1957

AISTRACT

CHECTIVE

This test was designed to obtain information concerning 57mm, spin-compensated HEAT ammunition.

SUMMARY

Shells th fluted conical liners were tested for dynamic penetration of armor plate.

The multi-piece modified shells were tested at excess pressure for metal parts security.

Shells were fired with inert boosters to check fuze functioning.

CONCLUSIONS

Substantial improvement in penetration was obtained with fluted liners as compared to known performance of smooth liners.

Observations from this test indicate that the modified M307Al projectiles can withstand excess pressure conditions.

Results indicate that the M90Al fuze was functioning properly and was not bypassing the booster in initiating the Composition B bursting charge.

RECOMMENDATIONS

Development and testing of fluted liners to counteract undesirable rotational effects associated with spin-stabilized rounds should be continued.

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INTRODUCTION			•			,			•		٠	•				0	9	•	۰		٠		•	0		3	
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CONCLUSIONS				•	٠	•	•	•	•	•	•	•	•	•	•		•	•	•	٠	•	•			•	7	
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REFERENCES .		L	•	٠	0	•	•	•	•	•	•	•	•	•	•	•	٠	٠		•	•		•	•	•	8	
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APPENDIX A:	Firi	ng	Re	130	್	N	0.	P	4	26	47	L			•	•	•	•		•	•	•	•	•		A-1	
APPENDIX B:	APG	Fh	oto	gr	ap	he	B	-2	38	30	1	h	ru	B-	-23	8	ध	•	•		•	•	•	•	•	B-1	
APPENDIX C:	Ammu	mi	tic	n	Da	ta	C	er	de		•	•	•	•	•	•	•	•	•	•	÷	•	•	•	•	C-1	
APPENDIX D:	Draw	day	gs	75	-1	-2	15		nd	I	- (368	35()	•		•	•	•	•		•	•	•	٠	2-1	
APPENDIX E:	Corr	75	por	ide	nc		٠	•	•	•	•	•		•	•	6	•	•		٠	•	•		•	•	B-1	
APPENDIK F:	List	wi)	but	de	n	•				٠	0			•				•	•	٠		•	•		•	F-1	

•

I DECEMBER OF

- A. The primary objective of this test use to obtain information from dynamic tests of modified 57mm, HMT assemblation, and, by comparing it with existing data for the standard 51mm HMT round, to determine the effectiveness of the fluted liner in compensating for the rotational effect on penetration.
- B. In Phase One of this program the M307Al Mod.) projectiles, containing fluted liners made by the rubber-covered-punch process, were fired against homogeneous armor plate to determine the penetration characteristics of the round.
- C. In Phase Two the modified 1307Al projectiles were subjected to excess pressure conditions to determine if the new design was of adequate strength. The standard 1307Al projectile had a one-piece body. The body of the modified projectile was made from two pieces joined together by a screw thread.
- D. The third and final phase of this program was to determine if the M9CAl Fuse would initiate the main charge of Composition B if an inert booster was used.

II DESCRIPTION OF MATERIEL

- A. Cartridge, HEAT, 57mm, M307Al (Mod) with PHX booster pellet and live auxiliary detorator, 180 each, Lot PA-E-24034. (Reference Appendix D, Dwg. 75-1-215; Appendix C, Data Card No. 83539.)
- B. Cartridge, HEAT, 57mm, M307Al (Mod) with FEX booster pellet and a dummy auxiliary detonator, 100 each, Lot PA-B-24077. (Reference Appendix D, Dwg. 75-1-215; Appendix C, Data Card No. 83542.)
- C. Cartridge, HEAT, 57mm, M307Al with inert booster pellet, 25 each, Lot PA-E-24035.
- D. Cartridges from Lots PA-E-24034 and 24035 were received as complete rounds and X-Rayed by this proving ground to determine quality of loading. Assumition data oards for these lots are inclosed in Appendix C.
- E. Cartridges from Lot FA-E-24037 were received as complete rounds less propellant and were loaded at this proving ground with enough propellant to reach 7280 psi (112% of rated maximum pressure), at a temperature of: +125°F.

COMFIDENT AL

III BAIL O THE

A. PROCEDURE FOR PHASE I

Phase I of this test consisted of firing 180 rounds, Lot RA-S-24034, as follows:

- 1. Forty-five cartridges were conditioned to $70^{\circ} \pm 5^{\circ}$ F. for a minimum of 16 hours. These rounds were fixed against 4-inch homogeneous armor plate with a one-inch witness plate six inches behind the target.
- 2. Forty-five cartridges were conditioned to $70^{\circ} \pm 5^{\circ}$ F. for a minimum of 16 hours. These rounds were fired against five-inch homogeneous armor plate with a one-inch witness plate five inches behind the target.
- 3. Forty-five cartridges were conditioned to $-65^{\circ} \pm 5^{\circ}$ F. for a minimum of 16 hours. However, due to poor ignition of the propellant at a temperature of -65° F, the conditioning temperature was changed to -40° F after 21 rounds had been fixed. These rounds were fixed against four-inch homogeneous armor plate with a one-inch witness plate six inches behind the target.
- 4. Forty-five cartridges were conditioned to $-40^{\circ} \pm 5^{\circ}$ F. for a minimum of 16 hours. These rounds were fired against five-inch homogeneous armor plate with a one-inch witness plate five inches behind the target. The rounds were observed for premature functioning and the depth of penetration was recorded. Any round which impacted three-hole diameters from the edge of the plate or another impact was considered as an unfair hit.

B. RESULTS FOR PHASE I

- 1. Table I is a summary of firing of Phase I of this test.
- No. P-62641, Appendix A of this report.
- 3. Aberdeen Proving Ground photographs, Nos. B-23808 to B-23819, which show the entrance and exit views of penetrations of the target and witness plate, are inclosed in Appendix B.

COMPONIAL

THE !

SUMMERY OF FIREING

FIRING RP JRD RANGE NO. P-62641 CUN TO TARGE	B T D T: 150 ft.	DATES OF TE	26, 27, and 7 M	28 Feb arch 1957
	AMBURITION AT 70°T.	5º PLATE AMEDITATION 1T 10°T.	AMEDITION AT * -65°T AND -40°T	5° PLATE AMEDICATION AT -40°7
Total No. of Rounds	45	45	45	45
Failure to Function	4	4	2	2
Improper Ignition of Prop.		_	3	. agrantigate
Rounds Contted (Unfair Hits)	1	4	encoding to	1
Total No. of Valia Rounds	40	37	40	42
Total Rounds Penetrating:				
4º Plate	28	Name of Street	28	-
5" Plate	-	12		23
1º Witnes Plate	n	2	3	23 8
Total No. of Penetrations				
greater than 3°	36	28	35	39
0				

**Rounds 1 - 21 conditioned at: -65°?.

Rounds 22- 45 conditioned at: -40°?.

Due to improper ignition of the propellant at -65°T, specifically rounds 277, 278, and 283, the conditioning temperature was changed to -40°T.

CUMPINGALIAL

G. PROCEDER FOR PRASE II

In Phase II of this test 100 rounts of Lot PA-E-21037 were fired under the following conditions:

- 1. Cartridge cases contained enough propellant to develop 7280 psi, 112% of maximum rated pressure, after the rounds had been conditioned to +125°F for a minimum of 40 hours.
- 2. These rounds were fired for land impact at a range of approximately 4000 yards and observed for evidence of functioning. (Failure of the metal parts would be expected to result in instability or premature functioning in the bore or at the muzzle.)

D. RESULTS FOR PHASE II

There was no evidence of instability or of premature functioning or functioning on ground impact.

E. PROCEDURE FOR FHASE III

- 1. In Phase III of this program 25 rounds, Lot PA-E-25035 were conditioned to $+70^{\circ}$ F and fired against five-inch homogeneous armor plate.
- 2. The rounds were fired to determine if the M9OAl Fuze would initiate the Composition B in an inert boostered shell.

F. RESULTS FOR PHASE III

- 1. No plate penetrations were obtained. Examination of the target area disclosed large quantities of Composition B, indicating that the projectiles were either breaking up or deflagrating on impact to varying degrees.
- 2. Many base plugs were recovered from the shells. The base plugs had holes in them caused by the auxiliary detonator. This verified that the jet formed by the nose element of the fuze was properly directed to the tooster rather than penetrating side of the spit-back tube or the cone proper. (Eccentricities in the auxiliary detonator were believed capable of yielding fuze failures.)

COMPRESENTAL

IN CONCLUBION

A. It is concluded that:

- 1. Results from this test show that the H307A1 projectile with the fluted liners made by the rubber-covered-punch process is especie of defeating 4 to 5 inches of homogeneous armor plate and is therefore superior to the standard homispherical liner which cannot be relied upon to consistently penetrate 3 inches of armor plate. (Inclesed in the reference is a list of reports which give the characteristics of the standard M30711 projectile with hemispherical liner.)
- 2. The modified M307Al projectile can withstand excess pressure conditions for the 57mm, MLB, Rifle.
- 3. The nose element of the M9OAl fese supplied with these projectiles was functioning properly.

V RECOMMENDATION

It is recommended that:

Development and testing of spin-compensating methods be continued to obtain a MEAT round which has optimum penetration characteristics.

SUBCITED:

CARS . BIONINGS

SP3 CROC

Project Engineer

O. MORROW Chief, Morter and

Recailless Rifle Branch

Artillery Division

APPROVED

Assistant to the Deputy Director

for Engineering Tooling Development and Proof Services

PEDCE

CLIFT, G. D., Performance of 57mm Shell Containing Pluted Liners Coined by the Rubber-Commend-Punch Process (C), Picatinny Arsenal Technical Report 2293, July 1956.

FIRING RECORD NO. P-47934

To determine the effect of clearance between shell bourrelet and rifle barrel on plate performance of Shell, HEAT, M307Al with Fuse PD, M90Al, 57mm Rifle.

FIRING RECORD NO. P-49028

To develop Fuze, PI, T189El for use in Shell, HEAT, 57mm, M307 or M307Al.

CBSERVERS

Mr. Jacobsen . . . Picatinny Arsenal Mr. McGarry . . . Picatinny Arsenal

Mr. Simon . . . Ballistic Research Labs

Code A

Code B

APPRODUCES

	Page No.	,
APPENDIX A:	Firing Record No. P-62641	
	AFG Photographs B-23808 thru B-23823 B-1	
APPENDIX C:	Ammunition Data Cards	
APPRIORY D:	Drawings 75-1-215 and P-86890	
APPENDIX B:	Correspondence	
APPENDIX F:	Distribution	

COMPRENTIAL

PRILIPARE AND MOST SETTION HOVER BOTTE, MITTAE FIREIRI MECORD

THE COLUMN

SURET OF TROTE To obtain information concerning 57km, spinted Im: duton

12 3 1957

FIRING RECORD NO. : P-62641

SIEST 1 07 13 AUTORITI: 0000-74,471.5/6-9)

APR(C) 471/307

INVELOPMENT. PROJECT NO.: 203-5204

WORK CRIER NO.: 32-254-50

MINIEL

Rifle, 57mm, M18, No. 3871, with triped mount.

TEST AMMUNITION

- 180 Cartridges, HEAT, 57mm, N307Al (Nod), which contain PEX booster pellet and spit-back tube liner No. P-83981A Lot PA-8-24034, Data Card No. 83539.
- 100 Cartridges, HMAT, 57mm, M307A1 (Mod), except that shell contains a PEX booster pellet and a dumy auxiliary detonator in the fuze also, spit-back liner No. 857624 Lot PA-E-24037, Data Card No. 83542.
- 25 Cartridges, HEAT, 57mm, M307Al, except that shell comtains an inert booster pellet. The standard hemispherical liner is used in this shell. Lot FA-E-24035, Data Card 83540.

PIATE DATA

4	Plate No.	012939812	255	302 -302 /	
	Charpy Impact Value at: -40°F.	55		49	
5*	Plate No.	0137600A1 255-255/255-	262	01690 269-252/	25A 277-269
	Value at: -40°T.	No value		No ve	lue
1*	Witness Flats No. BHN	A-139 352-363	A-145 352-363	A-124 352-358	4-138 341-341
	Value at: -40°T.	18.75	14.1	17.5	17.1

COMPRENTIAL

7701300 MCCGD NO. P-62641 STEET 2 OF 13 MORE-ET-COME MA

ME I OF THE

1000 to 1600 Hours THE OF CARTRIDGE: 70° F.

DATE: 25 Feb. 1957
RANGE: INTO Area
CARTRIDGE LOT NO.: M-8-24034

MRGET: Vertical armor plate 150 ft. from susule, consisting of 4 inch plate (No. 01293968-2), 6 inch air space, followed by 1 inch witness plate (No. 4-139).

	(No	· A-139).		, and any a most meaning party
RIFI RD NO.	mo.	COPPER CHAMER PRESS, peri	TION inches	REARES
148	Lost	4300	4	Maximal and demand a Torto
149	Lost		ó	Marked witness plate
150	Lost		4	
151	Lost		4	Marked witness plate
152	171	-	O	writings brace
153	168	Lost	4	Marked witness plate
154	84	-		Unfair hit
155	62		3 1/2	Bulged back of target
156	56	-	3 1/2	Bulged back of target
157	150	-	4	purfect on tarket
158	143R	4400	5	Completely renetwated without -1.4
159	133		5	Completely penetrated witness plate
160	54		2 3/4	Completely penetrated witness plate
161	82	-	4	
162	131R	-	5	
163	101	4400	Ĺ	Completely penetrated witness plate
164	57		3 1/8	Marined witness plate
165	9		3 3/8	Bulged back of target
166	103R		2 3/4	Bulged back of target
167	100	CONTRACTOR ON	4	
168	233	4400	5	Complete Im manadaya ta 1
169	26	(2000)	4	Completely penetrated witness plate
	128		3 3/4	Polled book of forms
	Lost	-	3 7/8-	Polyed back of target
	86	********	3 7/16	Bulged back of target
	193	4300	4	Manha d day
	107		7	Marked witness plate
3.75	79	CALLED BY	2 7/16	
	110		4 1/10	Manked and America 2011
177	70	4400	5	Marked witness plate
	172	~~~	ó	Completely penetrated witness plate
	109	Cope Ellegani,	4	Marries 2 - 14
180	48		4	Marked witness plate
181	24	CCACHOLOGO	4	Marked witness plate
1.82	39	Lost	•	Marked witness plate
183	45	-	5	Completely penetrated witness plate
	108	-	5	Campilodo 7
			J	Completely ponetrated witness plate

COMPROENTIAL

FIRING RECORD NO P- 2041 JULIA 3 OF 13

RIPLE RD NO.	PROJ.	COPPER CHAMBER FRESS, psi	PENETRA - TION inches	R DA RKS
185	43		3 5/8	
186	237		5	Completely penetrated witness plate
187	28	4000	5	Completely penetrated witness plate
188	122	-	5	Completely penetrated witness plate
189	21			Unable to measure due to slug in hole
190	53	-	5	Completely penetrated witness plate
191	34R		4	, and the same of
192	71	4200	0	

NOTE: Where "Marked witness plate" is listed in remarks, no appreciable penetration occurred.

PRESENT AT TEST: Mr. Jacobsen - Picatinny Arsenal

Mr. Simon

- Ballistic Research Lab

POLICE MORE IN. MARKE SEET: 4 OF 13

PANE: 27 and 28 Feb. 1957 THE: 1725 to 1570 Hours RANGE: STD Area TREPRATURE OF CARTRIDE: 70°7.

CARTRIDOS LOT NO.: PA-6-24034

- 4.2 - 4.2 st. COIL DISTANCES: Gan to First

30.05- 30.00 ft Between 1st and 2nd -

Second to Plate - 72.9 ft.

TARGET: Vertical armor plate 150 ft. from mustle, consisting of 5 inch plate (No. 0137600-A1), 5 inch air space, followed by 1 inch witness plate (No. A-145).

RIFLE RD. NO.		COPPER CHAMBER PRESS, psi	VEL.	STRIKING VEL. fps	PENTRA- TION inches	REMARKS
218	170	4300		ties were	0	
219	106		record		3 1/2	
	128			252 to	2	
	31R		261)		0	
	91R	4400			3 1/1	
223	-				3 5/8	7.4.4
	89					Unfair hit
	102					Unfair hit
	239				2 7/8	
227	49				6	Completely penstruted witness plate.
228	132	4800			3 1/4	
229	69	-			5	Marked witness plate
230	16	co-			5	
	7R				2 7/16	
232	60				4 1/8	
233	76	4500			5	9
234					3	
235	22	Constitution of the Consti			0	
236	87	CHARLES AND			43,4	Bulged rear of target
	147	4600			3 3/4	
238	46	CHILL STATE			3 3/4	
39	64	(-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1			3 1/8	
40	65	CHI CHI MICH.			3 1/2	and the second second
241	42	4600			3	Marked witness plate
	105	4400			7/8	
243	85	00000-450			5	Marked witness plate
244	Lost	COLUMN TARGET			41,7	Bulged rear of target
245	11	Crist parcedates	0		2 5/8	di mania ana
246	3CR	(34475-00)			-	Unfadr hit
	160	4300				Unfair hit
	181	(Carp-Links)			5	Marked witness plate
249	13	REQUESTED.			3 3/4	
250	55	Contraction substates			2 1/2	
251	140	CAL TO DOD			5	Marked witness plate



	I SDMAIS	TION Linches	STATELY FEL. I/W	LET. NET.	CONTRACTOR (POL	NO.	ED.
		0	1135	1169	4900	66	252
		2 15 .6	1127			44	253
d witnes	Completely perstrated plate	6	Lost	Lost		195	254
	•	2 3/=	1119	1151	-	47	255
		3 1/4	1123	1156		71	256 1
		5	1128	1161	4800	124	257
		2 3/4	Cost	Lost I		6	258
		4	Lost,	Lost I	-	38	259
t	Bulged back of target	4 1.5/16	1123	L156 1		92.	260 1
		5	121	-		12	261 1
		5			4800	.95	262 1

NOTE: Where "Marked witness plate" is listed in remarks, no appreciable penetration occurred.

PRESENT AT FIRING: Mr. Jacobsen - Picatinny Arsenal

Mr. Simon - Ballistic Research Lab

Code A

Code B

SATE | Sand 7 Marks 1997 | TIME: 09000 to 1200 Name

| ANDE: 070 Area | TE-4-24034

COIL MISTERIES: 000 to First: 44.25 - 44.1 (1

le ten let cal. 2nd: 30. - 30.05 ft.
Second to Plate: 72.85 ft.

TAKOST: Vertical armor plate 150 ft. from muzzle, consisting of 4 inch plate (No. 715441A), 6 inch air space, followed by 1 inch witness plate (No. A124).

RIFLE RL NO.	PROJ MO.	CHANGER	WIZZIZ VEL.	SELICIO	PROTIRA-	
no.		FRESS, pei		for	inchee	PRAIS
	177	3100	(Veloci	ties were	4	Marked witness plate
	162		record		4	it witness plate
265	127		Cours	200 to 30	7)4	
	178				3 1/2	
267	-				3 1/2	
268		3100			4	Marked witness plate
269					2 3/8	
	179				3 3/4	Bulged back of target
	196	and the same of th			4	Marked witness plate
-	164				4	
273	185	2500(Est)			4	
	125					
	17				4	iarked witness plate
	69				2 3/4	
277	236	-			C	Poor ignition - found
						projectile 10 ft. in front
						of target - No evidence
1000	/ ***					of hitting plate.
278	67	0			O	Poor ignition - found
						projectile 40 ft. in front
277	121R	2/00			,	of gun.
	85 15TK	3400			4	***************************************
					4 ~ 10	Marked witness plate
	138R				3 7/8	Bulged back of target
	129R 149	0			4	
283	143	U			0	Poor ignition - found
						proj.20 ft, in front of
						gun
	Above	21 rounds	were fir	ed on Marc	h 5th at	-65°P
		wing 24 rou				
	148				5	
~~ +					,	Completely penetrated
285	141R	Contrago and pro-			4	witness plate
	158				2 7/16	
	190				4	
- 0	LAR				4	Marked witness plate
289	97				Z	wer war at respon himse

FIRST RECORD NO PHONES

1	RDARKS	TON Inches	STALLED NO WILL Ope	STO PARTIE PARTIE	Filess, per	(A)		20°1 20°1
1444	Marked witness p	4	1031	1053		42		290
	ען פפשטור ניסג	4	1024	1046		74	1	301
		2 7/16	1002	1022		36	1	545
		0	1019	1027	3600	19	1	503
		3	1015	1035		59		296
		4	1034	1050		රීර	1	-94
		6	1032	1054	2440	3		296
ata	l'arked witness pl	4	1034	1056	100 desp. 10	8		297
	in a time of participation of the participation of	4	1040	1063	3500			298
ete	Marked witness p.)	4	1036	1058	CE CO POLICE		2	299
	p	4	1023	1045	000 66 10		13	900
ated	Completely penetra	5	1049	1075	SAA Marea	~		01
		2 1/4	1022	1043			23	02
Ita	Marked witness pla		1034	1056	3300	-	18	03
	Bulged back of tar		1039	1057	CE man was 311	-	-	04
	Bulged back of tar		1042	1065			7	05
	larked witness pla		Lost	Lost	alin Maragori Alin		7	06
	arked witness pla		Lost	Lost	· Mar the (192)	7	18	07

NOTE: Where "Marked witness plate" is listed in remarks; no appreciable penetration or union,

PRESENT AT FILING: Mr. McGarry Picatinny Arsensi

Mr. Simon - Ballistic Research Lab

LUMPHORNI M

FINITED LECOND NO. 1-43641

CARTRILGE LOT NO.: 10-1-2004

COIL DISTANCES: Gun to First - 44.3 - 44.2 Ct

Between let and 2nd - 30.2 - 30.3 ft.
Second to Target - 72.65 ft.

TARGET: Vertical armor place 150 ft. from muscle, consisting of 5 inch plate (No. (169625A), 5 inch air space, followed by 1 inch witness plate (No. 4126)

108 183 3800 1075 1051 6 Completely penetrated witness plate 1030 1010 6 Completely penetrated witness plate 1030 1010 6 Completely penetrated witness plate 1063 1040 6 Completely penetrated witness plate 1063 1040 6 Completely penetrated witness plate 1055 1033 5 Inches plate 1054 1032 5 Inches plate 1062 1039 6 Completely penetrated witness plate 1063 1040 5 Inches plate 1064 1032 2 7/16 Inches plate 1064 1032 2 7/16 Inches plate 1064 1022 6 Completely penetrated witness plate 1068 1045 4 7/16 Inches plate 1057 1035 3 5/16 Inches plate 1057 1035 3 5/16 Inches plate 1057 1035 3 5/16 Inches plate 1056 1034 3 3/8 157 1056 1034 3 3/8 157 1056 1034 3 3/8 157 1056 1034 3 3/8 157 1056 1034 3 3/8 157 1056 1034 3 3/8 1042 1062 1071 1047 5 Inches plate 1059 1036 1023 3 7/16 1059 1036 1023 3 7/16 1059 1036 1034 1059 1036 1034 1059 1036 1059 1036 1059 1036 1059 1036 1054 1054 1054 1054 1055 1056	RIFIE RD NO.	PROJ NO.		WUZZIM VEL. si fpe	STRIKING VEL. Ipe	PENETRA- TION inches	RPARE
1049 1027 5 1048 1030 1010 6 1048 1030 1010 6 1048 10	308	183					
1030 1010 6 6 6 6 6 6 6 6 6				10/5	1051	6	Completely penetrated
1030 1010 6 Completely penetrated witness plate				1049	1027	5	Warland stituess where
1063 1040 6 Completely penetrated witness plate 1075 1033 5 Marked viltness plate 1062 1020 5 1062 1039 6 Completely penetrated witness plate 1062 1039 6 Completely penetrated witness plate 1063 1040 5 1054 1032 2 7/16 1054 1032 2 7/16 1054 1032 2 7/16 1054 1022 6 Completely penetrated witness plate 1068 1044 1022 6 Completely penetrated witness plate 1057 1035 3 5/16 1057 1035 3 5/16 1057 1035 3 5/16 1046 1024 6 Completely penetrated witness plate 1057 1035 3 5/16 1046 1024 6 Completely penetrated witness plate 1054 1032 5 Marked witness plate 1056 1034 3 3/8 15 3600 1062 1039 5 1056 1034 3 3/8 1046 1024 5 1056 1034 5 1046 1024 5 1036 1045 1047 5 1048 1049	310	98	-	1030	· ·	6	Completely penetrated
1055 1033 5	?11	41		1063	1040	6	Completely penetrated
313 72 3500 1042 1020 5 314 93 — 1062 1039 6 Completely penetrated witness plate 315 50 — 1063 1040 5 316 154 3300 1054 1032 2 7/16 317 161 — 1044 1022 6 Completely penetrated witness plate 318 19 3600 1061 1039 4 1/4 Bulged back of target 320 167 — 1057 1035 3 5/16 321 18 — 1046 1024 6 Completely penetrated witness plate 322 72 — 1054 1032 5 Bulged back of target 323 15 3600 1062 1039 5 324 157 — 1056 1034 3 3/8 325 130 — 1046 1024 5 326 Lost — 1071 1047 5 Bulged witness plate 327 95 — 1036 1015 4 1/8 328 163 — 1042 1020 4 3/16 329 29 3500 1045 1023 3 7/16 330 73 — 1062 1039 5 331 182 — 1059 1036 0 332 4 — 1064 1041 5 Marked witness plate	312	75		1055	1022		withes plate
1062 1039 6 Completely penetrated witness plate 1063 1040 5 Marked vi.tness plate 1064 1032 2 7/16 1044 1022 6 Completely penetrated witness plate 1064 1022 6 Completely penetrated witness plate 1068 1045 4 7/16 Bulged back of target 1068 1045 4 7/16 Bulged back of target 1057 1035 3 5/16 1046 1024 6 Completely penetrated witness plate 1054 1032 5 Marked witness plate 1054 1032 5 Marked witness plate 1054 1034 3 3/8 1055 1066 1024 5 1056 1034 3 3/8 1046 1024 5 1056 1034 3 3/8 1046 1024 5 1056 1034 3 3/8 1046 1024 5 1056 1034 3 3/8 1046 1024 5 1056 1034 3 3/8 1057 1056 1034 3 3/16 1046 1024 5 1056 1034 1047 5 1056 1034 1047 5 1056 1034 1047 5 1056 1034 1047						5	marked witness plate
315 50 — 1063 1040 5 Harked vitness plate 316 154 3300 1054 1032 2 7/16 317 161 — 1044 1022 6 Completely penetrated witness plate 318 19 3600 1061 1039 4 1/4 Bulged back of target 320 167 — 1057 1035 3 5/16 321 18 — 1046 1024 6 Completely penetrated witness plate 322 72						2	0
1063 1040 5 1071 1044 1032 2 7/16 1044 1022 6 1044 1022 6 1044 1022 6 1044 1022 6 1044 1022 6 1044 1022 6 1044 1022 6 1044 1022 6 1044 1022 6 1044	27 t						witness plate
317 161 — 1044 1022 6 Completely penetrated witness plate 318 19 3600 1061 1039 4 1/4 Bulged back of target 319 1978 — 1068 1045 4 7/16 Bulged back of target 320 167 — 1057 1035 3 5/16 321 18 — 1046 1024 6 Completely penetrated 322 72		-		-			Marked vi.tness plate
318 19 3600 1061 1039 4 1/4 Bulged back of larget 319 197R — 1068 1045 4 7/16 Bulged back of larget 320 167 — 1057 1035 3 5/16 321 18 — 1046 1024 6 Completely penetrated 322 72 1054 1032 5 Parked witness plate 323 15 3600 1062 1039 5 324 157 — 1056 1034 3 3/8 325 130 — 1046 1024 5 326 Lost — 1071 1047 5 Parked witness plate 327 95 — 1036 1015 4 1/8 Bulged back of target 328 163 — 1042 1020 4 3/16 Bulged back of target 329 29 3500 1045 1023 3 7/16 330 73 1062 1039 5 331 182 — 1059 1036 0 332 4 1064 1041 5 Marked witness plate			3300	-		2 7/16	
1978				1044	1022	6	Completely penetrated
1068 1045 4 7/16 Bulged back of target 1057 1035 3 5/16 1046 1024 6 Completely penetrated				1061	1039	4 1/4	Bulged back of terrest
1057 1035 3 5/16 1024 6 Commetely penetrated witness plate 1054 1032 5 Perked witness plate 1054 1039 5 1054 157 1056 1034 3 3/8 1055 130 1046 1024 5 1061 1047 5 Perked witness plate 1071 1047 5 Perked witness plate 1072 95 1036 1015 4 1/8 Bulged back of target 1082 163 1042 1020 4 3/16 Bulged back of target 1083 73 1062 1039 5 1084 1084 1086 0 1085 1086 1086 0 1086 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 1086 0 1087 1086 0 1			}	1068	1045		Bulged back of taxent
1046 1024 6 Commetely penetrated			-	1057	1035	3 5/16	and and the total Ref.
1054 1032 5 Marked witness plate 1054 1039 5 1056 1034 3 3/8 1055 130 1046 1024 5 1071 1047 5 Marked witness plate 1071 1047 5 Marked witness plate 1082 163 1042 1020 4 3/16 Bulged back of target 1082 29 3500 1045 1023 3 7/16 1083 73 1062 1039 5 Marked witness plate 1083 182 1059 1036 0 1084 1041 5 Marked witness plate		18	OF ARTS SERVICE	1046	1024	6	Completely penetrated
15 3600 1062 1039 5 324 157 — 1056 1034 3 3/8 325 130 — 1046 1024 5 326 Lost — 1071 1047 5 Marked witness plate 327 95 — 1036 1015 4 1/8 Eulged back of target 328 163 — 1042 1020 4 3/16 Bulged back of target 329 29 3500 1045 1023 3 7/16 330 73 — 1062 1039 5 Marked witness plate 331 182 — 1059 1036 0 332 4 — 1064 1041 5 Marked witness plate		72	Carrie	1054	1032	5	
1046 1024 5 1066 Lost 1071 1047 5 Marked witness plate 1079 95 1036 1015 4 1/8 Bulged back of target 1088 163 1042 1020 4 3/16 Bulged back of target 109 29 3500 1045 1023 3 7/16 1010 1010 1010 1010 1010 1010 1010 10		1.5	3600	1062	_	5	
1046 1024 5 326 Lost — 1071 1047 5 Marked witness plate 327 95 — 1036 1015 4 1/8 Bulged back of target 328 163 — 1042 1020 4 3/16 Bulged back of target 329 29 3500 1045 1023 3 7/16 330 73 — 1062 1039 5 Marked witness plate 331 182 — 1059 1036 0 332 4 — 1064 1041 5 Marked witness plate			COPCIA.	1056		3 3/8	
1071 1047 5 Marked witness plate 1072 95 1036 1015 4 1/8 Bulged back of target 1042 1042 1043 3 7/16 1059 1059 1056 0 1059 1059 1056 0 1059 1054 1051 5 Marked witness plate	-1 -0	-		1046			
1036 1015 4 1/8 Bulged back of target 1042 1020 4 3/16 Bulged back of target 1042 1023 3 7/16 1062 1039 5 Marked witness plate 1059 1064 1041 5 Marked witness plate				1071			Marked witness plate
328 163 1042 1020 43/16 Bulged back of target 329 29 3500 1045 1023 3 7/16 330 73 1062 1039 5 Marked witness plate 331 182 1059 1036 0 1064 1041 5 Marked witness plate		*		1036	1.015		Euleed back of target
329 29 3500 1045 1023 3 7/16 330 73 1062 1039 5 Marked witness plate 331 182 1059 1036 0 332 4 1064 1041 5 Marked witness plate		_		1042			Bulged back of target
1062 1039 5 Marked witness plate 1059 1036 0 1064 1041 5 Marked witness plate			3500	1045	1023		or our each
1059 1036 0 1064 1041 5 Marked witness plate			CACOPOLAGE	1062			Marked witness plate
1064 1041 5 Marked witness plate			Wilder Chicago	1059	1036		pan oo
			STEP STEP DES	1064	1041	5	Marked witness plate
				1063	1040		pas or
34 166 1046 1024 3 9/16			OT. COMPLETE	1046	1024	3 9/16	
33 3500 1051 1029 5 Completely penetrated			3500		1029	5	Completely penetrated
36 1 1064 1041 3 witness plate	36	1	CONTRACTOR OF THE PARTY OF THE	1064	1041	3	witness plate

CORNERPIAL

FIDING RECORD NO. P-6441 SUBST 9 OF 13

RIYU RD NO.	MO.	COPPER CHANGE FRESS, per	LED ART	STRUKTHO VILL Spo	PEDETRA- TION inches	PERMARIES
337	83		1042	1020	5	
338	61	3100	1033	1013	4	Bulged back of target
339	3		1056	1034	9	
340	52	-	1051	1029	4 1/8	Pulged back of target
341	111R	3600	1058	1036	3 1/2	
342	134	-	1064	1041	2 7/8	
343	25	3900	1062	1035	-	Unfair hit
344	180R		1046	1024	4	Bulged back of target
345	120R		1065	1042	3 3/16	
346	135		1059	1036	5	
347	68		1057	1035	5	Marked witness plate
348	5	3600	1059	1036	5	Marked witness plate
349	176		1048	1026	3 3/4	
350	99	-	1056	1034	5	Marked witness place
351	117	CARCOLINGIA	1059	1036	3 15/16	•
-	175		1079	1047	6	Completely penetrated witness plate

NOTE: Where "Marked witness plate" is listed in remarks, no appreciable penetrations occurred.

CONFIDENTIAL

ACAS CHUCK-YS-CHOOL

FLAIR NEARC NO. F-62MAL SHEET 10 OF LJ

PASS II OF TEST

PATE OF PIRIND: 28 March and 12 June 1957 TEPHRATURE: + 125°7.

ANGE: 970 AMMENTITION LOT NO. HA-E-2403?

PANCE: 9500 AMMINITION DARGET: 9600 Yard Recovery Field

RIFLE RD NO.	PROJECTILE NO.	CHAMBLER PRESSURE poi		REVERKS					
353				(See below)					
354	21 R								
355	89								
356	94 R								
357	94 N	7600							
358	18	7000							
3 54		9000							
3 6 0	1 R	8000							
	51 R								
3 61	2	770.							
362	50 R	7200							
363	49 R								
364	C	4===							
365	6 R	8500							
366	46 R								
367	68	8000							
868	19 R								
369	31 C								
370	71								
371	13 R								
372	83 R	7300							
373	65								
374	29 R		-						
375	72								
376	55 R								
377	70	8300							
378	79								
379	40 R								
380	37		•						
381	77 R								
382	100 R	8400							
383	23								
384	78 R								
385									
386	91 R								
387	56								
388	38	8100							
389	35 R	0200							
3 9 0	33			Rounds 353 to 392 inclusive:					
391	82			No evidence of premature function-					
392	39	8500		ing or function upon ground impact.					

CUMPIUSMIIAL

MONTH STRONG 2/2 SHEET I G

MASE II OF TEST

DATE OF FIRENCE 28 March and 12 June 1967 (Continued)

RD NO.	PROJECTILE NO	CHAMBER PRESSURE pei	REMARKS	
200			(See below)	
393	81			
394	43			
395	7			
396	9 2	400		
397	12 R	820		
398				
399	278			
¥00	54			
01	30			
102	28			
03	32			
04	59			
25	84			
06	90			
27	85			
80	66			
09	30	7900		
10	10			
11	57			
12	22			
1.3 1.4	45			
1.4	8			49
ió	93			0
17	64 27			
18	41			
19	7			
50	48			
21	92			
22	99			
23	34			
24	16			
25	95			
26	íí			
27	1	7200		
28	69	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
29	62			
30	44	7700	Rounds 393 to 430 inclusive:	
31	91		No syidence of premature func- tioning or function upon ground impact.	

A-11

CONFIDENTIAL

CURRIGATIAL

HOUSE-BY-HOUSE MASS SHEET IN OF IN

PARSE II OF TEST

DATE OF FIRING: 18 March and 12 June 1957 (Continued)

RIFIZ RD NO.	PROJECTIE NO.	CHAMBER PRESSURE pei	REARIS
			(See be 🛩)
32	5 29	7900	
33	29		
34	24	7400	
34	24 86		
36	to a lateral transfer of the l		
37	88		
38	53		
39	96		
40	61		
41	en mortina		
42	87		
43	9 8		
44	9 8 76		
42 43 44 45	31	7400	
46	-		
47	31 47		
48	47		
49	-		
50	42 3		
51.	42		
52	3		
			No evidence of presenting

No evidence of premature functioning or function upon ground impact.

At intervals throughout test chamb: pressure was recorded with TIAL oppose pressure gages, inserted in the front of the chamber open and towards breech.

COMHOGRITAL

MOUND-87-ACTIVE DATE

FOLLO RECORD NO. POR 31637 13 UF 13

MANUEL III OF THE!

DATE OF FURING: 27 Pobruary 1957

TEMPERATURE: + 7077.

RAMP! BTD

MAGNITION LOT NO. PA-8-24035 (inert booster)

DANIET: Homogeneous Armor Plate

PRESENT FOR TEST:

Mr. Jacobsen - Picatinny Arsemal

Mr. Simon - Ballistic Research Labs

Code A Code B

TIME OF FIRING: 0930

RIFIE RD NO.	PROJECTII		CHAMBER PRESSURE pei		REARIS								
193	4			No	penetre	tion	- Car	p B or	gr	ouni			
194	7 R			11	10								
195	± R		4300	Ħ	11					plate	heard		
196	16 R			10	*		- I	mact b	CAT	ರ.			
197	26 R	4			*								
7.58	24 R												
199	27 R			w	×								
200	20 R			11									
201	14			10				19	**				
202	18 R			- 19	19			10	72				
203				**	n			17	**				
204	9 R		4700	tŧ	11			10	1.				
205	21				Pene	Impac	et he	ard					
206	5 R			19	U	10	19						
207	B 12			19	11	**	18						
208	22 R			H	10								
209	29 R			H	99	10	8						
210	B2			u	11	n	14						
211	3 R				A	-							
212	17 R		4100	11	H		13						
TIME OF	FIRING:	1015									d.		
213	lo R			11							1		
214	30 R			tt.	10	15							
215	8 R			11	11	19	11						
216	15 R			W	10	10	. 0						
217	2, R			11	()	19	10	TIM	2 2	1030			
APPROV	ED:		/7										

Chief

Artillery Division

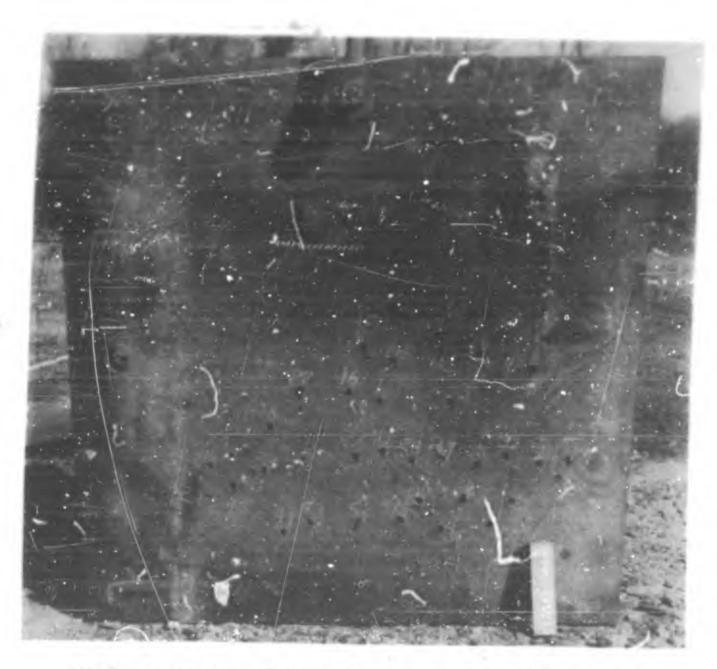
G. MORROW

Chief, Mortar and

Recoilless Rifle Br.

Ord Coxps Project Engineer

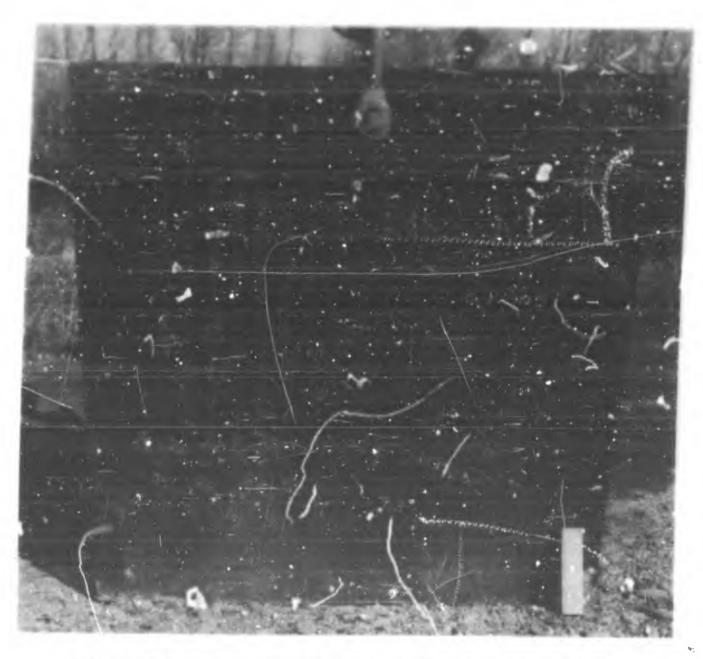
A-13 CONFIDENTIAL



B23808 - Penetrations in 4 inch thick target plate with argumition conditioned at 70°F. Plate normal to the line of fire,

B-1

CONFIDENTIAL



B23809 - Penetrations in 4 irch thick target plate with ammunition conditioned at 70°F. Plate normal . the line of fire.

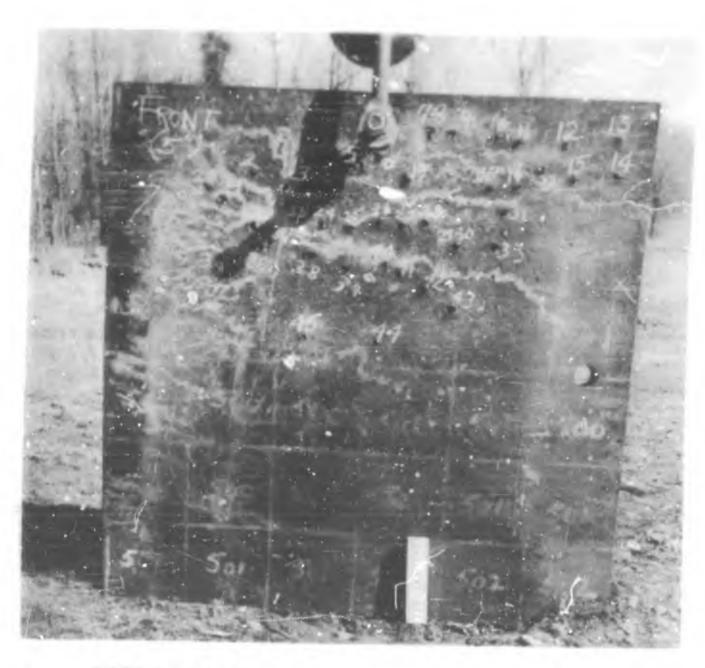
E-2 CONFIDENTIAL



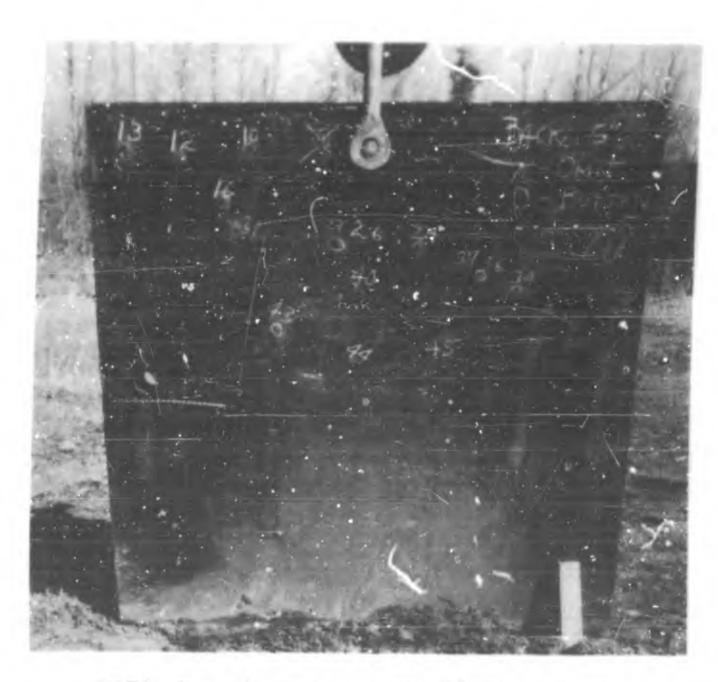
B23810 - Penetrations in 1 inch thick witness plate positioned 6 inches behind 4 inch thick target plate.



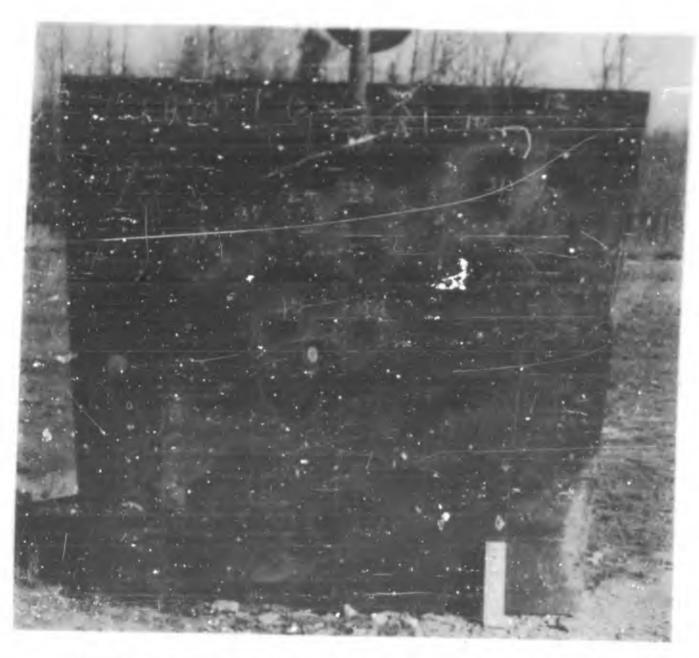
B23811 - Penetrations in 1 inch thick witness plate positioned 6 inches behind 4 inch thick terget plate.



B23812 - Penetrations in 5 inch target plate with ammunition conditioned at 70°F. Plate normal to line of fire.



B23813 - Penetrations in 5 inch target plate with mition conditioned at 70°F. Flate normal to _ of fire.

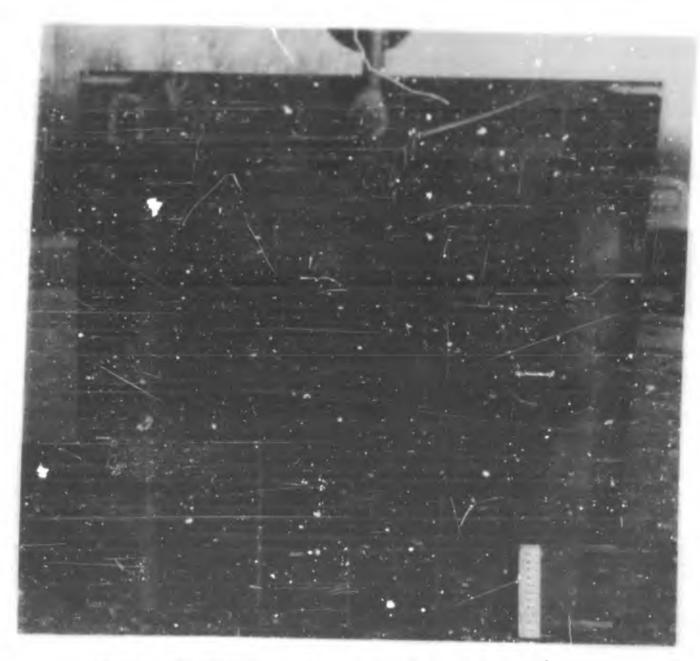


B23814 - Penetrations in 1 inch thick witness plate positioned 5 inches behind 5 inch thick target plate.



B23815 - Penetrations in 1 inch thick witness plate positioned 5 inches behind 5 inch thick target plate.

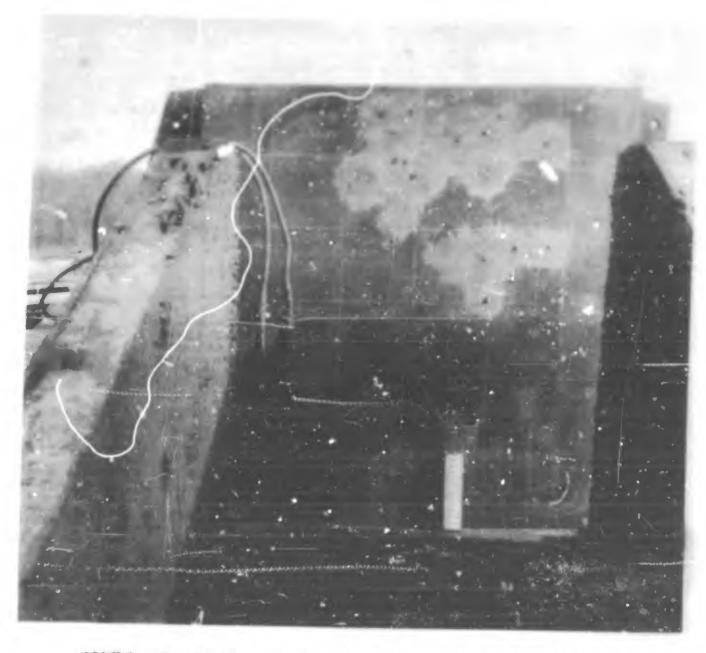
E-3 CONFIDENTIAL



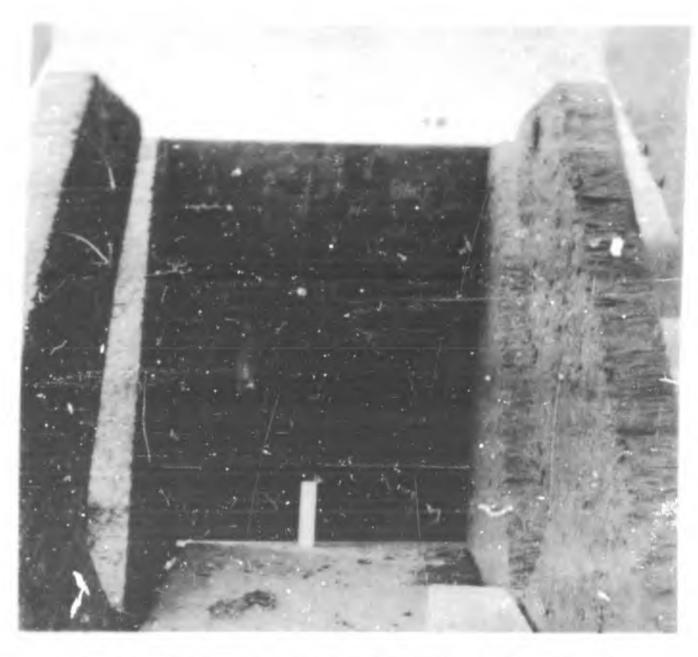
B23816 - Penetrations in 5 inch target plate with ammunition conditioned at -40°F. Plate normal to line of fire.



B23817 - Penetrations in 5 inch target plate with ammunition conditioned at ~40°F. Plate normal to line of fire.

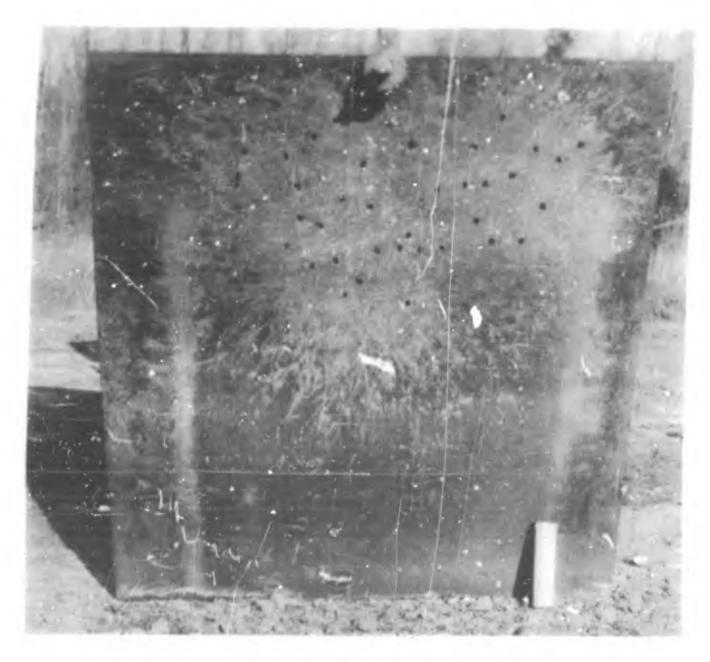


B23818 - Penetrations in 1 inch thick witness plate positioned 5 inches behind 5 inch thick target plate.

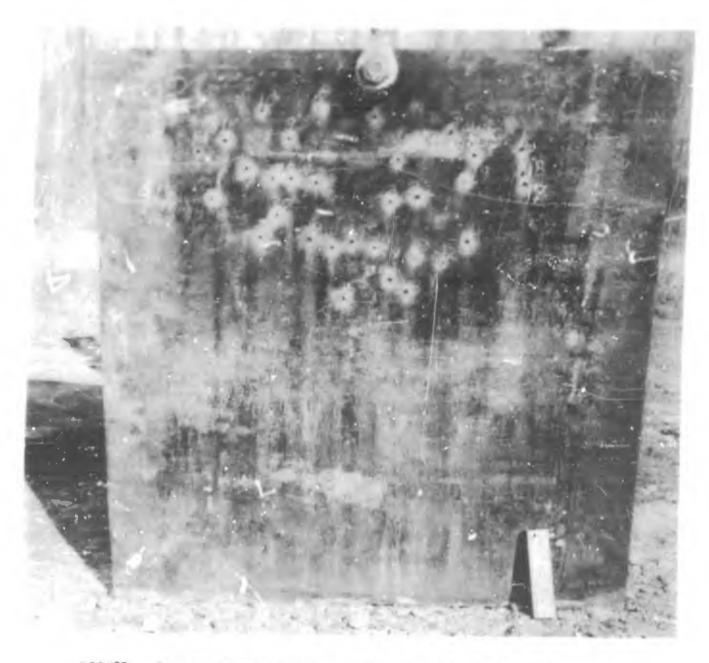


B23819 - Penetrations in 1 inch thick witness plate positioned 5 inches behind 5 inch thick target plate.

CONFIDENTIAL

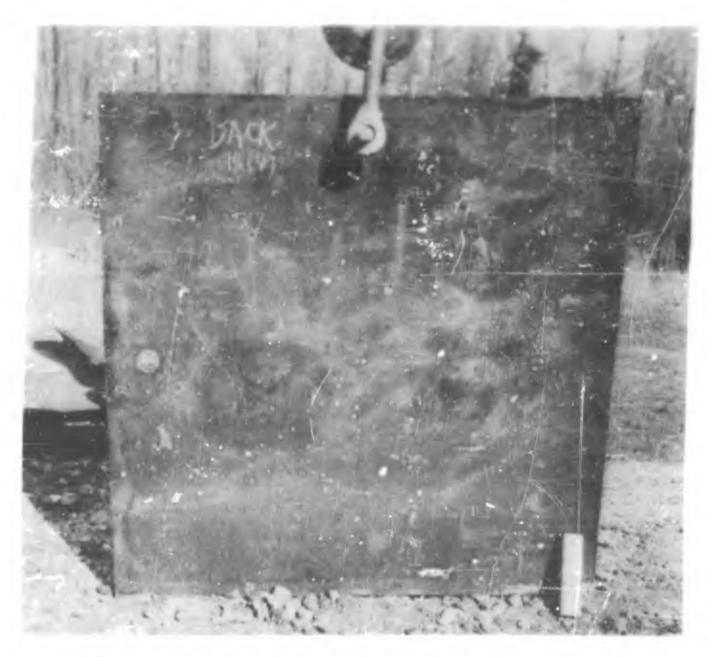


B23820 - Penetrations in 4 inch thick target plate with rounds: 1-21 conditioned to: -65°F and 22-45 conditioned to: -40°F. Plate normal to line of fire.



B23821 - Penetrations in 4 inch thick target plate with rounds: 1-21 conditioned to: -65°F and 22-45 conditioned to: -40°F. Plate normal to line of fire.

B23822 - Penetrations in 1 inch thick witness plate positioned 6 inches behind 4 inch thick target plate.



P23823 - Penetrations in 1 inch thick witness plate positioned 6 inches behind 4 inch thick target plate.

B-16 CONFIDENTIAL

EXPERIMENTAL AMMUNITION DATA CARD Sureridge, Fig.T., KNOW, (But) This Fine PL, MYSS. Top: 57MC Bullion OR PER AGUER MANGE \$45 IR 170 AS DESCRIPTION AND Defects or 1200 Pt-/HH Packeds 1 Cartridge/filter container; a filter containers/wood now. ews of Projectile 2.75 lbs. Shell loaded in accordance with driving PE-13-1641 dated 28 January 1954. Pellet Booster Fonk. 75-14-4720 menufactured of PRE minimum density 1.60. Liner and Tube Assembly are numbered and this number is stenciled on outside of each shell. To be tested at APS in accordance with test program request No. 4605. Tes. of 22 rounds at PAR 6 rounds at ambient temp, 7 rounds conditioned at -65 F for 16 hours and fired (over) COMPONENT Liner Care Carte Pricer Powder Shell HEAT Pure PD 5730M Pend Folyethylene Propellent MW0741 (Mod) M9041 Felt 3630A2 B3 R6051 STMI MPTS DHS. NO 7D-15105 71-2-153 71-2-68 PY-13-1462 DRG DATE UR BEY Sev. 7 Stera. Rev. 7 9-14-53 9-8-53 Sey. MFG'D BT P放 Kingsbuzz unk Indiana 10.00 PA PA DATE 1949 1954 unk 1953 1956 1951 1956 LOT: NO KOP-59-Fh-4-2 IA-3901 unk PA-409+) Noge A. Kurtulik Kishpaugh PREPARED BY CERTIFIED TO BY: INSPECTOR PICATINNY ARSENAL 9/6 DOVER, NEW JERSEY Ars Opers Inspection DIVISION DIVISION

Card No. 63539

REMARKS: at -65°F, and 7 rounds conditioned at 125°F for 16 hours and fired at 125°F. 3" Class B Homogeneous Armor Plate used as target for all rounds. M18 Rifle placed 150 ft. away from the target plate with lineof fire at angle of 36° with a perpendicular to the plate (i.e an angle of 54° between the plane of the plate and the line of Fire).

Two 1" thick mild steel witness plates placed together and parallel to the armor plate. 6" Air space between armor plate and witness plates. Depth of penetration produced by each round measured by probing to nearest 0.1". Non-functioning or mal-functioning recorded. **Shells mig'd by FA and Mod by FA. Liner and Tube Assembly furnished by SFAL.

COMPONENT Pellet Charge
KIND Booster Bursting
PBX
DRG. NO. 75-14-472C
UKK. PATZ OR REV.
MFG'D. BY PA Holston

MFG'D. BY PA Holston
DATE 1956 1956
LOT NO. none HOL-7-1694

Exp. Amm. Data Card No. 83539 - Lot No. PA-E-21.034

CHEST COSTS OF	Avench EXP	ERIMENTAL	AMMUNITION DA	ATA CARD	M. PHIO
P = 1/30	Cartr O-	ilee, MET, Ma Rifle	TAI WILL Pize, PI,	190A2 5716F	PA-P-1024 OUANTITY IN LOT
7 -1- 1	3-27-55	ALLOT ADVICE	TA 3-5204	RAD OR EPO NO	QUANTITY N SHIPMENT
3055-0K-300	14.16 029#	1200 ft/sec.	5000 lbs/so in	ASSEMBLED DY PA	DATE OF ASSEMBLY October, 1956

REMARKS: Packed: 1 Cartridge/fiber container; 4 fiber containers/wood box.

*Wt Projectile 2.75 lb. Shell loaded in accordance with Dwg 75-14-472, Rev. 4-28-53 with ANR'S 24208 and 24951. Pallet Booster Pcmk. 75-14-472C mfg'd Inert. To be tested at APG in accordance with Test Program request No. 4605. Shell loaded in accordance with Dwg. 75-14-472 Rev. 4-28-53/ANR'S 24208 and 24951.

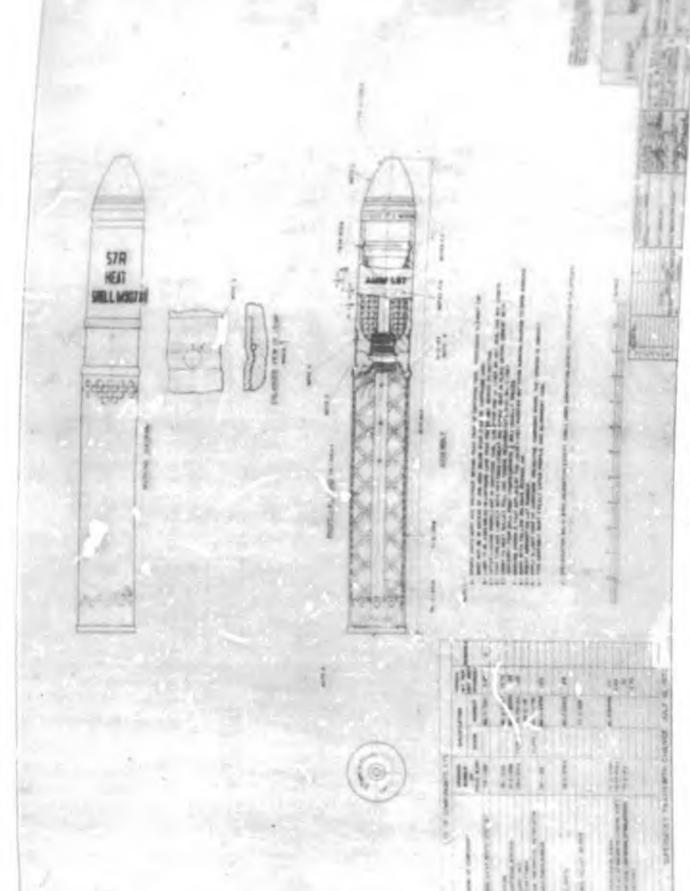
COMPONENT	10	Ps.	7				ver)
	Case Cartg	Primer	Liner	Pwd Prop	Shell HEAT	Fuze PI	Spacer
KIND	57MM M30ALB	Perc.	Polyethylene	MO	11307A1 57M		
		M60A1			MPTS		
DRG. NO.	FD-15105	74-2-68	71-2-153		75-2-353	73-2-236	75-14-4720
DRG. DATE OR REV.	Rev. 7	Rev. 7	9-14-53		4-28-53	Rev. 7	12 24 4122
MFG D BY	FA	Kingsbury	unk	Indiana	FA	PA	PA
DATE	1949	1954	unk	1953	unk	1951	1956
LOT NO.	FA-4-2	KOP-59-3	unk	IA-39015	Mixed	PA-109/10	none

TINSPECTOR	W. Kishpaugh	CERTIFIED TO BY	By A, Kurtulik	PRE
	Inspection	PICATINNY ARSENAL 916	Ars Opers	
DIVISION		DOVER, NEW JERSEY	DIVISION	

Card No. 83540

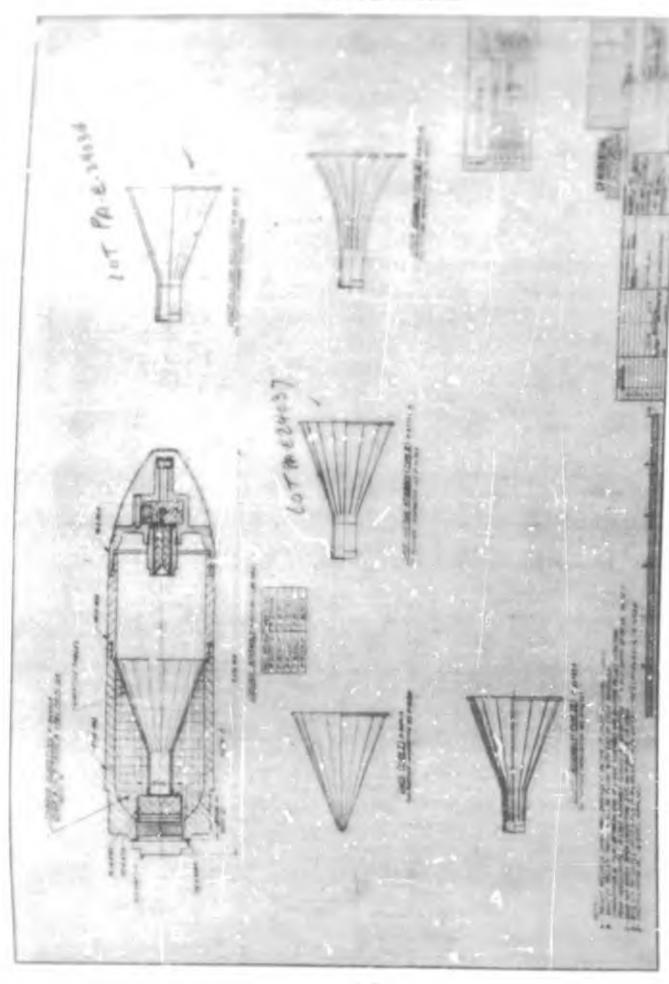
COMPONENT	Pellet	Charge
KIID	Booster	Bursting
DRG. NO.	Inert 75-14-4720	Comp. B
DRG. DATF CR REV.	,	
MFG'D. BY	PA	Holston
DATE	1956	1956
LOT NO.	none	HOI -7-1694

Exp. Amm. Data Cari No. 83540 - Lot No. PA-E-24035



Drawing No. 75-1-215

D-1 CONFIDENTIAL



D-2 CONFIDENTIAL

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STRUMENT: Test Program Request Stader IS-1 Cartetign; HEAT, 57 mm, MSOTAl (ModLfled) (V)

TO: Commanding General
Aberdaen Proving Ground
Naryland
ATTENTION: CROSS-DPS

l. Inclosed is Test Program Request Number T (C)

1B.for testing of subject items. These items, the description of which are furnished in the inclosed test program request, will be supposed to your Proving Ground during the week of 8 October 1956.

2, Funding Data

Funds are available under Sub-Project Order No. 70405530-61-30901-01, and Job Order No. 3056-06-901. The inclosed TPR was initially identified as No. 4605 but has been renumbered as TJ-1 (C).

3. Coordination

- a. OCC-ORDINA
- b. APG-D&PS
- c. APG-BRL, Dr. R. J. Eichelberger

d. Picatimny Arsenal - Engineer primarily responsible for the test is Mr. C. E. Jacobson, phone Picatinny Arsenal, Extension 5220.

4. Notification for Test Attendance

Mr. C. E. Jacobson well attend the tests. Notice to make prior to the firings, is requested.

FOR THE COLDANDER

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1 Incl

IN HEREIT

REFER TO:

l. TPR No. TV-1
w/incls (6 cys)

C. S. DAVIS

THEORET A L

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Brufull, January (portrain)

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OCO-ORDIA w/incl 1

A.PG- Comp Office w/incl 1

"REGRADED UNCLASSIFIED WHEN SEPARATED FROM INCLOSURES"

TEST PRODUCE PRODUCT (PRELIXINAST EMILIERALIS) OR DEVELOPMENT TEST)

.E. Jacobson/
Test Program Request .TJ-1 C (Job Orlar No.3056-06-901) Pica rmy Arseral, Dover N.J. 5 October 1956

1. Material for Tost

- a. 180 Cartridge, HEAT, 57mm, M307Al (Modified), Dwg 75-1-215, rev 8/25/55, except for shell, PoNk P-8689CL, which contains a PBN booster pellet; Let PA-E-24034, Duta Card No. 83539
- b. 100 Shell, HEAT, 57mm, N307al (Modified), PoNk P-66890C, except that shell contains a PRI tooster pellet and a dummy auxiliary detonator in the fuse; Let PA-E-24035, Data Card No. 83540
- c. 25 Cartridge, HEAT, 57mm, N307Al, Dwg 75-1-215, rev 8/25/55, except that shell contains an inert booster pellet; Lot PA-E-24037, Data Card No. 83542

2. Project Authority

- a. Ordrance Project Number: TA3-5204
- b. Department of the Army Number: D/A 5404-07-001
- c. Funds available under Sub-Project Order Number 70405530-01-30901-01, and Job Order Number indicated above.
 - d. D/A Priority 1B

3. Object of Development or Experiment:

To determine the effectiveness of 57mm HEAT ammunition containing shaped charge liners made by the rubber-covered-punch process.

4. History Sketch:

It is known that spin-stabilized HEAT ammunition gives poorer performance when fired dynamically than when fired statically without rotation. This has been found to be caused by rotation and spreading of the jet from the liver. To counteract rotational effects, a number of methods of spin-compensation have been devised. Both theoretical considerations and initial experimental tests indicated that a fluted liner was the best means

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THE SE. TA-2 (C) (Cold.)

The results tained indicated superiority over shell see para 10 - Reference). The results tained indicated superiority over shell see para 10 - Reference). The results the optimum wall thickness of fluted liners made by the rubber-covered-punch process.

5. Discription in Detail of Improvements lade Since Last Proving Ground Test:

There have been no proving ground tests conducted under thes projects

5 Skithbar 2306

6. Local Tests:

Static spin and dynamic tests have been conducted (See para 10 - Reference). Additional static spin tests showed that fluted liners made with a forming load of 200 tons from blanks having on .065" wall gave optimum penetration values.

7. Object of Test:

a. To determine the effectiveness in dynamic tests of 57mm HEAT shell containing rubber-covered-punch process liners formed at 200 tons load and having an .065m wall.

b. To determine if the M90Al fuze will inditiate the Composition B bursting charge in an inert-boostered shell.

8. Precautions in Handing and Testing:

All precautions ordinarily taken when assembling and firing HEAT shell which may burst prematurely should be observed.

9. Recommended Test Program:

Fire all shell in this program using an M18 rifle at a range of 150 ft against an armor plate target placed perpendicular to the line of flight. Set up a 1" thick witness plate 6" behind the target. Detailed firing instructions are given below:

- a. Fire 180 cartridges of Lot PA-E-24034 as follows:
 - (1) Subject 90 cartridges to conditioning at 70° ± 5°F for at least 16 hours. Fire 45 of these cartridges against 4" Class B armor plate and the remaining 45 cartridges against 5" Class B armor plate.

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(2) Subject (6) martiridges to conditioning at -65° 2 5°F for at least 16 hours. Pire 65 of these partridges against 4° Class 2 proof plate and the remaining 65 partridges against 5° Class 2 army plate.

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Also record any instances t of impact of any shell is clover than ters from the edge of the plate or another

b. Assemble the 100 shell of Lot Ph-2-24037 (See Dwg 75-215, rev 9/2/5) with cartridge cases containing enough propellant to develop 7280 per which is 112% of the maximum rated pressure for the round. This pressure must be developed when the round is fired at a temperature of 125°F. Subject the cartridges to conditioning at 125°F ± 5°F for a minimum of 40 hours just before they are fired. Fire them for land impact and observe for evidence of functioning. Recovery of duds is not desired.

c. Subject the 25 cartridges of Lot PA-E-24035 to conditioning at 70° ± 5°F for a minimum of 16 hours. Fire the cartridges against any available target plate. Record evidence of smoke, flash, or noise at impact and depth of penetration optained, if any.

d. All cartridges, when fired, shall be as close to the condition-

10. Reference:

Clift, G.D., Performance of 57mm Shell Containing Fluted Liners Coined by the Rubber-Covered-Punch Process (C), Picatinny Arsenal Technical Report 2293, July 1956.

11. Report Distribution:

a. Test Report security classification - Confidential.

b. 1 Copy - OCO-RDTA, Mr. M. F. Massey 1 Copy - OCO-RDTB, Mr. M. C. Miller

1 Copy - APG DAPS

1 Copy - APG: BRL, Dr. R. J. Eichelberger

3 Copies - Picatinny Arsenal:

1 Copy - Attn: Inspection Division

1 Copy - Attn: ORIBB-TJ1 1 Copy - Attn: ORIBB-TB8

2 Incls
1. Dwg No. 75-1-215

/s/ P. B. Tweed
for D. R. BERMAN

2. Dwg No. P-86890

for D. R. BRIMAN Acting Director, Samuel Feltman Ammunition Laboratories

/8/

C. S. DAVIS
Assistant

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Bonds

ATTE: ORDER-TAIL ATTE: ORDER-TAIL AND 4/1,1/361

2d Ind Nr.C.E. Secondon/vim/plan

STRUCT: Dallistic tests of Modified 1007Al 57mm Shall

Ord Corps, Picatinny Arseral, Dover, J. J., COT 2 156 11 AN

TO: Commanding General. Aberdeen Proving Ground, Ma.,

- 1. The \$3650. required to perform the subject tests is being transferred to your proving ground. The project on which this wor to be done is TA3-5204. The Job Order No. is 3056-06-901.
- 2. The question raised in paragraph 2 of the 1st Indorsement was answered during a telephone call from Mr. B. A. Rausch of this Arsenal to Mr. J. C. Moore of D & PS on 24 September 1950. As was explained them, this Arsenal will furnish the 25 standard MOVAL 57mm HEAT cartridges. The 100 modified MOVAL 57mm HEAT shell, referred to in paragraph le of the basic letter, will be furnished as fused projectiles. It will be necessary for your proving ground to furnish the other components, such as cartridge cases, primers, and propellant, and to assemble the complete round.
- 3. Due to a change in Arsenal procedures, the Test Frogram Request for this work has been remambered as Test Program Request No. TJ-1. It is expected that the Test Program Request will be transmitted to Aberdsen Proving Ground in about two weeks.

FOR THE COMMANDER:

/2/

PAUL B. TWEED Assistant 1st Ind

Mr. JCMocre/jlw/32154

ARI 471.1/361 PA 471.1/31

SUB. MCT: Ballistic Tests of Modified M30711 57mm Shell

Ord Corps, Development and Proof Services, Aberdeen Proving Ground, Md.

- TO: Commanding Officer, Picatimny Arsenal, Dover, New Jersey SEP 17 1956 ATTN: ORDSB-TJ?
- 1. Reference is made to Paragraph 1 of basic communication. The cost estimate of the tests as outlined is \$3650.00.
- 2. A review of the stock records at this proving ground has indicated that there are not any Pentolite loaded M307Al (original) shell swallable for the firites referred to in Paragraph l.c. It is, therefore, requested that your arsenal furnish the twenty-five standard Cartridge, HEAT, Pentolite loaded, M307Al, 57mm Rifla, M38Al, along with the 280 modified Shell, HEAT, M307Al,
- 3. Your arsenal will be notified of the firing schedule in advance so that interested personnel may be present.

/3/

T. F. COLLEGAN

ORDNAM & CORPS
PICATIN & ARSENAL
DOVER. 1980 JERSEY

IN REPLI REFER TO:

DOVER, WEG JERSEY

Mr.B.A.Rausch/vka/6275

SAMUEL FELTMAN ALMUNITION LABORATORIES URIBB-TJ1 471.1/31

APG 47L 1/361 (1956

SUBJECT: Ballistic Tests of Modif od McO7Al 57mm Shell

TO:

Commandi & General Aberdee: Proving Ground

Maryland

ATTENTION: Development and Proof Services

- 1. A test program has been plumed to evaluate ballistically a number of modified M307Al 57hm hell. This Arsenal requests an estimate of the cost of the following tests:
- a. Firing of 180 Modifie M307Al 57mm HEAT cartridges, 90 against 4" and 90 against 5" he ageneous armor plate (Class B). Six inches behind the armor plate and parallel to it, there should be a 1" thick mild steel mitness parts. A record of depth and character of penetration will be r quired.
- b. Firing of 100 Modifie M307/1 57mm HEAT shell at 125°F for ground impact. In preparation for firing these shell are to be assembled by Aberdson Proving Growd with cartridge cases and enough propellant to give 7280 psi, which is 112% of the maximum rated pressure for the round. Any pressure shall be recorded.
- c. Firing of 25 Standard 1307Al 57mm HEAT cartaidges against 40 armor plate. No witnes, plate is recessary. A record of depth and character of penetral on will be required.
- 2. Pleatinny Arsenal Test: Program Request No. 4605 giving a detailed description of the work cathined above is being prepared and will be transmitted to Aberdee: Proving Ground in the near future.

FOR THE COMMINDER:

/3/

C. S. DAVIS

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