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US ARMY TEST & EVALUATION COMMAND



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USATECOM PROJECT NO. 8-4-0210-02-C
FINAL REPORT OF ENGINEERING TEST OF
CARTRIDGE, 5.56-MM, TRACER, XM196
REPORT NO. DPS-1687
JUNE 1965

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ABERDEEN PROVING GROUND
ABERDEEN PROVING GROUND, MARYLAND

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CARTRIDGE, 5.56-MM, TRACER, XM196

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ABSTRACT

This report describes the engineering test of cartridge, tracer, 5.56-mm, XM196. The purpose of the test was to determine cartridge physical dimensions, accuracy, tracer performance, cook-off, vibration effects, brush deflection, erosion, penetration (pine board, steel helmet, and armored vest), and gun functioning. The test was conducted at APG between 15 July 1964 and 16 March 1965. The characteristics of the test item were determined. It was recommended that the test cartridge be considered suitable for use with the M16 and M16E1 rifles.

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USATECOM PROJECT NO. 8-4-0210-02-C
FINAL REPORT OF ENGINEERING TEST OF
CARTRIDGE, 5.56-MM, TRACER, XM196
15 JULY 1964 TO 16 MARCH 1965

SECTION 1. GENERAL

1.1 REFERENCES

1. Engineering Test Plan for Cartridge, Tracer, 5.56-MM, XM196, USATECOM Project No. 8-4-0210-02C, May 1964.
2. First Letter Report on Engineering Test of Cartridge, Tracer, 5.56-MM, XM196, USATECOM Project No. 8-4-0210-02C, 26 October 1964.
3. Military Specification: Cartridge, 5.56-MM, Tracer, XM196. MIL-C-60111(MJ), 17 March 1964.
4. Military Specification: Cartridge, 7.62-MM, NATO, Tracer, M62. MIL-C-46281-B(MJ) Amend 1, 7 October 1963.

1.2 AUTHORITY

The authority to proceed with the conduct of test is the USATECOM Test Directive 8-4-0210-02C, 3 April 1964 (Appendix V).

1.3 OBJECTIVES

To determine the suitability of the XM196 cartridge for use in the M16 rifle. Since no QMR, Military Characteristics, or Technical Characteristics were available for the test cartridge, the M62 tracer round fired in the M14 rifle was used for comparative purposes.

1.4 RESPONSIBILITIES

Development and Proof Services, Aberdeen Proving Ground, Md., was responsible for planning, executing, and reporting the engineering testing.

1.5 DESCRIPTION OF MATERIEL

The XM196 tracer cartridge consists of the standard 5.56-mm cartridge case and primer assembly. The bullet has a gilding metal jacket around a halved lead core. The pyrotechnic components which are located to the rear of the halved lead core, consist of the igniter and tracer mix. The assembled bullet weighs approximately 55 grains and is flat-based. The bullet tip is colored orange to facilitate identification (Appendix III).

1.6 BACKGROUND

Rifles, 5.56-mm, M16 and XM16E1, and cartridge, ball, M193 have been adopted for use by the US Air Force and by the US Army Special Forces, Airborne, and air assault units. Cartridge, tracer, XM196 is being developed for use in the M16 and XM16E1 rifles.

1.7 FINDINGS

The physical characteristics of the test cartridge complied with drawing C10534193 (Appendix IV).

Accuracy targets were fired simultaneously at ranges of 100, 300, and 600 yards. When firing the XM196 tracer ammunition, the average mean radius of all targets at 100 yards was 1.6 inches; at 300 yards, 5.1 inches; and at 600 yards, 11.0 inches. When firing the M193 ball ammunition, the average mean radius of all targets at 100 yards was 1.2 inches; at 300 yards, 3.6 inches; and at 600 yards, 8.4 inches. The requirements of Reference 3 can be met by interpolating the average mean radius of the targets to 200 yards range.

The XM196 tracer ammunition conditioned at +70°F and fired at night revealed that 98% of the rounds traced with an average length of trace of 830 yards.

The conditioning of the test ammunition to +155°F and -65°F increased the number of delays. The trace of the XM196 was more difficult to observe, from all positions, in bright daylight than that of the M62. The length of trace of the test ammunition complied with Reference 3.

A cook-off occurred with both the XM196 and M193 cartridges when 140 rounds were fired as rapidly as possible. No cook-off occurred at the 120-round level.

Visual examination of the test cartridges subjected to the vibration test revealed that the points of the projectiles were slightly flattened and the red identification lacquer was chipped off the projectile tips. When these rounds were fired 76% of the rounds traced normally.

The average mean radius of the accuracy targets fired during the erosion test using M193 ammunition was 1.4 inches. The largest velocity drop from the initial burst was 62 fps. The average mean radius of the accuracy targets fired using XM196 ammunition was 1.6 inches. The largest velocity drop from the initial burst was 65 fps. The average mean radius of the accuracy targets fired using both M193 and XM196 ammunition was 1.5 inches. The largest velocity drop from the initial burst was 95 fps.

The five record impacts, with each type (XM196, M193, M62, and M80) of ammunition, completely perforated the front and rear of the helmet and liner at ranges of 100 and 300 yards. At a range of 600 yards, four XM196 projectiles perforated the front of the helmet and liner and the rear liner; one round perforated only the front of the helmet and liner. Two M193 projectiles perforated the front of the helmet and liner and the rear liner; three rounds did not penetrate the helmet. Four M62 projectiles perforated the front and rear of the helmet and liner; one round perforated the front of the helmet and liner and rear of the liner. All five M80 projectiles perforated the front and rear of the helmet and liner.

The number of pine boards, spaced 1-inch apart, perforated at ranges of 100, 300, and 600 yards using M193 ammunition was 11, 16, and 7; using XM196 ammunition, 24, 17, and 7; using M80 ammunition, 12, 11, and 14; using M62 ammunition, 42, 34, and 19, respectively.

All rounds (XM196, M193, M62, and M80) perforated armored vests at ranges of 100, 300, and 600 yards. (One thickness of vest was offered as a target.)

No malfunctions occurred with either type of ammunition (XM196 and M193) with the weapons held in the various attitudes.

1.8 CONCLUSIONS

It is concluded that:

- a. The physical characteristics, trace characteristics, and accuracy of the XM196 cartridge complied with Reference 3 (ref pars. 2.1, 2.2, 2.3, and Appendix I).
- b. A cook-off can be expected with either the XM196 or M193 round when more than 120 rounds are fired as rapidly as possible in the M16 rifle (ref par. 2.4 and Appendix I).
- c. The vibration of the XM196 cartridge caused delays in trace (ref pars. 2.3 and 2.5).
- d. The erosion characteristics of the XM196 cartridge are comparable to those of the M193 cartridge (ref par. 2.7 and Appendix I).
- e. The attitude of the weapon does not affect functioning when firing either the XM196 or M193 cartridge (ref par. 2.9).

1.9 RECOMMENDATION

It is recommended that cartridge, 5.56-mm, tracer, XM196 be considered suitable for use with the M16 and XM16E1 rifles.

SECTION 2. DETAILS OF TEST

2. INTRODUCTION

This test was conducted to determine the physical and ballistic characteristics of the XM196 cartridge. The M193 tracer round, fired in the M14 rifle, was used for comparative purposes.

2.1 INSPECTION

2.1.1 Objective

To determine the physical characteristics of the test item.

2.1.2 Method

Ten rounds of each (XM196 and M193) cartridge were disassembled and the components were measured and weighed.

2.1.3 Results

A summary of results is given in Table 1.

Table 1. Summary of Inspection Data

No. of Rds	Avg Wt of Components, gr				Avg Measurement of Components, in.			
	Bullet	IMR 4475 Prop.	Primed Ctg Case	Complete Ctg	Bullet Length	Bullet Diam	Primed Ctg Case Length	Complete Ctg Length
Cartridge: 5.56-mm; ball, M193, lot RA-5027 (control).								
10	54.90	24.90	94.39	174.19	0.746	0.224	1.757	2.247
Cartridge: 5.56-mm; tracer, XM196, lot RA-223-115 (test).								
10	51.88	23.97	94.93	170.78	0.881	0.224	1.755	2.248

2.1.4 Analysis

Not applicable.

2.2 ACCURACY

2.2.1 Objective

To determine the accuracy of the test cartridge.

2.2.2 Method

Five 10-shot groups, in each of three M16 rifles, were fired from a machine rest with both XM196 tracer and M193 ball ammunition. The groups were obtained simultaneously at ranges of 100, 300, and 600 yards. The center of impact at each range with reference to an index line was determined. The cartridge type was alternated after each 10-shot group.

2.2.3 Results

A summary of results is given in Table II.

Table II. Summary of Accuracy Data

Average Data for Five Targets, in.											
Rifle No.	Ammo Type	MR	MID	MVD	EHD	EVD	ES	CI from Line of Sight		Std Dev	
								Hor	Vert	Hor	Vert
Range: 100 yards.											
008625	Ball	1.2	0.7	0.8	2.8	3.3	3.8	- 1.2	2.7	0.9	1.1
	Tracer	1.7	1.1	1.1	4.4	4.2	5.3	- 0.1	3.3	1.3	1.4
023295	Ball	1.3	0.8	0.9	3.7	3.6	4.5	0.0	1.0	1.1	1.1
	Tracer	1.4	0.9	0.9	3.7	3.7	4.4	0.6	- 0.2	1.1	1.2
023348	Ball	1.0	0.5	0.7	2.2	2.7	3.1	2.6	2.7	0.7	0.9
	Tracer	1.7	1.1	1.2	4.1	5.7	6.5	2.4	3.5	1.4	1.7
Range: 300 yards.											
008625	Ball	3.8	2.2	2.5	8.6	10.5	11.3	- 3.7	- 1.8	2.8	3.3
	Tracer	5.2	3.3	3.4	13.6	12.3	15.9	- 0.6	0.4	4.2	4.1
023295	Ball	4.0	2.6	2.7	11.8	11.0	14.2	1.4	- 6.4	3.5	3.4
	Tracer	4.6	2.8	3.0	11.7	11.9	13.8	3.7	- 9.8	3.7	3.8

Table II (Cont'd)

Rifle No.	Ammo Type	Average Data for Five Targets, in.								Std Dev	
		MR	MID	MVD	EMD	EVD	ES	CI from Line of Sight		Hor	Vert
								Hor	Vert		
023348	Ball	3.0	1.8	2.1	7.6	8.2	10.1	7.9	- 1.3	2.4	2.6
	Tracer	5.6	3.5	3.6	13.0	17.8	20.1	8.0	1.4	4.5	5.0
Range: 600 yards.											
008625	Ball	8.7	4.6	6.6	17.2	25.0	27.0	- 3.6	-77.2	5.8	8.3
	Tracer	11.5	7.1	7.6	28.3	25.8	34.0	2.6	-69.7	9.1	9.3
023295	Ball	9.0	5.4	6.2	25.7	25.6	31.2	7.8	-88.7	7.5	7.8
	Tracer	10.5	6.6	6.6	27.6	27.0	32.4	13.9	-90.4	8.7	8.6
023348	Ball	7.6	5.1	5.0	20.3	19.6	26.2	11.9	-74.2	6.5	6.2
	Tracer	11.0	7.0	7.1	25.0	32.2	34.7	14.5	-71.4	8.7	9.5

Notes: Targets were fired at ranges of 100, 300, and 600 yards simultaneously.

Cartridge, 5.56-mm; ball, M193, lot RA-5027 (control).

Cartridge, 5.56-mm; tracer, XM196, lot RA-223-115 (test).

2.2.4 Analysis

Not applicable.

2.3 TRACE

2.3.1 Objective

To determine the trace characteristics of the test cartridge.

2.3.2 Method

One hundred test cartridges, at ambient temperature, were fired from each of three M16 rifles under each of three light conditions (bright daylight, overcast daylight, and night). A similar number of M62 rounds was fired from three M14 rifles under the same light conditions. This procedure was repeated with cartridges conditioned at +155°F and -65°F for 4 hours prior to firing. The distance to initiation of trace, length of trace, and visibility characteristics were determined.

2.3.3 Results

A summary of results is given in Table III.

Table III. Summary of Trace Data

Ammo Temp, °F	Avg Length of Trace, yd	Per Cent of Trace	Remarks
Weapon: M16.			Ammunition: XM196.
Weapon No.: 008625.			Light Condition: Night.
Ambient	835	99	One blind.
+155	817	98	Two delays.
- 65	820	96	Four delays.
Weapon No.: 023295.			
Ambient	830	97	Three blind.
+155	831	98	Two blind.
- 65	805	97	Two blind; one delay.
Weapon No.: 023348.			
Ambient	830	99	One blind.
+155	831	98	Two blind.
- 65	813	91	Nine delays.
Weapon No.: 008625.			
Light Condition: Overcast.			
Ambient	725	100	
+155	745	91	One blind; eight delays.
- 65	675	72	Six blind; 22 delays.
Weapon No.: 023295.			
Ambient	700	99	One blind.
+155	750	83	Three blind; 14 delays.
- 65	680	72	Nine blind; 19 delays.
Weapon No.: 023348.			
Ambient	740	97	One blind; two delays.
+155	750	78	Three blind; 19 delays.
- 65	700	59	Nineteen blind; 22 delays.

Table III (Cont'd)

Ammo Temp, °F	Avg Length of Trace, yd	Per Cent of Trace	Remarks
Weapon No.: 008625.			
Light Condition: Bright daylight.			
Ambient	-	-	Trace not visible from firing position. Barely visible at 75 yards (just a flash).
+155	^a 478	-	Trace observed from firing position. Barely visible at 75 yards.
- 65	^a 445	-	Trace observed from firing position. Not visible at other positions.
Weapon No.: 023295.			
Ambient	-	-	Trace not visible from firing position. Barely visible at 75 yards (just a flash).
+155	-	-	Trace visible intermittently at firing position and 75 yards.
- 65	^a 463	-	Trace observed from firing position.
Weapon No.: 023348.			
Ambient	-	-	Trace not visible from firing position. Barely visible at 75 yards (just a flash).
+155	-	-	Trace visible intermittently at firing and 75-yard positions.
- 65	^a 395	-	Trace observed from firing position. Not visible at other positions.
Weapon: M14.		Ammunition: M62.	
Weapon No.: 1563467.		Light Condition: Bright daylight.	
Ambient	^a 515	98	Two blinds. Trace visible from firing position, sometimes at 75- and 100-yard positions.
+155	^a 644	98	Two blinds. Trace visible from firing position, sometimes at 75- and 100-yard positions.
- 65	^a 761	96	Four blinds. Trace visible from firing position.

^aLength of trace estimated from firing position.

Table III (Cont'd)

Ammo Temp, °F	Avg Length of Trace, yd	Per Cent of Trace	Remarks
Weapon No.: 1568022.			
Ambient	^a 485	99	One blind. Trace visible from firing position, sometimes at 75- and 100-yard positions.
+155	^a 682	97	Three blinds. Trace visible from firing position, sometimes at 75- and 100-yard positions.
- 65	770	96	Four blinds.
Weapon No.: 1574901.			
Ambient	^a 465	97	Three blinds. Trace visible from firing position, sometimes at 75- and 100-yard positions.
+155	^a 570	95	Five blinds. Trace visible from firing position, sometimes at 75- and 100-yard positions.
- 65	725	99	One blind.
Weapon No.: 1563467.			
Light Condition: Overcast.			
Ambient	1020	97	Three blinds.
+155	1015	96	Four blinds.
- 65	925	90	Ten blinds.
Weapon No.: 1568022.			
Ambient	1005	95	Five blinds.
+155	1020	99	One blind.
- 65	935	89	Eleven blinds.
Weapon No.: 1574901.			
Ambient	1000	96	Four blinds.
+155	1025	97	Three blinds.
- 65	950	82	Eighteen blinds.

^aLength of trace estimated from firing position.

Table III (Cont'd)

Ammo Temp, °F	Avg Length of Trace, yd	Per Cent of Trace	Remarks
Weapon No.: 1563467.			
Light Condition: Night.			
Ambient	1000	97	Two blinds; one delay.
+155	1032	94	Four blinds; two long.
- 65	1048	91	Eight blinds; one long.
Weapon No.: 1568022.			
Ambient	1005	100	
+155	1030	99	One blind.
- 65	1057	89	Five blinds; six delays.
Weapon No.: 1574901.			
Ambient	998	94	Three blinds; three long.
+155	1025	87	Six blinds; five delays; two long.
- 65	1054	89	Six blinds; five delays.

Blind = No trace.

Delay in M62 = Trace started after 100 yards (Reference 4).

Delay in XM196 = Trace started after 75 yards (Reference 3).

Long = Trace started before 15 yards (Reference 4).

2.3.4 Analysis

Not applicable.

2.4 COOK-OFF

2.4.1 Objective

To determine the maximum number of tracer cartridges that can be safely fired from the M16 rifle without the occurrence of a premature function caused by chamber heating.

2.4.2 Method

The level, in number of rounds fired, at which a cook-off occurs was bracketed using both the tracer and ball rounds. Firing was conducted

as rapidly as possible using preloaded magazines. The time for firing and the time from insertion of the round to the cook-off were recorded.

2.4.3 Results

A summary of results is given in Table IV.

Table IV. Summary of Cook-Off Data

<u>Rifle No.</u>	<u>No. Rds Fired</u>	<u>Time to Fire Rds, sec</u>	<u>Time for Cook-Off to Occur, sec</u>
Ammunition: XM196.			
007239	119	68.9	No cook-off in 10 minutes
008651	140	69.3	No cook-off in 10 minutes
007239	140	44.0	30.7
008651	120	36.8	No cook-off in 10 minutes
007239	120	34.1	No cook-off in 10 minutes
008651	140	47.1	36.3
Ammunition: M193.			
007239	140	46.7	41.2
007239	120	36.3	No cook-off in 10 minutes
008651	120	31.9	No cook-off in 10 minutes
007239	140	51.2	42.7

2.4.4 Analysis

Not applicable.

2.5 VIBRATION

2.5.1 Objective

To determine the ability of the test cartridge to withstand vibrations caused by firing the M16 rifle.

2.5.2 Method

Five test rounds, one dummy round, and ten additional rounds were placed in a magazine. Ten rounds were fired. The dummy round was replaced in the magazine, and ten rounds were again placed on top of the dummy round and fired. This procedure was repeated until 100 rounds were fired. The five test rounds were then removed and inspected for damage. This procedure was repeated with nine additional magazines. The rounds positioned in the bottom of the magazine were fired during overcast conditions and the trace was observed.

2.5.3 Results

Visual examination of the cartridges revealed that the points of the projectiles were slightly flattened and the red identification lacquer was chipped off on the projectile tips only. This insignificant damage was caused by the projectile points impacting against the inside of the magazine when the 50 test rounds were fired, two blinds and ten tracer initiations beyond 75 yards were observed. The average length of trace was 745 yards.

2.5.4 Analysis

Not applicable.

2.6 BRUSH DEFLECTION

2.6.1 Objective

To determine the deflection characteristics of the test cartridge.

2.6.2 Method

Ten XM196 and ten M62 bullets were impacted on a 1/2-inch-diameter birch dowel pin at a range of 25 yards. The point of impact on the peg, and the path, degree of yaw, and orientation of yaw during the first 75 yards after impact on the peg were determined by means of 32 targets.

2.6.3 Results

Results are contained in Appendix I.

2.6.4 Analysis

It was agreed (because of time and expense limitations) at the initiation of the test program that the brush deflection data would not be analyzed, but would be presented in such a form that if future detailed evaluation were needed, the data in this report could readily be used. All pertinent data required for detailed evaluation are shown in Appendix I.

2.7 EROSION

2.7.1 Objective

To determine the erosion characteristics of the test cartridge.

2.7.2 Method

Six thousand rounds each of the XM196 tracer and M193 ball cartridges were fired from two M16 rifles to compare the erosion characteristics of the two cartridges. After this firing, a third rifle was fired using 3000 rounds of each cartridge (6000 total) to determine the effect of firing mixed cartridges on erosion life of the M16 rifle. The rate of fire was 20 rounds per minute. The rifles were cooled after each 100 rounds of firing.

Firing was alternated between semiautomatic and automatic fire after each 100 rounds. The rifle was disassembled and cleaned after each 1000 rounds of firing. Ball and tracer ammunition were alternated in the third rifle after each 100 rounds and an equal number of rounds of each type was fired automatically. The bores of the rifles were measured before and after the test and at 2000-round intervals. The accuracy and velocity were determined before and after the test and at 2000-round intervals. Five 10-round targets were fired from each rifle from a machine rest at a range of 100 yards in each accuracy test phase; velocity was recorded. The rifle firing both ball and tracer ammunition was fired with the tracer round and the rifles firing only ball and only tracer ammunition were fired with the same cartridge in the accuracy test phase.

2.7.3 Results

A summary of results is given in Table V.

Table V. Summary of Erosion Accuracy Targets

Average for Five Targets, in.											
Phase	MR	MID	MVD	EID	EVD	ES	CI from Line of Sight		Std Dev		Avg Vel, fps
							Hor	Vert	Hor	Vert	
Rifle No.: 007721. Type Ammunition: Ball.											
Range: 100 yards.											
Before test	1.9	1.0	1.4	4.2	6.5	7.2	3.5	8.3	1.3	2.0	3117
After 2000 rds	1.2	0.7	0.8	3.0	3.4	4.0	5.9	- 0.7	0.9	1.0	3123
After 4000 rds	1.2	0.7	0.8	3.0	3.1	3.8	3.0	2.4	0.9	1.0	3064
After 6000 rds	1.2	0.7	0.9	3.2	4.2	4.7	-2.6	1.6	0.9	1.3	3055
Rifle No.: 008651. Type Ammunition: Tracer.											
Before test	1.4	0.9	0.9	3.5	3.9	4.5	-4.3	- 2.9	1.2	1.2	3125
After 2000 rds	1.6	1.0	1.0	3.6	4.0	4.7	5.2	10.9	1.2	1.2	3108
After 4000 rds	1.3	0.8	0.9	3.3	3.9	4.3	-8.8	10.2	1.0	1.2	3045
After 6000 rds	1.6	1.0	1.0	3.7	4.2	5.0	-4.8	4.7	1.3	1.3	3030
Rifle No.: 007239.											
Before test	1.7	1.1	1.1	4.5	4.3	5.6	4.0	1.6	1.4	1.4	3138
After 2000 rds	1.6	1.0	1.0	3.3	3.8	4.4	-3.8	4.1	1.3	1.2	3111
After 4000 rds	1.5	1.0	1.0	3.3	4.0	4.7	3.6	10.2	1.1	1.3	3088
After 6000 rds	1.4	1.1	0.7	4.6	3.1	5.1	9.5	1.6	1.4	0.9	3073

2.7.4 Analysis

Not applicable.

2.8 PENETRATION

2.8.1 Objective

To determine the penetration characteristics of the test cartridge.

2.8.2 Method

A series of test cartridges were fired to impact on pine boards, steel helmets, and armor vests at ranges of 100, 300, and 600 yards. The series consisted of enough rounds to accumulate five desirable impacts on each type target at each range.

The method as outlined was repeated using the M193, 5.56-mm ball cartridge; the M80, 7.62-mm ball cartridge; and the M62, 7.62-mm tracer cartridge for comparison.

2.8.3 Results

A summary of results is given in Table VI.

Table VI. Summary of Penetration Data

<u>Round</u> <u>No.</u>	<u>Ammunition</u>
Helmets and Liners	
Range: 100 yards.	
a ₁ to 5	M62 tracer
a ₁ to 5	M80 ball
a ₁ to 5	XM196 tracer
a ₁ to 5	M193 ball
Range: 300 yards.	
a ₁ to 5	M62 tracer
a ₁ to 5	M80 ball
a ₁ to 5	XM196 tracer
a ₁ to 5	M193 ball

^aAll rounds completely perforated front and rear of helmet and liner.

Table VI (Cont'd)

<u>Round No.</u>	<u>Ammunition</u>
Range: 600 yards.	
b ₁	XM196 tracer
b ₂	XM196 tracer
c ₃	XM196 tracer
d ₄	XM196 tracer
b ₅	XM196 tracer
e ₁	M193 ball
e ₂	M193 ball
e ₃	M193 ball
b ₄	M193 ball
b ₅	M193 ball
a ₁ to 4	M62 tracer
b ₅	M62 tracer
a ₁ to 5	M80 ball

Vests

Ranges: 100, 300, and 600 yards.

All rounds (XM196, M193, M62, and M80) perforated the front of the vests at all ranges (100, 300, and 600 yards). Only the one thickness of the vest was offered as a target.

^aAll rounds completely perforated front and rear of helmet and liner.

^bRound completely penetrated front of helmet and liner and rear liner. Dented rear of helmet.

^cRound completely perforated front of helmet and liner and rear liner. Missed rear of helmet.

^dRound completely penetrated front of helmet and liner. Did not penetrate rear of liner.

^eRound dented front of helmet and broke front of helmet liner.

Table VI (Cont'd)

Penetration Test

Material: Pine boards.

Cartridge, 5.56-MM							Cartridge, 7.62-MM: NATO									
Hit	Ball, M193			Tracer, XM196			Hit	Ball, M80			Tracer, M62					
No.	C	Perf	CP	PP	C	Perf	CP	PP	C	Perf	CP	PP	C	Perf	CP	PP
Range: 100 yards.																
1	11	-	12	24	-	25	1	12	-	13	41	-	42			
2	10	-	11	24	-	25	2	12	-	13	41	-	42			
3	11	-	12	24	25	-	3	11	12	-	43	-	44			
4	10	-	11	24	-	25	4	11	-	12	41	-	42			
5	11	-	12	25	-	25	5	14	-	15	42	-	-			
Avg	11	-	12	24	25	25	Avg	12	12	13	42	-	43			
Range: 300 yards.																
1	9	-	10	17	-	18	1	11	12	-	34	35	-			
2	10	-	11	18	19	-	2	10	-	11	34	35	-			
3	20	-	21	17	-	18	3	10	11	-	35	36	-			
4	19	20	-	16	17	-	4	11	12	-	35	-	36			
5	21	-	22	18	-	19	5	11	-	12	34	35	-			
Avg	16	20	13	17	18	18	Avg	11	12	12	34	35	36			
Range: 600 yards.																
1	8	-	9	7	-	8	1	11	-	12	18	-	19			
2	8	-	9	6	-	7	2	17	-	18	20	-	21			
3	7	8	-	7	8	-	3	20	-	21	20	-	21			
4	7	8	-	8	-	9	4	11	-	12	20	-	21			
5	7	-	8	8	-	9	5	9	-	10	19	-	20			
Avg	7	8	9	7	8	8	Avg	14	-	15	19	-	20			

Legend:

- C Perf = Complete perforation, round passed completely through the board.
 CP = Complete penetration, round left a hole which light could be observed through.
 PP = Partial penetration, round entered board but did not leave a hole that light could be observed through.

2.8.4 Analysis

Greater pine-board penetration at longer ranges with the 5.56-mm and 7.62-mm ball bullets is attributed to a decrease in projectile yaw with an increase in range.

2.9 FUNCTIONING

2.9.1 Objective

To determine if the XM196 cartridge produces sufficient operating energy to insure reliable automatic functioning of the XM16E1 rifle when fired with the weapon held in various positions.

2.9.2 Method

Twenty rounds were fired semiautomatic and twenty rounds automatic using both the M193 and XM196 cartridges, in each of three weapons. The weapons were held at the following attitudes:

- a. Left side up, from the shoulder.
- b. Right side up, from the shoulder.
- c. Upside down, from the shoulder.
- d. Loosely in the hands, from the hip.
- e. Forty-five degree elevation, from the shoulder.
- f. Forty-five degree depression, from the shoulder.
- g. Ninety degree depression, from the shoulder.

2.9.3 Results

There were no malfunctions with either type ammunition with the weapons held in any one of the positions.

2.9.4 Analysis

Not applicable.

SECTION 3. APPENDICES

APPENDIX I - TEST DATA

Measurement and Weight Data

Cartridge, 5.56-MM: Ball, M193, lot RA-5027 (control).

Cartridge, 5.56-MM: Tracer, XM196, lot RA-223-115 (test).

Wt, gr					Wt, gr				
Sample No.	IMR				Sample No.	IMR			
	M193 Bullet	4475 Prop.	Primed	Complete		XM196 Bullet	4475 Prop.	Primed	Complete
			Ctg Case					Ctg	
1	54.77	24.60	93.89	173.26	1	51.85	23.97	95.35	171.17
2	54.87	24.87	94.10	173.84	2	51.85	23.96	95.68	171.49
3	54.95	24.87	93.13	172.95	3	51.66	23.98	95.21	170.85
4	54.80	24.81	94.38	173.99	4	52.03	24.04	94.97	171.04
5	55.38	25.25	93.33	173.96	5	51.92	23.98	93.39	169.29
6	54.73	25.03	94.55	174.31	6	51.97	24.08	95.09	171.14
7	54.82	24.63	95.09	174.54	7	51.74	23.85	94.49	170.08
8	54.85	24.92	94.78	174.55	8	51.62	23.90	95.36	170.88
9	54.83	25.16	96.54	176.53	9	52.16	23.93	94.80	170.89
10	54.97	24.85	94.12	173.94	10	52.00	23.99	94.95	170.94
Avg	54.90	24.90	94.39	174.19	Avg	51.88	23.97	94.93	170.78

Measurements, in.					Measurements, in.				
Sample No.	M193 Bullet		Length		Sample No.	XM196 Bullet		Length	
	Length	Diam	Primed	Complete Ctg		Length	Diam	Primed	Complete Ctg
			Ctg Case					Ctg Case	
1	0.743	0.224	1.757	2.246	1	0.877	0.224	1.756	2.249
2	.742	.224	1.756	2.248	2	.876	.224	1.756	2.248
3	.748	.224	1.755	2.245	3	.880	.224	1.755	2.246
4	.747	.224	1.757	2.246	4	.879	.224	1.755	2.246
5	.731	.224	1.756	2.246	5	.883	.224	1.755	2.249
6	.746	.224	1.757	2.246	6	.879	.224	1.754	2.250
7	.751	.224	1.758	2.250	7	.874	.224	1.755	2.248
8	.748	.224	1.760	2.246	8	.882	.224	1.755	2.248
9	.748	.224	1.757	2.246	9	.890	.224	1.755	2.246
10	.753	.224	1.755	2.247	10	.886	.224	1.754	2.249
Avg	0.746	0.224	1.757	2.247	Avg	0.881	0.224	1.755	2.248

Round-by-Round Data

Legend

S = Semiautomatic fire.
A = Automatic fire.
SS = Single shot fire.
SAT = Satisfactory.
FF = Failure to feed cartridge.
F2R = Fired two rounds automatic.
DF = Double feed.
FFR = Failure to fire cartridge.
FX = Failure to extract cartridge case.
FCB = Fired upon closing bolt without pulling trigger.

Weapons: Rifle, caliber .223, Colt, AR-15, model 02, serial No. 008625.
Rifle, caliber .223, Colt, AR-15, model 02 (XM16E1), serial No. 023295.
Rifle, caliber .223, Colt, AR-15, model 02 (XM16E1), serial No. 023348.
Rifle, caliber .223, Colt, AR-15, model 01, serial No. 007239.
Rifle, caliber .223, Colt, AR-15, model 01, serial No. 007721.
Rifle, caliber .223, Colt, AR-15, model 01, serial No. 008651.

Ammunition: Cartridge, 5.56-mm, ball, M193, lot RA-5027.
Cartridge, 5.56-mm, tracer, XM196, lot RA-223-115.

No. Rds Fired	Type of Ctg	No. of Ctg Fired	Rifle Serial No.	Rifle Rd No.	Total Rds Fired	Type of Fire	Func	Remarks
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Phase 2.2, Accuracy

Date Fired: 28 July 1964.

13	M193	13	008625	13	13	SS	SAT	Settling and locating rounds.
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Date Fired: 29 July 1964.

25	M193	38		38	38	SS	SAT	Locating rounds.
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Date Fired: 30 July 1964.

2	M193	40		40	40	SS	SAT	Warming rounds.
10	M193	50		50	50	SS	SAT	Target No. 1.
10	XM196	10		60	60	SS	SAT	Target No. 2.
10	M193	60		70	70	SS	SAT	Target No. 3.
10	XM196	20		80	80	SS	SAT	Target No. 4.

No. Rds Fired	Type of Ctg	No. of Ctg Fired	Rifle Serial No.	Rifle Rd No.	Total Rds Fired	Type of Fire	Funct	Remarks
10	M193	70		90	90	SS	SAT	Target No. 5.
10	XM196	30		100	100	SS	SAT	Target No. 6.
10	M193	80		110	110	SS	SAT	Target No. 7.
10	XM196	40		120	120	SS	SAT	Target No. 8.
10	M193	90		130	130	SS	SAT	Target No. 9.
10	XM196	50		140	140	SS	SAT	Target No. 10.

Date Fired: 31 July 1964.

46	M193	136	023295	46	186	SS	SAT	Settling and locating rounds.
21	XM196	71		67	207	SS	SAT	

Date Fired: 3 August 1964.

14	M193	150		81	221	SS	SAT	Locating rounds.
19	XM196	90		100	240	SS	SAT	

Date Fired: 4 August 1964.

10	M193	160		110	250	SS	SAT	Locating and warming rounds.
10	XM196	100		120	260	SS	SAT	
10	M193	170		130	270	SS	SAT	Target No. 11.
10	XM196	110		140	280	SS	SAT	Target No. 12.
10	M193	180		150	290	SS	SAT	Target No. 13.
10	XM196	120		160	300	SS	SAT	Target No. 14.
10	M193	190		170	310	SS	SAT	Target No. 15.
10	XM196	130		180	320	SS	SAT	Target No. 16.
10	M193	200		190	330	SS	SAT	Target No. 17.
10	XM196	140		200	340	SS	SAT	Target No. 18.
10	M193	210		210	350	SS	SAT	Target No. 19.
10	XM196	150		220	360	SS	SAT	Target No. 20.

5	M193	215	023348	5	365	SS	SAT	Settling and locating rounds.
5	XM196	155		10	370	SS	SAT	

Date Fired: 5 August 1964.

5	M193	220		15	375	SS	SAT	Locating and warming rounds.
5	XM196	160		20	380	SS	SAT	
10	M193	230		30	390	SS	SAT	Target No. 21.
10	XM196	170		40	400	SS	SAT	Target No. 22.
10	M193	240		50	410	SS	SAT	Target No. 23.
10	XM196	180		60	420	SS	SAT	Target No. 24.
10	M193	250		70	430	SS	SAT	Target No. 25.
10	XM196	190	023348	80	440	SS	SAT	Target No. 26.
10	M193	260		90	450	SS	SAT	Target No. 27.

No. Rds Fired	Type of Ctg	No. of Ctg Type Fired	Rifle Serial No.	Rifle Rd No.	Total Rds Fired	Type of Fire	Funct	Remarks
10	XM196	200		100	460	SS	SAT	Target No. 28.
10	M193	270		110	470	SS	SAT	Target No. 29.
10	XM196	210		120	480	SS	SAT	Target No. 30.

Phase 2.7, Erosion

Date Fired: 11 August 1964.

20	M193	290	007721	20	500	SS	SAT	Settling and locating rounds.
10	M193	300		30	510	SS	SAT	Target No. 31.
10		310		40	520	SS	SAT	Target No. 32.
10		320		50	530	SS	SAT	Target No. 33.
10		330		60	540	SS	SAT	Target No. 34.
10		340		70	550	SS	SAT	Target No. 35, one primer punch out.
20	XM196	230	008651	20	570	SS	SAT	Settling and locating rounds.
10	XM196	240		30	580	SS	SAT	Target No. 36.
10		250		40	590	SS	SAT	Target No. 37.
10		260		50	600	SS	SAT	Target No. 38.
10		270		60	610	SS	SAT	Target No. 39.
10		280		70	620	SS	SAT	Target No. 40.

Date Fired: 12 August 1964.

20	XM196	300	007239	20	640	SS	SAT	Settling and locating rounds.
10	XM196	310		30	650	SS	SAT	Target No. 41.
10		320		40	660	SS	SAT	Target No. 42.
10		330		50	670	SS	SAT	Target No. 43.
10		340		60	680	SS		Target No. 44.
10		350		70	690	SS		Target No. 45.
30	XM196	380	007239	100	720	S	SAT	
100		480		200	820	A	SAT	
30	M193	370	007721	100	850	S	SAT	
100		470		200	950	A	SAT	
30	XM196	510	008651	100	980	S	SAT	
100	M193	570		200	1080	A	SAT	
100	XM196	610	007239	300	1180	S	SAT	
100	M193	670	007721	300	1280	S	SAT	
100	XM196	710	008651	300	1380	S	SAT	
100	XM196	810	007239	400	1480	A	SAT	
100	M193	770	007721	400	1580	A	SAT	
100	M193	870	008651	400	1680	A	SAT	

No. Rds Fired	Type of Ctg	No. of Ctg Type Fired	Rifle Serial No.	Rifle Rd No.	Total Rds Fired	Type of Fire	Funct	Remarks
100	XM196	910	007239	500	1780	S	SAT	
100	M193	970	007721	500	1880	S	SAT	
100	XM196	1010	008651	500	1980	S	SAT	
100	XM196	1110	007239	600	2080	A	SAT	
100	M193	1070	007721	600	2180	A	SAT	
100	M193	1170	008651	600	2280	A	SAT	
100	XM196	1210	007239	700	2380	S	SAT	
100	M193	1270	007721	700	2480	S	1-FF 1-F2R	One primer punch out.
100	XM196	1310	008651	700	2580	S	SAT	
100	XM196	1410	007239	800	2680	A	SAT	
100	M193	1370	007721	800	2780	A	2-FF	
100	M193	1470	008651	800	2880	A	SAT	

Date Fired: 13 August 1964.

100	XM196	1510	007239	900	2980	S	SAT
100	M193	1570	007721	900	3080	S	SAT
100	XM196	1610	008651	900	3180	S	SAT
100	XM196	1710	007239	1000	3280	A	SAT
100	M193	1670	007721	1000	3380	A	1-DF
100	M193	1770	008651	1000	3480	A	SAT

Weapons were disassembled, cleaned, inspected, lubricated, and reassembled.

100	XM196	1810	007239	1100	3580	A	SAT
100	M193	1870	007721	1100	3680	A	SAT
100	XM196	1910	008651	1100	3780	A	SAT
100	XM196	2010	007239	1200	3880	S	SAT
100	M193	1970	007721	1200	3980	S	4-F2R
100	M193	2070	008651	1200	4080	S	SAT
100	XM196	2110	007239	1300	4180	A	SAT
100	M193	2170	007721	1300	4280	A	SAT
100	XM196	2210	008651	1300	4380	A	SAT
100	XM196	2310	007239	1400	4480	S	SAT
100	M193	2270	007721	1400	4580	S	3-F2R
100	M193	2370	008651	1400	4680	S	SAT
100	XM196	2410	007239	1500	4780	A	SAT
100	M193	2470	007721	1500	4880	A	SAT
100	XM196	2510	008651	1500	4980	A	SAT
100	XM196	2610	007239	1600	5080	S	SAT
100	M193	2570	007721	1600	5180	S	2-F2R
100	M193	2670	008651	1600	5280	S	SAT

No. Rds Fired	Type of Ctg	No. of Ctg Type Fired	Rifle Serial No.	Rifle Rd No.	Total Rds Fired	Type of Fire	Funct	Remarks
100	XM196	2710	007239	1700	5380	A	2-DF	Caused by magazine.
100	M193	2770	007721	1700	5480	A	SAT	
100	XM196	2810	008651	1700	5580	A	SAT	
100	XM196	2910	007239	1800	5680	S	SAT	
100	M193	2870	007721	1800	5780	S	4-F2R	
100	M193	2970	008651	1800	5880	S	SAT	
100	XM196	3010	007239	1900	5980	A	SAT	
100	M193	3070	007721	1900	6080	A	SAT	
100	XM196	3110	008651	1900	6180	A	SAT	
100	XM196	3210	007239	2000	6280	S	SAT	
100	M193	3170	007721	2000	6380	S	1-DF 8-F2R	
100	M193	3270	008651	2000	6480	S	SAT	

Weapons were disassembled, cleaned, inspected, lubricated, and reassembled. Barrels were star-gaged after firing 2000 rounds through each.

Date Fired: 14 August 1964.

10	XM196	3220	007239	2010	6490	SS	SAT	Settling and locating rounds.
10	XM196	3230		2020	6500	SS	SAT	Target No. 46.
10		3240		2030	6510	SS	SAT	Target No. 47.
10		3250		2040	6520	SS	SAT	Target No. 48.
10		3260		2050	6530	SS	SAT	Target No. 49.
10		3270		2060	6540	SS	SAT	Target No. 50.
10	M193	3280	007721	2010	6550	SS	SAT	Settling and locating rounds.
10	M193	3290		2020	6560	SS	SAT	Target No. 51.
10		3300		2030	6570	SS	SAT	Target No. 52.
10		3310		2040	6580	SS	SAT	Target No. 53.
10		3320		2050	6590	SS	SAT	Target No. 54.
10		3330		2060	6600	SS	SAT	Target No. 55.
10	XM196	3280	008651	2010	6610	SS	SAT	Settling and locating rounds.
10	XM196	3290		2020	6620	SS	SAT	Target No. 56.
10		3300		2030	6630	SS	SAT	Target No. 57.
10		3310		2040	6640	SS	SAT	Target No. 58.
10		3320		2050	6650	SS	SAT	Target No. 59.
10		3330		2060	6660	SS	SAT	Target No. 60.
40	XM196	3370	007239	2100	6700	S	SAT	
100		3470		2200	6800	A	SAT	
40	M193	3370	007721	2100	6840	S	2-F2R	
100		3470		2200	6940	A	SAT	

No. Rds Fired	Type of Ctg	No. of Ctg Type Fired	Rifle Serial No.	Rifle Rd No.	Total Rds Fired	Type of Fire	Funct	Remarks
40	XM196	3510	008651	2100	6980	S	SAT	
100	M193	3570		2200	7080	A	SAT	

Date Fired: 17 August 1964.

100	XM196	3610	007239	2300	7180	S	SAT	
100	M193	3670	007721	2300	7280	S	12-F2R	
100	XM196	3710	008651	2300	7380	S	SAT	
100	XM196	3810	007239	2400	7480	A	SAT	
100	M193	3770	007721	2400	7580	A	SAT	
100	M193	3870	008651	2400	7680	A	SAT	
100	XM196	3910	007239	2500	7780	S	SAT	
100	M193	3970	007721	2500	7880	S	3-F2R	
100	XM196	4010	008651	2500	7980	S	SAT	
100	XM196	4110	007239	2600	8080	A	SAT	
100	M193	4070	007721	2600	8180	A	SAT	
100	M193	4170	008651	2600	8280	A	SAT	
100	XM196	4210	007239	2700	8380	S	SAT	
100	M193	4270	007721	2700	8480	S	5-F2R	
100	XM196	4310	008651	2700	8580	S	1-DF	
100	XM196	4410	007239	2800	8680	A	1-FFR	Light blow on primer.
100	M193	4370	007721	2800	8780	A	SAT	
100	M193	4470	008651	2800	8880	A	SAT	
100	XM196	4510	007239	2900	8980	S	SAT	
100	M193	4570	007721	2900	9080	S	4-F2R	
100	XM196	4610	008651	2900	9180	S	SAT	
100	XM196	4710	007239	3000	9280	A	SAT	
100	M193	4670	007721	3000	9380	A	SAT	
100	M193	4770	008651	3000	9480	A	SAT	

Weapons were disassembled, cleaned, inspected, lubricated, and reassembled.

100	XM196	4810	007239	3100	9580	A	SAT	
100	M193	4870	007721	3100	9680	A	SAT	
100	XM196	4910	008651	3100	9780	A	SAT	
100	XM196	5010	007239	3200	9880	S	SAT	
100	M193	4970	007721	3200	9980	S	17-F2R	One primer punch out.
100	M193	5070	008651	3200	10080	S	SAT	
100	XM196	5110	007239	3300	10180	A	SAT	
100	M193	5170	007721	3300	10280	A	SAT	
100	XM196	5210	008651	3300	10380	A	SAT	
100	XM196	5310	007239	3400	10480	S	SAT	
100	M193	4270	007721	3400	10580	S	SAT	
100	M193	5370	008651	3400	10680	S	SAT	

No. Rds Fired	Type of Ctg	No. of Ctg Fired	Rifle Serial No.	Rifle Rd No.	Total Rds Fired	Type of Fire	Func	Remarks
100	XM196	5410	007239	3500	10780	A	SAT	
100	M193	5470	007721	3500	10880	A	SAT	
100	XM196	5510	008651	3500	10980	A	SAT	
Date Fired: 18 August 1964.								
100	XM196	5610	007239	3600	11080	S	SAT	
100	M193	5570	007721	3600	11180	S	7-F2R	
100	M193	5670	008651	3600	11280	S	SAT	
100	XM196	5710	007239	3700	11380	A	SAT	
100	M193	5770	007721	3700	11480	A	SAT	
100	XM196	5810	008651	3700	11580	A	SAT	
100	XM196	5910	007239	3800	11680	S	SAT	
100	M193	5870	007721	3800	11780	S	2-F2R	
100	M193	5970	008651	3800	11880	S	SAT	
100	XM196	6010	007239	3900	11980	A	3-FFR	Light blows on primers.
100	M193	6070	007721	3900	12080	A	SAT	
100	XM196	6110	008651	3900	12180	A	1-DF	
100	XM196	6210	007239	4000	12280	S	SAT	
100	M193	6170	007721	4000	12380	S	1-F2R	
100	M193	6270	008651	4000	12480	S	SAT	

Weapons were disassembled, cleaned, inspected, lubricated, and reassembled. Barrels were star-gaged after firing 4000 rounds through each.

Date Fired: 1 August 1964.

10	XM196	6220	007239	4010	12490	SS	SAT	Settling and locating rounds.
10	XM196	6230		4020	12500	SS	SAT	Target No. 61.
10		624		4030	12510	SS	SAT	Target No. 62.
10		625		4040	12520	SS	SAT	Target No. 63.
10		626		4050	12530	SS	SAT	Target No. 64.
10		6270		4060	12540	SS	SAT	Target No. 65.
10	M193	6280	007721	4010	12550	SS	SAT	Settling and locating rounds.
10	M193	6290		4020	12560	SS	SAT	Target No. 66.
10		6300		4030	12570	SS	SAT	Target No. 67.
10		6310		4040	12580	SS	SAT	Target No. 68.
10		6320		4050	12590	SS	SAT	Target No. 69.
10		6330		4060	12600	SS	SAT	Target No. 70.
10	XM196	6280	008651	4010	12610	SS	SAT	Settling and locating rounds.
10	XM196	6290		4020	12620	SS	SAT	Target No. 71.
10		6300		4030	12630	SS	SAT	Target No. 72.

No. Rds Fired	Type of Ctg	No. of Ctg Type Fired	Rifle Serial No.	Rifle Rd No.	Total Rds Fired	Type of Fire	Funct	Remarks
10		6310		4040	12640	SS	SAT	Target No. 73.
10		6320		4050	12650	SS	SAT	Target No. 74.
10		6330		4060	12660	SS	SAT	Target No. 75.
40	XM196	6370	007239	4100	12700	S	SAT	
100		6470		4200	12800	A	1-DF	
40	M193	6370	007721	4100	12840	S	3-F2R	
100		6470		4200	12940	A	SAT	
40	XM196	6510	008651	4100	12980	S	SAT	
100	M193	6570		4200	13080	A	SAT	
100	XM196	6610	007239	4300	13180	S	SAT	
100	M193	6670	007721	4300	13280	S	2-F2R	
100	XM196	6710	008651	4300	13380	S	SAT	
100	XM196	6810	007239	4400	13480	A	SAT	
100	M193	6770	007721	4400	13580	A	SAT	
100	M193	6870	008651	4400	13680	A	SAT	
100	XM196	6910	007239	4500	13780	S	SAT	
100	M193	6970	007721	4500	13880	S	2-F2R	
100	XM196	7010	008651	4500	13980	S	SAT	
100	XM196	7110	007239	4600	14080	A	SAT	
100	M193	7070	007721	4600	14180	A	SAT	
100	M193	7170	008651	4600	14280	A	SAT	
100	XM196	7210	007239	4700	14380	S	SAT	
100	M193	7270	007721	4700	14480	S	4-F2R	
100	XM196	7310	008651	4700	14580	S	SAT	
100	XM196	7410	007239	4800	14680	A	SAT	
100	M193	7370	007721	4800	14780	A	1-FFR	Light blows on primer.
100	M193	7470	008651	4800	14880	A	SAT	

Date Fired: 20 August 1964.

100	XM196	7510	007239	4900	14980	S	SAT
100	M193	7570	007721	4900	15080	S	2-F2R
100	XM196	7610	008651	4900	15180	S	SAT
100	XM196	7710	007239	5000	15280	A	SAT
100	M193	7670	007721	5000	15380	A	SAT
100	M193	7770	008651	5000	15480	A	SAT

Weapons were disassembled, cleaned, inspected, lubricated, and reassembled.

100	XM196	7810	007239	5100	15580	A	SAT
100	M193	7870	007721	5100	15680	A	SAT
100	XM196	7910	008651	5100	15780	A	SAT
100	XM196	8010	007239	5200	15880	S	SAT
100	M193	7970	007721	5200	15980	S	1-F2R
100	M193	8070	008651	5200	16080	S	SAT

No. Rds Fired	Type of Ctg	No. of Ctg Fired	Rifle Serial No.	Rifle Rd No.	Total Rds Fired	Type of Fire	Funct	Remarks
100	XM196	8110	007239	5300	16180	A	SAT	
100	M193	8170	007721	5300	16280	A	1-FFR	Light blows on primer.
100	XM196	8210	008651	5300	16380	A	SAT	
100	XM196	8310	007239	5400	16480	S	SAT	
100	M193	8270	007721	5400	16580	S	SAT	
100	M193	8370	008651	5400	16680	S	SAT	
100	XM196	8410	007239	5500	16780	A	SAT	
100	M193	8470	007721	5500	16880	A	1-FX	Replaced broken extractor.
100	XM196	8510	008651	5500	16980	A	SAT	
100	XM196	8610	007239	5600	17080	S	SAT	
100	M193	8570	007721	5600	17180	S	1-DF 1-FFR	Light blows on primer.
100	M193	8670	008651	5600	17280	S	SAT	
100	XM196	8710	007239	5700	17380	A	SAT	
100	M193	8770	007721	5700	17480	A	SAT	
100	XM196	8810	008651	5700	17580	A	SAT	
100	XM196	8910	007239	5800	17680	S	SAT	
100	M193	8870	007721	5800	17780	S	SAT	
100	M193	8970	008651	5800	17880	S	SAT	
100	XM196	9010	007239	5900	17980	A	SAT	
100	M193	9070	007721	5900	18080	A	SAT	
100	M193	9170	008651	5900	18180	A	SAT	
40	XM196	9050	007239	5940	18220	S	SAT	
40	M193	9210	007721	5940	18260	S	SAT	
40	XM196	9090	008651	5940	18300	S	SAT	

Date Fired: 21 August 1964.

10	XM196	9100	007239	5950	18310	SS	SAT	Settling and locating rounds.
10	XM196	9110		5960	18320	SS	SAT	Target No. 76.
10		9120		5970	18330	SS	SAT	Target No. 77.
10		9130		5980	18340	SS	SAT	Target No. 78.
10		9140		5990	18350	SS	SAT	Target No. 79.
10		9150		6000	18360	SS	SAT	Target No. 80.
10	M193	9220	007721	5950	18370	SS	SAT	Settling and locating rounds.
10	M193	9230		5960	18380	SS	SAT	Target No. 81.
10		9240		5970	18390	SS	SAT	Target No. 82.
10		9250		5980	18400	SS	SAT	Target No. 83.
10		9260		5990	18410	SS	SAT	Target No. 84.
10		9270		6000	18420	SS	SAT	Target No. 85.

No. Rds Fired	Type of Ctg	No. of Ctg Type Fired	Rifle Serial No.	Rifle Rd No.	Total Rds Fired	Type of Fire	Funct	Remarks
10	XM196	9160	008651	5950	18430	SS	SAT	Settling and locating rounds.
10	XM196	9170		5960	18440	SS	SAT	Target No. 86.
10		9180		5970	18450	SS	SAT	Target No. 87.
10		9190		5980	18460	SS	SAT	Target No. 88.
10		9200		5990	18470	SS	SAT	Target No. 89.
10		9210		6000	18480	SS	SAT	Target No. 90.

Weapons were disassembled, cleaned, inspected, lubricated, and reassembled. Barrels were star-gaged after firing 6000 rounds through each.

Phase 2.5, Vibration

Date Fired: 25 August 1964.

100	XM196	9310	007239	6100	18580	A	3-FFR	Fired from ten magazines. Light blows on primers.
100		9410	007721	6100	18680	A	SAT	
100		9510	008651	6100	18780	A	SAT	
100		9610	007239	6200	18880	A	3-FFR	Light blows on primers.
100		9710	007721	6200	18980	A	7-FFR	Light blows on primers.
100		9810	008651	6200	19080	A	SAT	
100		9910	007239	6300	19180	A	2-FFR	Light blows on primers.
100		10010	007721	6300	19280	A	20-FFR	Light blows on primers.
100		10110	008651	6300	19380	A	SAT	
100		10210	007239	6400	19480	A	1-FFR	Light blows on primers.

Visual examination of the cartridge revealed that the points of the projectiles were slightly flattened and the red identification lacquer was chipped off the projectile tips only. This insignificant damage was caused by the projectile points impacting against the inside of the magazine.

Phase 2.4, Cook-Off

Date Fired: 25 August 1964.

6	XM196	10216	008651	6306	19486	A	1-FFR
120		10336	007239	6520	19606	A	SAT

Fired 119 rounds in 68.9 seconds. No cook-off occurred in 10 minutes.

No. Rds Fired	Type of Ctg	No. of Ctg Fired	Rifle Serial No.	Rifle Rd No.	Total Rds Fired	Type of Fire	Funct	Remarks
141		10477	008651	6447	19747	A	SAT	
Fired 141 rounds in 72.4 seconds. Fired cook-off round erroneously.								
141		10618	008651	6588	19888	A	SAT	
Fired 140 rounds in 69.3 seconds. No cook-off occurred in 10 minutes.								
141		10759	007239	6661	20029	A	SAT	
Fired 140 rounds in 44.0 seconds. Cook-off occurred in 30.7 seconds.								
121		10880	008651	6709	20150	A	SAT	
Fired 120 rounds in 36.8 seconds. No cook-off occurred in 10 minutes.								
121		11001	007239	6782	20271	A	SAT	
Fired 120 rounds in 34.1 seconds. No cook-off occurred in 10 minutes.								
141		11142	008651	6850	20412	A	SAT	
Fired 140 rounds in 47.1 seconds. Cook-off occurred in 36.3 seconds.								
Date Fired: 26 August 1964.								
141	M193	9411	007239	6923	20553	A	SAT	Five-stretched cases.
Fired 140 rounds in 46.7 seconds. Cook-off occurred in 41.2 seconds.								
5		9416	008651	6855	20558	A	FCB	
Fired automatically on closing bolt.								
121		9537	007239	7044	20679	A	SAT	Three-stretched cases.
Fired 120 rounds in 36.3 seconds. No cook-off occurred in 10 minutes.								
121	M193	9658	008651	6976	20800	A	SAT	Five-stretched cases.
Fired 120 rounds in 31.9 seconds. No cook-off occurred in 10 minutes.								
141		9799	007239	7185	20941	A	SAT	Two-stretched cases.
Fired 140 rounds in 51.2 seconds. Cook-off occurred in 42.7 seconds.								
A cook-off will probably occur with both the XM196 tracer and M193 ball cartridges if more than 120 rounds are fired rapidly.								

Brush Deflection Data

Date: 30 September 1964.
 Weapon No.: M14, serial No. 1563467.
 Cartridge: 7.62-mm, M62.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 1.
 Velocity at 25 Feet, fps: 2857.
 Velocity at 55 Feet, fps: 2829.
 Bullet Hole in Peg: Vertical -
 Horizontal -

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	a 3.5 in.	-0.5	0.7		
2	3 in.	-0.5	0.8		
3	1 ft	-0.3	0.8		
4	2 ft	-0.4	0.7	0.3	210
5	3 ft	-0.4	0.7	0.3	241
6	4 ft	-0.4	0.8	0.4	268
7	5 ft	-0.3	0.8	0.4	297
8	6 ft	-0.4	0.8	0.4	322
9	7 ft	-0.3	0.8	0.4	344
10	8 ft	-0.3	0.9	0.4	7
11	9 ft	-0.5	0.9		
12	10 ft	-0.4	0.9		
13	11 ft	-0.4	0.9		
14	12 ft	-0.4	0.9		
15	13 ft	-0.4	0.9		
16	14 ft	-0.3	0.9		
17	15 ft	-0.3	0.8		
18	16 ft	-0.3	0.9		
19	17 ft	-0.4	0.8		
20	18 ft	-0.1	0.8		
21	19 ft	-0.1	0.8		
22	20 ft	-0.1	0.7		
23	40 ft	-0.9	1.1		
24	60 ft	1.2	2.0		
25	80 ft	1.1	3.7		
26	100 ft	2.1	1.9		
27	120 ft	2.5	3.0		
28	140 ft	2.6	3.4		
29	160 ft	3.1	3.5		
30	180 ft	3.6	4.0		
31	200 ft	3.9	4.7		
32	225 ft	3.4	4.2		

aIn front of peg.

bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 30 September 1964.
 Weapon No.: M14, serial No. 1563467.
 Cartridge: 7.62-mm, M62.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 2.
 Velocity at 25 Feet, fps: 2865.
 Velocity at 55 Feet, fps: 2837.
 Bullet Hole in Peg: Vertical -
 Horizontal -

Target No.	Distance Peg to Target		Bullet from Index Point, in.		Bullet Hole	
			Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5	in.	-0.6	-1.3		
2	3	in.	-0.6	-1.2		
3	1	ft	-0.5	-1.2		
4	2	ft	-0.5	-1.2		
5	3	ft	-0.4	-1.1	0.3	55
6	4	ft	-0.4	-1.0	0.3	68
7	5	ft	-0.5	-1.0	0.3	91
8	6	ft	-0.6	-1.0	0.4	123
9	7	ft	-0.7	-1.1	0.4	136
10	8	ft	-0.7	-1.2	0.4	153
11	9	ft	-0.6	-1.3		
12	10	ft	-0.6	-1.4		
13	11	ft	-0.5	-1.4		
14	12	ft	-0.5	-1.4		
15	13	ft	-0.4	-1.4		
16	14	ft	-0.4	-1.4		
17	15	ft	-0.3	-1.5		
18	16	ft	-0.4	-1.4	0.3	139
19	17	ft	-0.5	-1.6	0.4	170
20	18	ft	-0.5	-1.7	0.4	185
21	19	ft	-0.4	-1.8	0.4	206
22	20	ft	-0.4	-1.9	0.4	237
23	40	ft	0.8	-2.4	0.3	305
24	60	ft	1.3	-1.8		
25	80	ft	1.2	-0.5		
26	100	ft	2.1	-2.9		
27	120	ft	2.6	-2.5		
28	140	ft	2.8	-2.6		
29	160	ft	3.4	-2.9		
30	180	ft	4.0	-3.1		
31	200	ft	4.3	-2.8		
32	225	ft	3.8	-4.0		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 30 September 1964.
 Weapon No.: M14, serial No. 1563467.
 Cartridge: 7.62-mm, M62.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 3.
 Velocity at 25 Feet, fps: 2841.
 Velocity at 55 Feet, fps: 2813.
 Bullet Hole in Peg: Vertical -
 Horizontal -

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-2.0	-0.8		
2	3 in.	-2.0	-0.8		
3	1 ft	-1.9	-0.7		
4	2 ft	-1.9	-0.7		
5	3 ft	-1.8	-0.7		
6	4 ft	-1.8	-0.7		
7	5 ft	-2.0	-0.7		
8	6 ft	-2.0	-0.6		
9	7 ft	-2.0	-0.8		
10	8 ft	-2.0	-0.8		
11	9 ft	-2.0	-0.8		
12	10 ft	-2.0	-0.8		
13	11 ft	-2.0	-0.8		
14	12 ft	-2.0	-0.8		
15	13 ft	-1.9	-0.8		
16	14 ft	-1.9	-0.9		
17	15 ft	-1.9	-0.9		
18	16 ft	-1.9	-0.9		
19	17 ft	-1.9	-1.0		
20	18 ft	-1.9	-0.9		
21	19 ft	-1.9	-1.0		
22	20 ft	-1.9	-1.0		
23	40 ft	-1.5	-1.2		
24	60 ft	-1.6	-0.8		
25	80 ft	-2.0	-0.5		
26	100 ft	-1.5	-1.6		
27	120 ft	-1.6	-1.2		
28	140 ft	-1.8	-1.4		
29	160 ft	-1.6	-1.5		
30	180 ft	-1.6	-1.5		
31	200 ft	-1.8	-1.4		
32	225 ft	-2.7	-2.4		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 30 September 1964.
 Weapon No.: M14, serial No. 1563467.
 Cartridge: 7.62-mm, M62.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 4.
 Velocity at 25 Feet, fps: 2857.
 Velocity at 55 Feet, fps: 2833.
 Bullet Hole in Peg: Vertical -
 Horizontal -

Target No.	Distance Peg to Target		Bullet from Index Point, in.		Bullet Hole	
			Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5	in.	0	-0.9		
2	3	in.	0.1	-0.8	0.3	21
3	1	ft	0.3	-0.7	0.4	36
4	2	ft	0.3	-0.6	0.4	52
5	3	ft	0.1	-0.5	0.4	78
6	4	ft	0	-0.5	0.4	105
7	5	ft	-0.1	-0.5	0.4	127
8	6	ft	-0.2	-0.7	0.4	156
9	7	ft	0	-0.8		
10	8	ft	0	-0.8		
11	9	ft	0	-0.8		
12	10	ft	0.1	-0.8		
13	11	ft	0	-0.8		
14	12	ft	0.1	-0.6	0.3	90
15	13	ft	0.1	-0.6	0.4	105
16	14	ft	-0.1	-0.7	0.4	133
17	15	ft	0	-0.8	0.4	154
18	16	ft	0	-1.0	0.4	181
19	17	ft	0	-1.1	0.4	209
20	18	ft	0.2	-1.0		
21	19	ft	0.2	-1.1		
22	20	ft	0.2	-1.1		
23	40	ft	1.1	-1.6		
24	60	ft	1.9	-1.4		
25	80	ft	2.0	0.1		
26	100	ft	2.9	-2.2		
27	120	ft	3.5	-1.8		
28	140	ft	3.8	-2.0		
29	160	ft	4.4	-2.2		
30	180	ft	5.1	-2.5		
31	200	ft	5.6	-2.2		
32	225	ft	5.1	-3.3		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 30 September 1964.
 Weapon No.: M14, serial No. 1563467.
 Cartridge: 7.62-mm, M62.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 5.
 Velocity at 25 Feet, fps: 2857.
 Velocity at 55 Feet, fps: 2833.
 Bullet Hole in Peg: Vertical -
 Horizontal -

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-1.4	0.8		
2	3 in.	-1.3	0.9		
3	1 ft	-1.2	0.9		
4	2 ft	-1.2	0.9		
5	3 ft	-1.2	0.9		
6	4 ft	-1.2	0.9		
7	5 ft	-1.3	1.0		
8	6 ft	-1.3	1.0		
9	7 ft	-1.3	0.9		
10	8 ft	-1.3	0.9		
11	9 ft	-1.3	0.9		
12	10 ft	-1.3	0.9		
13	11 ft	-1.3	0.9		
14	12 ft	-1.2	0.9		
15	13 ft	-1.2	1.0		
16	14 ft	-1.1	1.0		
17	15 ft	-1.0	1.0		
18	16 ft	-1.0	1.0		
19	17 ft	-1.0	0.9		
20	18 ft	-1.0	1.0		
21	19 ft	-1.0	1.0		
22	20 ft	-1.0	0.9		
23	40 ft	-0.7	1.4		
24	60 ft	-0.7	1.9		
25	80 ft	-0.8	3.6		
26	100 ft	-0.3	2.1		
27	120 ft	-0.5	2.9		
28	140 ft	-0.6	3.0		
29	160 ft	-0.3	3.4		
30	180 ft	-0.3	3.7		
31	200 ft	-0.3	4.2		
32	225 ft	-1.1	3.8		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 30 September 1964.
 Weapon No.: M14, serial No. 1563467.
 Cartridge: 7.62-mm, M62.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 6.
 Velocity at 25 Feet, fps: 2845.
 Velocity at 55 Feet, fps: 2825.
 Bullet Hole in Peg: Vertical - +2.90.
 Horizontal - +0.10.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	a 3.5 in.	-2.7	0		
2	3 in.	-2.7	0		
3	1 ft	-2.4	0.2	0.4	75
4	2 ft	-2.4	0.3	0.4	106
5	3 ft	-2.5	0.3	0.5	130
6	4 ft	-2.5	0.3	0.6	154
7	5 ft	-2.5	0.3	0.6	179
8	6 ft	-2.5	0.3	0.5	202
9	7 ft	-2.4	0.3	0.4	228
10	8 ft	-2.3	0.3	0.3	250
11	9 ft	-2.2	0.5		
12	10 ft	-2.2	0.5		
13	11 ft	-2.3	0.6		
14	12 ft	-2.3	0.8	0.4	143
15	13 ft	-2.4	0.8	0.5	167
16	14 ft	-2.4	0.7	0.5	192
17	15 ft	-2.3	0.6	0.5	214
18	16 ft	-2.3	0.6	0.5	237
19	17 ft	-2.4	0.7	0.4	263
20	18 ft	-2.4	0.9		
21	19 ft	-2.4	0.9		
22	20 ft	-2.5	0.9		
23	40 ft	-4.0	0.1		
24	60 ft	-4.7	- 1.6		
25	80 ft	-4.5	- 1.6		
26	100 ft	-3.9	- 3.8		
27	120 ft	-4.8	- 3.9		
28	140 ft	-5.6	- 5.3		
29	160 ft	-5.4	- 6.6		
30	180 ft	-5.4	- 7.3		
31	200 ft	-6.1	- 7.8		
32	225 ft	-7.6	-10.3		

aIn front of peg.

bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 30 September 1964.

Weapon No.: M14, serial No. 1563467.

Cartridge: 7.62-mm, M62.

Distance from Rifle to Peg: 25 yards.

Diameter of Peg: 1/2 inch.

Type of Wood: Birch.

Round No.: 7.

Velocity at 25 Feet, fps: 2853.

Velocity at 55 Feet, fps: 2825.

Bullet Hole in Peg: Vertical - +4.60.

Horizontal - +0.20.

Target No.	Distance Peg to Target		Bullet from Index Point, in.		Bullet Hole	
			Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a	3.5 in.	- 0.9	- 0.1		
2		3 in.	- 0.9	- 0.1		
3		1 ft	- 0.7	- 0.3	0.4	292
4		2 ft	- 0.6	- 0.4	0.6	311
5		3 ft	- 0.4	- 0.5	0.8	330
6		4 ft	- 0.2	- 0.4	0.9	352
7		5 ft	- 0.2	- 0.4	0.9	17
8		6 ft	- 0.1	- 0.3	0.8	38
9		7 ft	- 0.1	- 0.4	0.7	60
10		8 ft	- 0.1	- 0.6	0.4	78
11		9 ft	0	- 0.8		
12		10 ft	0.3	- 0.9	0.4	315
13		11 ft	0.6	- 1.0	0.6	334
14		12 ft	0.9	- 1.0	0.8	355
15		13 ft	1.2	- 0.9	0.8	18
16		14 ft	1.4	- 0.8	0.9	43
17		15 ft	1.6	- 0.9	0.8	61
18		16 ft	1.8	- 0.9	0.6	83
19		17 ft	1.9	- 1.1	0.4	103
20		18 ft	2.3	- 1.2		
21		19 ft	2.5	- 1.2		
22		20 ft	3.1	- 1.3	0.6	1
23		40 ft	10.1	1.3	0.8	96
24		60 ft	Missed			
25		80 ft	20.2	17.3		
26		100 ft	20.4	21.7	0.6	240
27		120 ft	20.9	25.5	0.6	354
28		140 ft	23.2	28.4		
29		160 ft	Missed			
30		180 ft	Missed			
31		200 ft	Missed			
32		225 ft	Missed			

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 30 September 1964.

Weapon No.: M14, serial No. 1563467.

Cartridge: 7.62-mm, M62.

Distance from Rifle to Peg: 25 yards.

Diameter of Peg: 1/2 inch.

Type of Wood: Birch.

Round No.: 8.

Velocity at 25 Feet, fps: 2861.

Velocity at 55 Feet, fps: 2841.

Bullet Hole in Peg: Vertical - +2.50.
Horizontal - -0.35.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-3.1	0.5		
2	3 in.	-3.0	0.5		
3	1 ft	-2.9	0.5		
4	2 ft	-2.9	0.5		
5	3 ft	-2.9	0.6		
6	4 ft	-2.9	0.6		
7	5 ft	-3.0	0.6		
8	6 ft	-3.0	0.6		
9	7 ft	-3.0	0.5		
10	8 ft	-3.0	0.5		
11	9 ft	-3.0	0.5		
12	10 ft	-3.0	0.6		
13	11 ft	-3.0	0.5		
14	12 ft	-2.9	0.7		
15	13 ft	-2.9	0.7		
16	14 ft	-2.8	0.7		
17	15 ft	-2.8	0.8		
18	16 ft	-2.8	0.8		
19	17 ft	-2.9	0.8		
20	18 ft	-2.8	0.8		
21	19 ft	-2.8	0.8		
22	20 ft	-2.8	0.8		
23	40 ft	-3.3	1.5		
24	60 ft	-3.8	1.7		
25	80 ft	-4.0	3.5		
26	100 ft	-4.0	2.3		
27	120 ft	-4.7	3.0		
28	140 ft	-4.8	3.1		
29	160 ft	-5.0	3.7		
30	180 ft	-5.5	4.0		
31	200 ft	-5.7	4.4		
32	225 ft	-7.0	4.3		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 1 October 1964.

Weapon No.: M14, serial No. 1563467.

Cartridge: 7.62-mm, M62.

Distance from Rifle to Peg: 25 yards.

Diameter of Peg: 1/2 inch.

Type of Wood: Birch.

Round No.: 9.

Velocity at 25 Feet, fps: 2857.

Velocity at 55 Feet, fps: 2829.

Bullet Hole in Peg: Vertical - +4.75.
Horizontal - +0.15.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	- 0.8	- 0.1		
2	3 in.	- 0.8	0		
3	1 ft	- 0.7	- 0.2	0.4	297
4	2 ft	- 0.5	- 0.3	0.6	313
5	3 ft	- 0.4	- 0.3	0.7	337
6	4 ft	- 0.3	- 0.2	0.8	2
7	5 ft	- 0.2	- 0.2	0.8	25
8	6 ft	- 0.3	- 0.1	0.8	49
9	7 ft	- 0.3	- 0.2	0.6	70
10	8 ft	- 0.3	- 0.4	0.4	90
11	9 ft	- 0.2	- 0.5		
12	10 ft	0	- 0.6	0.3	322
13	11 ft	0.2	- 0.6	0.5	341
14	12 ft	0.5	- 0.5	0.7	2
15	13 ft	0.7	- 0.4	0.8	27
16	14 ft	0.8	- 0.3	0.8	51
17	15 ft	0.9	- 0.3	0.7	71
18	16 ft	1.0	- 0.3	0.6	94
19	17 ft	1.0	- 0.5	0.5	117
20	18 ft	1.4	- 0.5		
21	19 ft	- 1.5	- 0.5		
22	20 ft	- 2.0	- 0.5	0.5	6
23	40 ft	6.5	3.0	0.7	106
24	60 ft	9.4	9.1	0.6	201
25	80 ft	9.3	17.6		
26	100 ft	8.0	20.0		
27	120 ft	7.8	22.6	0.5	345
28	140 ft	9.3	25.9	0.5	97
29	160 ft	10.9	30.4	0.4	210
30	180 ft	11.4	35.2		
31	200 ft	-	-		
32	225 ft	11.5	41.9		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 1 October 1964.
 Weapon No.: M14, serial No. 1563467.
 Cartridge: 7.62-mm, M62.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 10.
 Velocity at 25 Feet, fps: 2857.
 Velocity at 55 Feet, fps: 2833.
 Bullet Hole in Peg: Vertical - +2.25.
 Horizontal - -0.30.

Target No.	Distance Peg to Target		Bullet from Index Point, in.		Bullet Hole	
			Vert	Hor	Length ^a , in.	Orientation ^b , deg
1	^a 3.5	in.	- 3.4	0.4		
2	3	in.	- 3.3	0.4		
3	1	ft	- 3.1	0.7	0.5	107
4	2	ft	- 3.3	0.9	0.7	135
5	3	ft	- 3.5	1.0	0.8	164
6	4	ft	- 3.5	1.0	0.9	191
7	5	ft	- 3.5	1.1	0.8	217
8	6	ft	- 3.4	1.2	0.7	245
9	7	ft	- 3.3	1.4	0.5	275
10	8	ft	- 3.4	1.7		
11	9	ft	- 3.5	1.9		
12	10	ft	- 3.6	2.2	0.5	135
13	11	ft	- 3.9	2.4	0.7	163
14	12	ft	- 4.1	2.4	0.8	190
15	13	ft	- 4.1	2.3	0.9	217
16	14	ft	- 4.2	2.3	0.8	245
17	15	ft	- 4.1	2.4	0.7	270
18	16	ft	- 4.2	2.6	0.6	298
19	17	ft	- 4.5	2.8		
20	18	ft	- 4.6	3.0		
21	19	ft	- 5.0	3.2	0.5	159
22	20	ft	- 5.3	3.1	0.7	189
23	40	ft	- 9.5	1.6	0.8	304
24	60	ft	-13.4	- 3.1		
25	80	ft	-14.0	- 8.4	0.6	340
26	100	ft	-11.7	-15.2	0.6	108
27	120	ft	- 8.5	-28.4		
28	140	ft	- 7.1	-19.3	0.5	162
29	160	ft	- 5.3	-20.7	0.4	309
30	180	ft	- 8.6	-23.5		
31	200	ft	- 8.4	-27.2	0.4	2
32	225	ft	- 8.4	-31.6		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 1 October 1964.

Weapon No.: M14, serial No. 1563467.

Cartridge: 7.62-mm, M62.

Distance from Rifle to Peg: 25 yards.

Diameter of Peg: 1/2 inch.

Type of Wood: Birch.

Round No.: 11.

Velocity at 25 Feet, fps: 2878.

Velocity at 55 Feet, fps: 2853.

Bullet Hole in Peg: Vertical - +3.75.
Horizontal - +0.35.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	- 1.8	- 0.2		
2	3 in.	- 1.8	- 0.2		
3	1 ft	- 1.7	- 0.3		
4	2 ft	- 1.7	- 0.4	0.4	297
5	3 ft	- 1.6	- 0.5	0.5	317
6	4 ft	- 1.5	- 0.6	0.6	333
7	5 ft	- 1.4	- 0.5	0.6	0
8	6 ft	- 1.4	- 0.5	0.6	19
9	7 ft	- 1.4	- 0.6	0.6	43
10	8 ft	- 1.4	- 0.7	0.5	65
11	9 ft	- 1.4	- 0.7	0.3	88
12	10 ft	- 1.3	- 0.9		
13	11 ft	- 1.3	- 1.0		
14	12 ft	- 1.1	- 1.0		
15	13 ft	- 0.8	- 1.0	0.5	354
16	14 ft	- 0.6	- 1.1	0.6	15
17	15 ft	- 0.4	- 1.1	0.6	37
18	16 ft	- 0.4	- 1.0	0.6	60
19	17 ft	- 0.4	- 1.1	0.6	81
20	18 ft	- 0.3	- 1.1	0.5	100
21	19 ft	- 0.2	- 1.1	0.4	124
22	20 ft	0	- 1.3		
23	40 ft	3.0	- 0.3		
24	60 ft	4.6	2.2		
25	80 ft	4.6	5.4		
26	100 ft	5.3	3.8		
27	120 ft	7.0	4.6		
28	140 ft	8.6	6.1		
29	160 ft	9.4	7.8		
30	180 ft	10.0	8.2		
31	200 ft	11.6	9.3		
32	225 ft	12.2	10.3		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 1 October 1964.
 Weapon No.: M14, serial No. 1563467.
 Cartridge: 7.62-mm, M62.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 12.
 Velocity at 25 Feet, fps: 2894.
 Velocity at 55 Feet, fps: 2874.
 Bullet Hole in Peg: Vertical - +1.80.
 Horizontal - +0.35.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	- 3.8	- 0.2		
2	3 in.	- 3.9	- 0.3		
3	1 ft	- 3.6	- 0.2		
4	2 ft	- 3.6	- 0.6	0.4	297
5	3 ft	- 3.5	- 0.7	0.5	316
6	4 ft	- 3.4	- 0.8	0.6	335
7	5 ft	- 3.4	- 0.8	0.6	356
8	6 ft	- 3.3	- 0.9	0.6	17
9	7 ft	- 3.3	- 1.1	0.5	37
10	8 ft	- 3.3	- 1.2	0.4	54
11	9 ft	- 3.3	- 1.5		
12	10 ft	- 3.2	- 1.7		
13	11 ft	- 3.1	- 1.8		
14	12 ft	- 3.0	- 1.8		
15	13 ft	- 2.7	- 2.0	0.5	1
16	14 ft	- 2.5	- 2.1	0.5	23
17	15 ft	- 2.3	- 2.2	0.6	39
18	16 ft	- 2.3	- 2.2	0.6	57
19	17 ft	- 2.3	- 2.4	0.5	76
20	18 ft	- 2.1	- 2.4	0.5	94
21	19 ft	- 2.1	- 2.6	0.4	117
22	20 ft	- 1.9	- 2.9		
23	40 ft	1.0	- 3.5		
24	60 ft	2.2	- 3.1		
25	80 ft	2.5	- 2.4		
26	100 ft	4.2	- 5.9		
27	120 ft	6.0	- 6.2		
28	140 ft	7.0	- 6.7		
29	160 ft	8.1	- 7.8		
30	180 ft	9.7	- 8.9		
31	200 ft	11.0	- 9.1		
32	225 ft	11.4	-11.2		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 1 October 1964.
 Weapon No.: M14, serial No. 1563467.
 Cartridge: 7.62-mm, M62.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 13.
 Velocity at 25 Feet, fps: 2853.
 Velocity at 55 Feet, fps: 2829.
 Bullet Hole in Peg: Vertical - +3.40.
 Horizontal - -0.35.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	- 2.1	0.4		
2	3 in.	- 2.1	0.4		
3	1 ft	- 2.0	0.5		
4	2 ft	- 2.0	0.6		
5	3 ft	- 2.1	0.5	0.4	259
6	4 ft	- 2.0	0.6	0.5	288
7	5 ft	- 1.9	0.7	0.5	309
8	6 ft	- 1.9	0.8	0.5	330
9	7 ft	- 1.9	0.8	0.5	350
10	8 ft	- 1.9	0.9	0.4	16
11	9 ft	- 1.9	1.1	0.3	40
12	10 ft	- 1.9	1.1		
13	11 ft	- 2.0	1.1		
14	12 ft	- 1.8	1.2		
15	13 ft	- 1.7	1.3		
16	14 ft	- 1.6	1.2	0.4	319
17	15 ft	- 1.4	1.2	0.5	344
18	16 ft	- 1.4	1.3	0.5	9
19	17 ft	- 1.4	1.3	0.5	29
20	18 ft	- 1.3	1.5	0.5	47
21	19 ft	- 1.3	1.5	0.4	72
22	20 ft	- 1.2	1.4		
23	40 ft	1.0	3.1		
24	60 ft	2.6	6.1		
25	80 ft	3.2	10.0		
26	100 ft	4.6	9.7		
27	120 ft	6.2	12.2		
28	140 ft	7.3	14.6		
29	160 ft	8.4	16.6		
30	180 ft	9.9	18.4		
31	200 ft	11.2	21.1		
32	225 ft	11.5	22.9		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 1 October 1964.
 Weapon No.: M14, serial No. 1563467.
 Cartridge: 7.62-mm, M62.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 14.
 Velocity at 25 Feet, fps: 2849.
 Velocity at 55 Feet, fps: 2825.
 Bullet Hole in Peg: Vertical - +3.80.
 Horizontal - -0.10.

Target No.	Distance Peg to Target		Bullet from Index Point, in.		Bullet Hole	
			Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5	in.	- 1.8	0.1		
2	3	in.	- 1.8	0.1		
3	1	ft	- 1.4	0.2	0.4	44
4	2	ft	- 1.3	0.5	0.6	68
5	3	ft	- 1.3	0.6	0.7	96
6	4	ft	- 1.2	0.7	0.7	124
7	5	ft	- 1.3	0.7	0.7	146
8	6	ft	- 1.2	0.7	0.6	172
9	7	ft	- 1.0	0.6	0.5	200
10	8	ft	- 0.8	0.8		
11	9	ft	- 0.7	0.9		
12	10	ft	- 0.6	1.1		
13	11	ft	- 0.6	1.4	0.5	89
14	12	ft	- 0.6	1.6	0.6	115
15	13	ft	- 0.6	1.7	0.7	138
16	14	ft	- 0.7	1.7	0.7	165
17	15	ft	- 0.5	1.7	0.7	192
18	16	ft	- 0.5	1.8	0.6	215
19	17	ft	- 0.5	1.8	0.4	240
20	18	ft	- 0.3	2.3		
21	19	ft	- 0.4	2.3		
22	20	ft	- 0.4	2.4		
23	40	ft	- 2.5	4.8	0.5	198
24	60	ft	- 5.5	5.2	0.6	293
25	80	ft	- 7.8	5.4	0.5	35
26	100	ft	- 8.2	2.2		146
27	120	ft	- 8.2	2.4		
28	140	ft	- 9.3	3.0		
29	160	ft	-10.9	2.9		
30	180	ft	-12.0	2.0		
31	200	ft	-12.5	2.1		
32	225	ft	-15.1	1.7		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 1 October 1964.

Weapon No.: M14, serial No. 1563467.

Cartridge: 7.62-mm, M62.

Distance from Rifle to Peg: 25 yards.

Diameter of Peg: 1/2 inch.

Type of Wood: Birch.

Round No.: 15.

Velocity at 25 Feet, fps: 2878.

Velocity at 55 Feet, fps: 2853.

Bullet Hole in Peg: Vertical - +2.30.
Horizontal - -0.10.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	- 3.3	0.2		
2	3 in.	- 3.3	0.1		
3	1 ft	- 3.1	0.5	0.5	89
4	2 ft	- 3.1	0.7	0.7	115
5	3 ft	- 3.3	0.8	0.8	142
6	4 ft	- 3.4	0.8	0.9	167
7	5 ft	- 3.4	0.8	0.9	193
8	6 ft	- 3.3	0.9	0.7	217
9	7 ft	- 3.2	0.9	0.5	243
10	8 ft	- 3.2	1.3		
11	9 ft	- 3.3	1.4		
12	10 ft	- 3.4	1.8	0.6	120
13	11 ft	- 3.7	1.9	0.8	145
14	12 ft	- 3.9	2.0	0.9	169
15	13 ft	- 4.0	2.0	0.9	195
16	14 ft	- 4.0	2.0	0.8	221
17	15 ft	- 3.9	2.1	0.6	247
18	16 ft	- 4.0	2.3	0.4	271
19	17 ft	- 4.3	2.5		
20	18 ft	- 4.4	2.8	0.4	128
21	19 ft	- 4.8	3.0	0.6	151
22	20 ft	- 5.2	2.9	0.8	175
23	40 ft	-11.3	3.1	0.7	289
24	60 ft	-17.3	-0.1		
25	80 ft	Missed			
26	100 ft	Missed			
27	120 ft	Missed			
28	140 ft	Missed			
29	160 ft	Missed			
30	180 ft	Missed			
31	200 ft	Missed			
32	225 ft	Missed			

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 28 September 1964.

Weapon No.: M16, serial No. 008651.

Cartridge: 5.56-mm, XM196.

Distance from Rifle to Peg: 25 yards.

Diameter of Peg: 1/2 inch.

Type of Wood: Birch.

Round No.: 1.

Velocity at 25 Feet, fps: 3021.

Velocity at 55 Feet, fps: 2981.

Bullet Hole in Peg: Vertical -
Horizontal -

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	a 3.5 in.	-3.0	-0.5		
2	3 in.	-3.0	-0.4		
3	1 ft	-2.9	-0.4		
4	2 ft	-2.9	-0.4		
5	3 ft	-2.9	-0.4		
6	4 ft	-2.9	-0.4		
7	5 ft	-2.9	-0.4		
8	6 ft	-2.9	-0.4		
9	7 ft	-2.9	-0.4		
10	8 ft	-2.9	-0.5		
11	9 ft	-2.9	-0.5		
12	10 ft	-2.9	-0.5		
13	11 ft	-2.9	-0.4		
14	12 ft	-2.9	-0.4		
15	13 ft	-2.9	-0.4		
16	14 ft	-2.9	-0.4		
17	15 ft	-2.9	-0.4		
18	16 ft	-2.9	-0.4		
19	17 ft	-2.9	-0.4		
20	18 ft	-2.9	-0.4		
21	19 ft	-2.9	-0.4		
22	20 ft	-3.0	-0.5		
23	40 ft	-3.1	-0.8		
24	60 ft	-3.1	-0.8		
25	80 ft	-3.2	-0.9		
26	100 ft	-3.2	-0.9		
27	120 ft	-3.3	-1.1		
28	140 ft	-3.5	-1.2		
29	160 ft	-3.6	-1.4		
30	180 ft	-3.8	-1.4		
31	200 ft	-4.0	-1.6		
32	225 ft	-5.1	-2.2		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 28 September 1964.
 Weapon No.: M16, serial No. 008651.
 Cartridge: 5.56-mm, XM196.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 2.
 Velocity at 25 Feet, fps: 3003.
 Velocity at 55 Feet, fps: 2972.
 Bullet Hole in Peg: Vertical -
 Horizontal -

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-3.0	-1.0		
2	3 in.	-3.0	-0.8		
3	1 ft	-2.8	-0.9		
4	2 ft	-2.9	-0.8		
5	3 ft	-2.9	-0.8		
6	4 ft	-2.8	-0.8		
7	5 ft	-2.9	-0.8		
8	6 ft	-2.9	-0.8		
9	7 ft	-2.9	-0.9		
10	8 ft	-2.9	-0.9		
11	9 ft	-2.9	-0.9		
12	10 ft	-2.9	-0.9		
13	11 ft	-2.9	-0.9		
14	12 ft	-2.9	-0.9		
15	13 ft	-2.9	-0.9		
16	14 ft	-2.9	-0.9		
17	15 ft	-2.8	-1.0		
18	16 ft	-2.8	-1.0		
19	17 ft	-2.9	-1.0		
20	18 ft	-2.8	-1.0		
21	19 ft	-2.8	-1.1		
22	20 ft	-2.8	-1.1		
23	40 ft	-3.0	-1.2		
24	60 ft	-2.8	-1.5		
25	80 ft	-3.1	-1.6		
26	100 ft	-2.9	-1.8		
27	120 ft	-3.2	-2.1		
28	140 ft	-3.3	-2.4		
29	160 ft	-3.3	-2.6		
30	180 ft	-3.5	-2.8		
31	200 ft	-3.7	-3.1		
32	225 ft	-4.8	-3.9		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 28 September 1965.
 Weapon No.: M16, serial No. 008651.
 Cartridge: 5.56-mm, XM196.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 3.
 Velocity at 25 Feet, fps: 2933.
 Velocity at 55 Feet, fps: 2894.
 Bullet Hole in Peg: Vertical -
 Horizontal -

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-2.5	-0.9		
2	3 in.	-2.4	-0.8		
3	1 ft	-2.3	-0.8		
4	2 ft	-2.2	-0.8		
5	3 ft	-2.3	-0.8		
6	4 ft	-2.3	-0.9		
7	5 ft	-2.3	-0.8		
8	6 ft	-2.4	-0.8		
9	7 ft	-2.3	-0.9		
10	8 ft	-2.3	-0.9		
11	9 ft	-2.3	-0.9		
12	10 ft	-2.3	-0.9		
13	11 ft	-2.3	-0.9		
14	12 ft	-2.3	-0.8		
15	13 ft	-2.2	-0.9		
16	14 ft	-2.1	-0.9		
17	15 ft	-2.2	-0.9		
18	16 ft	-2.2	-0.9		
19	17 ft	-2.2	-0.9		
20	18 ft	-2.2	-0.9		
21	19 ft	-2.2	-0.9		
22	20 ft	-2.2	-1.0		
23	40 ft	-2.2	-1.2		
24	60 ft	-2.0	-1.3		
25	80 ft	-1.9	-1.3		
26	100 ft	-1.8	-1.5		
27	120 ft	-1.7	-1.6		
28	140 ft	-1.8	-1.9		
29	160 ft	-1.7	-1.9		
30	180 ft	-1.7	-2.2		
31	200 ft	-1.8	-2.2		
32	225 ft	-2.7	-2.9		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 28 September 1964.

Weapon No.: M16, serial No. 008651.

Cartridge: 5.56-mm, XM196.

Distance from Rifle to Peg: 25 yards.

Diameter of Peg: 1/2 inch.

Type of Wood: Birch.

Round No.: 4.

Velocity at 25 Feet, fps: 2981.

Velocity at 55 Feet, fps: 2941.

Bullet Hole in Peg: Vertical -
Horizontal -

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-2.7	-0.4		
2	3 in.	-2.7	-0.3		
3	1 ft	-2.5	-0.3		
4	2 ft	-2.5	-0.3		
5	3 ft	-2.5	-0.3		
6	4 ft	-2.5	-0.3		
7	5 ft	-2.5	-0.2		
8	6 ft	-2.6	-0.2		
9	7 ft	-2.6	-0.3		
10	8 ft	-2.6	-0.3		
11	9 ft	-2.6	-0.2		
12	10 ft	-2.6	-0.3		
13	11 ft	-2.6	-0.3		
14	12 ft	-2.6	-0.2		
15	13 ft	-2.6	-0.2		
16	14 ft	-2.6	-0.3		
17	15 ft	-2.5	-0.3		
18	16 ft	-2.6	-0.3		
19	17 ft	-2.6	-0.4		
20	18 ft	-2.5	-0.3		
21	19 ft	-2.5	-0.3		
22	20 ft	-2.5	-0.3		
23	40 ft	-2.7	-0.5		
24	60 ft	-2.5	-0.7		
25	80 ft	-2.8	-0.7		
26	100 ft	-2.6	-0.9		
27	120 ft	-2.8	-1.0		
28	140 ft	-3.0	-1.3		
29	160 ft	-3.1	-1.4		
30	180 ft	-3.3	-1.5		
31	200 ft	-3.5	-1.7		
32	225 ft	-4.6	-2.5		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 28 September 1964.

Weapon No.: M16, serial No. 008651.

Cartridge: 5.56-mm, XM196.

Distance from Rifle to Peg: 25 yards.

Diameter of Peg: 1/2 inch.

Type of Wood: Birch.

Round No.: 5.

Velocity at 25 Feet, fps: 2985.

Velocity at 55 Feet, fps: 2950.

Bullet Hole in Peg: Vertical -
Horizontal -

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	a 3.5 in.	-2.6	-0.8		
2	3 in.	-2.6	-0.7		
3	1 ft	-2.4	-0.7		
4	2 ft	-2.4	-0.7		
5	3 ft	-2.4	-0.7		
6	4 ft	-2.4	-0.7		
7	5 ft	-2.4	-0.7		
8	6 ft	-2.5	-0.7		
9	7 ft	-2.5	-0.7		
10	8 ft	-2.5	-0.7		
11	9 ft	-2.5	-0.7		
12	10 ft	-2.4	-0.7		
13	11 ft	-2.5	-0.7		
14	12 ft	-2.5	-0.6		
15	13 ft	-2.4	-0.7		
16	14 ft	-2.4	-0.7		
17	15 ft	-2.3	-0.8		
18	16 ft	-2.3	-0.8		
19	17 ft	-2.4	-0.8		
20	18 ft	-2.3	-0.7		
21	19 ft	-2.3	-0.8		
22	20 ft	-2.3	-0.8		
23	40 ft	-2.3	-1.0		
24	60 ft	-2.1	-1.2		
25	80 ft	-2.2	-1.2		
26	100 ft	-1.9	-1.4		
27	120 ft	-2.0	-1.5		
28	140 ft	-2.0	-1.8		
29	160 ft	-2.0	-1.8		
30	180 ft	-2.0	-2.0		
31	200 ft	-2.1	-2.2		
32	225 ft	-3.1	-2.9		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 28 September 1964.
 Weapon No.: M16, serial No. 008651.
 Cartridge: 5.56-mm, XM196.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 6.
 Velocity at 25 Feet, fps: 2981.
 Velocity at 55 Feet, fps: 2946.
 Bullet Hole in Peg: Vertical - +2.65.
 Horizontal - +0.15.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^a , in.	Orientation ^b , deg
1	a 3.5 in.	-3.0	- 0.1		
2	3 in.	-2.9	0		
3	1 ft	-2.8	- 0.1	0.2	304
4	2 ft	-2.6	- 0.2	0.3	332
5	3 ft	-2.5	- 0.3	0.4	2
6	4 ft	-2.4	- 0.3	0.5	28
7	5 ft	-2.4	- 0.2	0.5	57
8	6 ft	-2.4	- 0.3	0.4	79
9	7 ft	-2.4	- 0.5	0.3	117
10	8 ft	-2.3	- 0.6	0.2	140
11	9 ft	-2.2	- 0.6	0.2	175
12	10 ft	-2.1	- 0.7	0.3	201
13	11 ft	-1.9	- 0.8	0.4	222
14	12 ft	-1.7	- 0.8	0.4	245
15	13 ft	-1.4	- 0.8	0.4	271
16	14 ft	-1.1	- 0.8	0.4	300
17	15 ft	-0.9	- 0.6	0.3	321
18	16 ft	-0.8	- 0.4	0.2	356
19	17 ft	-0.8	- 0.4	0.2	-
20	18 ft	-0.5	- 0.2	0.2	50
21	19 ft	-0.5	- 0.1	0.3	71
22	20 ft	-0.4	- 0.1	0.4	103
23	40 ft	0.6	3.1	0.2	277
24	60 ft	-0.2	4.5	0.3	309
25	80 ft	0.5	5.3	0.2	141
26	100 ft	1.5	7.4		
27	120 ft	1.3	8.6	0.3	22
28	140 ft	2.1	9.8		
29	160 ft	2.3	11.6		
30	180 ft	2.9	12.8	0.2	138
31	200 ft	3.1	14.5		
32	225 ft	2.9	15.8		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 28 September 1964.
 Weapon No.: M16, serial No. 008651.
 Cartridge: 5.56-mm, XM196.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 7.
 Velocity at 25 Feet, fps: 2967.
 Velocity at 55 Feet, fps: 2933.
 Bullet Hole in Peg: Vertical = +3.25.
 Horizontal = +0.40.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-2.3	- 0.4		
2	3 in.	-2.3	- 0.3		
3	1 ft	-2.2	- 0.3		
4	2 ft	-2.1	- 0.3		
5	3 ft	-2.3	- 0.3	0.3	167
6	4 ft	-2.3	- 0.3	0.3	154
7	5 ft	-2.3	- 0.3	0.3	223
8	6 ft	-2.4	- 0.4	0.3	251
9	7 ft	-2.3	- 0.5	0.3	278
10	8 ft	-2.3	- 0.5	0.3	301
11	9 ft	-2.3	- 0.5	0.2	324
12	10 ft	-2.3	- 0.5	0.2	359
13	11 ft	-2.4	- 0.6		
14	12 ft	-2.4	- 0.6		
15	13 ft	-2.4	- 0.7		
16	14 ft	-2.4	- 0.9	0.2	269
17	15 ft	-2.3	- 0.9	0.2	301
18	16 ft	-2.3	- 1.0	0.3	324
19	17 ft	-2.4	- 1.1	0.3	354
20	18 ft	-2.3	- 1.1	0.3	20
21	19 ft	-2.3	- 1.2	0.3	46
22	20 ft	-2.3	- 1.2	0.2	68
23	40 ft	-1.8	- 2.3	0.2	214
24	60 ft	-1.2	- 3.3	0.2	35
25	80 ft	-1.3	- 4.1		
26	100 ft	-1.1	- 5.2		
27	120 ft	-0.9	- 6.1	0.2	186
28	140 ft	-0.8	- 7.3		
29	160 ft	-0.5	- 8.1		
30	180 ft	-0.4	- 9.3		
31	200 ft	-0.2	-10.2		
32	225 ft	-0.9	-12.1		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 28 September 1964.

Weapon No.: M16, serial No. 008651.

Cartridge: 5.56-mm, XM196.

Distance from Rifle to Peg: 25 yards.

Diameter of Peg: 1/2 inch.

Type of Wood: Birch.

Round No.: 8.

Velocity at 25 Feet, fps: 2959.

Velocity at 55 Feet, fps: 2920.

Bullet Hole in Peg: Vertical - +3.20.
Horizontal - +0.10.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^a , in.	Orientation ^b , deg
1	^a 3.5 in.	-2.5	0		
2	3 in.	-2.4	0		
3	1 ft	-2.2	- 0.1	0.3	310
4	2 ft	-2.1	- 0.1	0.4	335
5	3 ft	-2.1	- 0.2	0.5	9
6	4 ft	-2.0	- 0.2	0.5	37
7	5 ft	-2.0	- 0.1	0.4	63
8	6 ft	-2.1	- 0.2	0.3	92
9	7 ft	-2.0	- 0.5	0.2	128
10	8 ft	-1.9	- 0.5		
11	9 ft	-1.7	- 0.5	0.3	350
12	10 ft	-1.5	- 0.5	0.4	17
13	11 ft	-1.4	- 0.5	0.4	45
14	12 ft	-1.3	- 0.3	0.5	71
15	13 ft	-1.2	- 0.3	0.4	100
16	14 ft	-1.1	- 0.4	0.4	128
17	15 ft	-0.9	- 0.4	0.3	156
18	16 ft	-0.7	- 0.4		
19	17 ft	-0.7	- 0.3		
20	18 ft	-0.3	- 0.1	0.3	50
21	19 ft	-0.4	+ 0.1	0.4	78
22	20 ft	-0.2	+ 0.2	0.4	111
23	40 ft	0.9	3.8		
24	60 ft	-0.8	6.6	0.4	308
25	80 ft	-1.7	7.4		
26	100 ft	-0.8	9.3	0.3	172
27	120 ft	-1.7	11.9		
28	140 ft	-2.4	13.0	0.3	233
29	160 ft	-2.5	15.4		
30	180 ft	-3.5	17.0		
31	200 ft	-3.7	19.2		
32	225 ft	-5.8	21.0		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 28 September 1964.
 Weapon No.: M16, serial No. 008651.
 Cartridge: 5.56-mm, XM196.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 9.
 Velocity at 25 Feet, fps: 2972.
 Velocity at 55 Feet, fps: 2937.
 Bullet Hole in Peg: Vertical - +2.85.
 Horizontal - -0.10.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^a , in.	Orientation ^b , deg
1	^a 3.5 in.	-2.8	0.1		
2	3 in.	-2.8	0.2		
3	1 ft	-2.5	0.3	0.3	123
4	2 ft	-2.5	0.5	0.4	140
5	3 ft	-2.6	0.5	0.5	171
6	4 ft	-2.6	0.6	0.5	200
7	5 ft	-2.5	0.7	0.5	226
8	6 ft	-2.5	0.7	0.4	255
9	7 ft	-2.4	0.8	0.3	287
10	8 ft	-2.5	1.0		
11	9 ft	-2.6	1.1	0.2	142
12	10 ft	-2.7	1.1	0.3	174
13	11 ft	-2.8	1.1	0.4	208
14	12 ft	-2.8	1.2	0.5	231
15	13 ft	-2.8	1.1	0.5	261
16	14 ft	-2.8	1.2	0.4	287
17	15 ft	-2.8	1.2	0.3	314
18	16 ft	-3.0	1.2		
19	17 ft	-3.1	1.2		
20	18 ft	-3.2	1.1	0.3	217
21	19 ft	-3.3	0.9	0.4	244
22	20 ft	-3.4	0.8	0.5	271
23	40 ft	-3.8	- 2.7		
24	60 ft	-1.0	- 5.2	0.4	110
25	80 ft	0.3	- 5.4	0.2	313
26	100 ft	0.6	- 7.4	0.2	321
27	120 ft	2.2	- 9.1	0.3	173
28	140 ft	2.9	-10.3		
29	160 ft	4.0	-12.3	0.3	253
30	180 ft	5.0	-13.2	0.2	259
31	200 ft	5.9	-15.1		
32	225 ft	6.2	-17.1		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 29 September 1964.
 Weapon No.: M16, serial No. 008651.
 Cartridge: 5.56-mm, XM196.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 10.
 Velocity at 25 Feet, fps: 3008.
 Velocity at 55 Feet, fps: 2967.
 Bullet Hole in Peg: Vertical - +3.00.
 Horizontal - -0.10.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-2.6	0.1		
2	3 in.	-2.5	0.2		
3	1 ft	-2.4	0.3	0.3	112
4	2 ft	-2.4	0.5	0.4	136
5	3 ft	-2.5	0.6	0.5	163
6	4 ft	-2.5	0.5	0.5	195
7	5 ft	-2.5	0.6	0.5	222
8	6 ft	-2.4	0.7	0.4	250
9	7 ft	-2.4	0.8	0.2	285
10	8 ft	-2.5	1.0	0.2	128
11	9 ft	-2.7	1.1	0.3	151
12	10 ft	-2.8	1.1	0.5	181
13	11 ft	-2.9	1.1	0.5	209
14	12 ft	-2.9	1.2	0.5	236
15	13 ft	-3.0	1.2	0.4	269
16	14 ft	-3.0	1.2	0.3	301
17	15 ft	-3.2	1.3		
18	16 ft	-3.4	1.4	0.2	160
19	17 ft	-3.7	1.2	0.4	197
20	18 ft	-3.8	1.2	0.5	221
21	19 ft	-4.0	1.0	0.5	254
22	20 ft	-4.1	0.9	0.5	284
23	40 ft	-7.6	- 3.0	0.4	305
24	60 ft	-7.4	- 8.8		
25	80 ft	-5.5	-11.5	0.3	210
26	100 ft	-5.9	-12.9	0.4	252
27	120 ft	-7.2	-16.4	0.3	303
28	140 ft	-6.8	-19.8	0.2	207
29	160 ft	-7.2	-22.1	0.3	259
30	180 ft	-7.6	-25.4		
31	200 ft	-7.5	-28.1		
32	225 ft	-9.0	-32.4		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 29 September 1964.
 Weapon No.: M16, serial No. 008651.
 Cartridge: 5.56-mm, XM196.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 11.
 Velocity at 25 Feet, fps: 3008.
 Velocity at 55 Feet, fps: 2967.
 Bullet Hole in Peg: Vertical - +3.00.
 Horizontal - -0.15.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	- 2.5	0.1		
2	3 in.	- 2.5	0.3	0.2	90
3	1 ft	- 2.3	0.5	0.3	115
4	2 ft	- 2.4	0.6	0.5	145
5	3 ft	- 2.5	0.8	0.6	174
6	4 ft	- 2.4	0.8	0.6	205
7	5 ft	- 2.3	0.9	0.5	233
8	6 ft	- 2.3	1.1	0.3	265
9	7 ft	- 2.2	1.3	0.2	294
10	8 ft	- 2.4	1.6	0.3	134
11	9 ft	- 2.6	1.7	0.5	162
12	10 ft	- 2.7	1.8	0.6	191
13	11 ft	- 2.8	1.8	0.6	221
14	12 ft	- 2.7	1.9	0.5	250
15	13 ft	- 2.8	2.1	0.4	282
16	14 ft	- 3.0	2.2		
17	15 ft	- 3.2	2.4	0.3	146
18	16 ft	- 3.5	2.4	0.4	173
19	17 ft	- 3.7	2.3	0.5	210
20	18 ft	- 3.8	2.3	0.6	237
21	19 ft	- 4.0	2.2	0.5	269
22	20 ft	- 4.2	2.3	0.4	299
23	40 ft	- 9.3	- 0.9	0.5	331
24	60 ft	-11.4	- 8.2	0.5	10
25	80 ft	- 9.8	-13.7	0.3	59
26	100 ft	- 8.8	-16.2		
27	120 ft	-11.0	-19.2		
28	140 ft	-11.8	-24.4	0.3	64
29	160 ft	-11.8	-28.0		
30	180 ft	Missed			
31	200 ft	Missed			
32	225 ft	-15.9	-41.7		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 29 September 1964.
 Weapon No.: M16, serial No. 008651.
 Cartridge: 5.56-mm, XM196.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 12.
 Velocity at 25 Feet, fps: 3012.
 Velocity at 55 Feet, fps: 2972.
 Bullet Hole in Peg: Vertical - +2.80
 Horizontal - -0.25.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-2.8	0.4		
2	3 in.	-2.7	0.5		
3	1 ft	-2.6	0.7	0.2	120
4	2 ft	-2.6	0.9	0.2	149
5	3 ft	-2.7	1.0	0.3	174
6	4 ft	-2.7	1.2	0.3	205
7	5 ft	-2.7	1.4	0.3	226
8	6 ft	-2.8	1.6	0.3	248
9	7 ft	-2.8	1.7	0.3	280
10	8 ft	-2.8	2.0	0.2	315
11	9 ft	-2.9	2.2		
12	10 ft	-2.9	2.4		
13	11 ft	-3.0	2.6	0.2	180
14	12 ft	-3.0	2.7	0.2	220
15	13 ft	-3.0	2.9	0.2	259
16	14 ft	-3.0	3.0	0.3	284
17	15 ft	-3.0	3.2	0.3	309
18	16 ft	-3.0	3.3	0.3	335
19	17 ft	-3.0	3.5	0.3	4
20	18 ft	-3.0	3.7	0.3	35
21	19 ft	-3.1	3.7		
22	20 ft	-3.1	3.9		
23	40 ft	-2.7	7.0		
24	60 ft	-2.7	10.4		
25	80 ft	-2.6	13.6		
26	100 ft	-2.6	17.2		
27	120 ft	-2.5	20.2		
28	140 ft	-2.8	23.7		
29	160 ft	-2.6	26.8		
30	180 ft	-2.6	30.2		
31	200 ft	-2.7	33.4		
32	225 ft	-3.7	37.1		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 29 September 1964.
 Weapon No.: M16, serial No. 008651.
 Cartridge: 5.56-mm, XM196.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 13.
 Velocity at 25 Feet, fps: 2981.
 Velocity at 55 Feet, fps: 2941.
 Bullet Hole in Peg: Vertical - +3.15.
 Horizontal - 0.0.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-2.4	0		
2	3 in.	-2.4	0.1		
3	1 ft	-2.3	0.1		
4	2 ft	-2.2	0.1		
5	3 ft	-2.1	0.1		
6	4 ft	-2.0	0.1		
7	5 ft	-2.0	0.1		
8	6 ft	-2.0	0.1		
9	7 ft	-1.9	0		
10	8 ft	-1.8	0		
11	9 ft	-1.7	0		
12	10 ft	-1.6	0.1		
13	11 ft	-1.6	0.1		
14	12 ft	-1.5	0.2		
15	13 ft	-1.4	0.2		
16	14 ft	-1.4	0.2		
17	15 ft	-1.2	0.2		
18	16 ft	-1.2	0.2		
19	17 ft	-1.2	0.2		
20	18 ft	-1.1	0.2		
21	19 ft	-1.1	0.2		
22	20 ft	-1.0	0.2		
23	40 ft	0.1	-0.3		
24	60 ft	1.4	-0.1		
25	80 ft	2.5	-0.3		
26	100 ft	3.8	-0.2		
27	120 ft	4.9	-0.4		
28	140 ft	6.0	-0.4		
29	160 ft	7.2	-0.6		
30	180 ft	8.2	-0.5		
31	200 ft	9.3	-0.7		
32	225 ft	9.6	-1.2		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 29 September 1964.
 Weapon No.: M16, serial No. 008651.
 Cartridge: 5.56-mm, XM196.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 14.
 Velocity at 25 Feet, fps: 2959.
 Velocity at 55 Feet, fps: 2920.
 Bullet Hole in Peg: Vertical - +3.20.
 Horizontal - +0.30.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-2.4	- 0.3		
2	3 in.	-2.3	- 0.2		
3	1 ft	-2.2	- 0.3	0.2	115
4	2 ft	-2.3	- 0.3	0.3	138
5	3 ft	-2.4	- 0.3	0.3	167
6	4 ft	-2.4	- 0.4	0.4	193
7	5 ft	-2.4	- 0.4	0.4	222
8	6 ft	-2.5	- 0.5	0.4	245
9	7 ft	-2.5	- 0.7	0.3	266
10	8 ft	-2.5	- 0.7	0.2	303
11	9 ft	-2.6	- 0.7		
12	10 ft	-2.7	- 0.8		
13	11 ft	-2.8	- 0.9	0.2	202
14	12 ft	-2.9	- 1.0	0.3	230
15	13 ft	-2.9	- 1.1	0.4	249
16	14 ft	-3.0	- 1.3	0.4	274
17	15 ft	-2.9	- 1.4	0.4	302
18	16 ft	-3.0	- 1.5	0.3	327
19	17 ft	-3.2	- 1.7	0.3	357
20	18 ft	-3.2	- 1.8		
21	19 ft	-3.3	- 2.0		
22	20 ft	-3.4	- 2.2		
23	40 ft	-3.3	- 5.7	0.3	72
24	60 ft	-3.2	- 7.8	0.3	251
25	80 ft	-4.0	-10.5	0.2	82
26	100 ft	-3.8	-13.2		
27	120 ft	-4.4	-15.8		
28	140 ft	-4.6	-18.7		
29	160 ft	-5.2	- 2.34		
30	180 ft	-5.3	- 2.43		
31	200 ft	-5.8	-26.9		
32	225 ft	-7.1	-30.5		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Date: 29 September 1964.
 Weapon No.: M16, serial No. 008651
 Cartridge: 5.56-mm, XM196.
 Distance from Rifle to Peg: 25 yards.
 Diameter of Peg: 1/2 inch.

Type of Wood: Birch.
 Round No.: 15.
 Velocity at 25 Feet, fps: 3017.
 Velocity at 55 Feet, fps: 2981.
 Bullet Hole in Peg: Vertical - +2.70.
 Horizontal - +0.05.

Target No.	Distance Peg to Target	Bullet from Index Point, in.		Bullet Hole	
		Vert	Hor	Length ^b , in.	Orientation ^b , deg
1	^a 3.5 in.	-2.9	0		
2	3 in.	-2.9	0.1		
3	1 ft	-2.7	0.2		
4	2 ft	-2.7	0.1		
5	3 ft	-2.7	0.2		
6	4 ft	-2.7	0.2		
7	5 ft	-2.8	0.3		
8	6 ft	-2.9	0.3		
9	7 ft	-2.9	0.3		
10	8 ft	-3.0	0.2		
11	9 ft	-3.0	0.3		
12	10 ft	-3.0	0.2		
13	11 ft	-3.0	0.2		
14	12 ft	-3.0	0.3		
15	13 ft	-3.0	0.2		
16	14 ft	-3.0	0.2		
17	15 ft	-3.0	0.2		
18	16 ft	-3.1	0.1		
19	17 ft	-3.2	0.1		
20	18 ft	-3.1	0.1		
21	19 ft	-3.2	0		
22	20 ft	-3.2	-0.1		
23	40 ft	-3.3	-0.2		
24	60 ft	-3.6	-0.3		
25	80 ft	-3.8	-0.4		
26	100 ft	-4.2	-0.5		
27	120 ft	-4.4	-0.6		
28	140 ft	-4.9	-0.9		
29	160 ft	-5.1	-1.0		
30	180 ft	-5.7	-1.1		
31	200 ft	-6.0	-1.3		
32	225 ft	-7.5	-2.0		

^aIn front of peg.

^bThe absence of measurements for length and orientation of bullet hole indicates there was no projectile yaw.

Summary

Weapon: M14, serial No. 1563467.
Ammunition: 7.62-mm, M62.

Rounds 1 through 5 missed peg.
Rounds 6 through 15 hit peg.

Weapon: M16, serial No. 008651.
Ammunition: 5.56-mm, XM196.

Rounds 1 through 5 missed peg.
Rounds 6 through 15 hit peg.

Accuracy Data

Legend

MR = Mean radius.
MHD = Mean horizontal dispersion.
MVD = Mean vertical dispersion.
EHD = Extreme horizontal dispersion.
EVD = Extreme vertical dispersion.
ES = Extreme spread.
H = Horizontal (Location of center of impact
V = Vertical from line of sight.)
Stand Dev = Standard deviation.
H = Horizontal.
V = Vertical.

Cartridge, 5.56-MM: Tracer, XM196, lot RA-223-115 (test).
Cartridge, 5.56-MM: Ball, M193, lot RA-5027 (control).

Notes: Targets 1 through 30 were fired at ranges of 100, 300, and 600 yards simultaneously.
Targets 31 through 45 were fired at beginning of erosion test.
Targets 46 through 60 were fired after 2000 rounds in erosion test.
Targets 61 through 75 were fired after 4000 rounds in erosion test.
Targets 76 through 90 were fired after 6000 rounds in erosion test.

<u>Target</u> <u>No.</u>	<u>Rifle</u> <u>Rd No.</u>	<u>Type</u> <u>Ammo</u>
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Phase 2.2, Accuracy
(Simultaneously at 100, 300, and 600 yards)

Date Fired: 30 July 1964.
Rifle No.: 008625.

1	41 to 50	Ball
2	51 to 60	Tracer
3	61 to 70	Ball
4	71 to 80	Tracer
5	81 to 90	Ball
6	91 to 100	Tracer
7	101 to 110	Ball
8	111 to 120	Tracer
9	121 to 130	Ball
10	131 to 140	Tracer

<u>Target No.</u>	<u>Rifle Rd No.</u>	<u>Type Ammo</u>
Date Fired: 4 August 1964.		
Rifle No.: 023295.		
11	121 to 130	Ball
12	131 to 140	Tracer
13	141 to 150	Ball
14	151 to 160	Tracer
15	161 to 170	Ball
16	171 to 180	Tracer
17	181 to 190	Ball
18	191 to 200	Tracer
19	201 to 210	Ball
20	211 to 220	Tracer

Date Fired: 5 August 1964.
Rifle No.: 023348.

21	21 to 30	Ball
22	31 to 40	Tracer
23	41 to 50	Ball
24	51 to 60	Tracer
25	61 to 70	Ball
26	71 to 80	Tracer
27	81 to 90	Ball
28	91 to 100	Tracer
29	101 to 110	Ball
30	111 to 120	Tracer

Phase 2.7, Erosion
(100 yards only)

Date Fired: 11 August 1964.
Rifle No.: 007721.

31	21 to 30	Ball
32	31 to 40	Ball
33	41 to 50	Ball
34	51 to 60	Ball
35	61 to 70	Ball

<u>Target No.</u>	<u>Rifle Rd No.</u>	<u>Type Ammo</u>
Date Fired: 11 August 1964. Rifle No.: 008651.		
36	21 to 30	Tracer
37	31 to 40	Tracer
38	41 to 50	Tracer
39	51 to 60	Tracer
40	61 to 70	Tracer
Date Fired: 12 August 1964. Rifle No.: 007239.		
41	21 to 30	Tracer
42	31 to 40	Tracer
43	41 to 50	Tracer
44	51 to 60	Tracer
45	61 to 70	Tracer
Date Fired: 14 August 1964. Rifle No.: 007239.		
46	2011 to 2020	Tracer
47	2021 to 2030	Tracer
48	2031 to 2040	Tracer
49	2041 to 2050	Tracer
50	2051 to 2060	Tracer
Date Fired: 14 August 1964. Rifle No.: 007721.		
51	2011 to 2020	Ball
52	2021 to 2030	Ball
53	2031 to 2040	Ball
54	2041 to 2050	Ball
55	2051 to 2060	Ball
Date Fired: 14 August 1965. Rifle No.: 008651.		
56	2011 to 2020	Tracer
57	2021 to 2030	Tracer
58	2031 to 2040	Tracer
59	2041 to 2050	Tracer
60	2051 to 2060	Tracer

<u>Target No.</u>	<u>Rifle Rd No.</u>	<u>Type Ammo</u>
Date Fired: 18 August 1964.		
Rifle No.: 007239.		
61	4011 to 4020	Tracer
62	4021 to 4030	Tracer
63	4031 to 4040	Tracer
64	4041 to 4050	Tracer
65	4051 to 4060	Tracer
Date Fired: 18 August 1964.		
Rifle No.: 007721.		
66	4011 to 4020	Ball
67	4021 to 4030	Ball
68	4031 to 4040	Ball
69	4041 to 4050	Ball
70	4051 to 4060	Ball
Date Fired: 18 August 1964.		
Rifle No.: 008651.		
71	4011 to 4020	Tracer
72	4021 to 4030	Tracer
73	4031 to 4040	Tracer
74	4041 to 4050	Tracer
75	4051 to 4060	Tracer
Date Fired: 21 August 1964.		
Rifle No.: 007239.		
76	5951 to 5960	Tracer
77	5961 to 5970	Tracer
78	5971 to 5980	Tracer
79	5981 to 5990	Tracer
80	5991 to 6000	Tracer
Date Fired: 21 August 1964.		
Rifle No.: 007721.		
81	5951 to 5960	Ball
82	5961 to 5970	Ball
83	5971 to 5980	Ball
84	5981 to 5990	Ball
85	5991 to 6000	Ball

<u>Target No.</u>	<u>Rifle Rd No.</u>	<u>Type Ammo</u>
Date Fired: 21 August 1964.		
Rifle No.: 008651.		
86	5951 to 5960	Tracer
87	5961 to 5970	Tracer
88	5971 to 5980	Tracer
89	5981 to 5990	Tracer
90	5991 to 6000	Tracer

TGT NO.	RN	MND	WAD	BHP	EVD	ES	H	V	STAND	DEV
									H	V
<u>RIFLE NO. 008625</u>										
1.	1.3	.6	.9	3.8	3.9	4.2	-2.6	.7	1.0	1.2
2.	1.1	.6	.6	2.5	2.1	3.2	-2.2	1.1	.9	.9
5.	.9	.8	.3	3.3	1.8	3.2	-2.5	2.6	1.0	.5
7.	1.2	.5	.9	2.1	2.3	3.3	.0	3.9	.7	1.2
9.	1.5	.7	1.1	2.5	4.6	4.7	-4	5.2	.9	1.5
AVERAGE	1.2	.7	.8	2.8	3.3	3.6	-1.2	2.7	.9	1.1
<u>RIFLE NO. 022295</u>										
14.	1.7	1.1	1.1	5.6	4.3	5.9	-7	1.1	1.6	1.4
16.	1.0	.5	.7	2.4	2.4	2.1	.0	1.3	.8	.8
15.	1.5	.7	1.1	4.0	4.7	5.7	.0	1.3	1.1	1.5
17.	1.2	.9	.7	2.6	3.5	4.1	.2	.6	1.0	1.0
19.	1.2	.7	.8	3.5	2.9	4.0	-2	.8	1.0	1.0
AVERAGE	1.3	.9	.9	3.7	3.6	4.5	.0	1.0	1.1	1.1
<u>RIFLE NO. 023346</u>										
21.	1.1	.5	.9	2.2	2.3	3.6	2.1	2.9	.7	1.1
23.	.8	.5	.7	1.5	2.5	2.6	2.4	2.4	.5	.8
25.	1.1	.4	1.0	2.2	3.4	2.5	2.8	2.7	.6	1.2
27.	1.0	.7	.5	2.0	2.5	2.9	2.7	2.8	.9	.7
29.	.8	.5	.5	2.1	1.9	2.8	3.0	2.7	.7	.6
AVERAGE	1.0	.5	.7	2.2	2.7	3.1	2.6	2.7	.7	.9

TGT NO.	RIFLE NO.	MR	MRD	MVD	RHD	RVD	RS	T	T	STAND DEV	
										H	T
										TYPE AMMO BALL	
										RANGE 300 yds.	
1.	4.0	2.1	2.0	11.9	13.1	-9.6	-7.9	3.1	3.7		
3.	3.9	2.6	2.2	9.7	10.6	-6.7	-6.3	3.4	2.9		
5.	2.7	2.1	1.2	5.3	7.2	-7	-2.2	2.5	1.7		
7.	3.7	1.7	2.8	11.0	11.1	-5	1.6	2.1	3.7		
9.	4.6	2.2	2.5	14.3	14.7	-1.9	5.8	2.9	4.5		
MEAN	3.8	2.2	2.5	10.5	11.2	-3.7	-1.6	2.8	3.3		

TGT NO.	RIFLE NO.	MR	MRD	MVD	RHD	RVD	RS	T	T	STAND DEV	
										H	T
										TYPE AMMO BALL	
										RANGE 300 yds.	
11.	5.3	2.6	3.4	13.4	13.8	-9	-6.4	5.0	4.3		
13.	2.1	2.3	1.9	7.6	10.3	-9	-5.4	2.7	2.3		
15.	4.2	2.1	2.3	13.8	15.6	3.1	-5.8	3.1	4.2		
17.	3.7	2.6	2.1	10.6	12.8	2.9	-7.7	3.3	3.0		
19.	2.9	2.3	2.8	9.7	13.6	-8	-6.9	3.4	3.3		
MEAN	4.0	2.6	2.7	11.0	14.2	1.4	-6.4	3.5	3.4		

TGT NO.	RIFLE NO.	MR	MRD	MVD	RHD	RVD	RS	T	T	STAND DEV	
										H	T
										TYPE AMMO BALL	
										RANGE 300 yds.	
21.	3.2	1.9	2.3	9.1	9.8	6.3	-9	2.2	2.9		
23.	2.6	1.7	2.0	7.3	7.9	6.3	-2.4	2.1	2.4		
25.	3.2	1.6	2.6	9.9	11.5	9.0	-1.4	2.1	3.3		
27.	2.5	2.5	1.3	7.8	12.5	2.0	-7	3.4	2.2		
29.	2.5	1.6	1.9	7.0	8.9	6.8	-1.3	2.0	2.2		
MEAN	3.0	1.8	2.1	8.2	10.1	7.9	-1.3	2.4	2.6		

TGT NO.	MR	MHD	MWD	EHD	EVD	ES	H	V	STAND H	DEV V
RIFLE NO. 008625										
RANGE 600 yds.										
TYPE AMMO Bell										
1.	9.3	4.7	7.3	17.5	27.0	27.5	-14.7	-22.5	5.0	2.0
3.	9.8	5.6	5.5	22.2	22.1	25.0	-8.5	-25.8	7.2	7.0
5.	7.0	4.3	5.0	17.7	18.5	23.8	2.9	-78.2	5.7	6.3
7.	6.5	3.7	7.1	12.0	26.9	27.9	2.2	-70.4	4.2	2.2
9.	9.9	4.9	7.9	16.4	30.8	31.0	.1	-62.7	5.9	9.8
MEAN	8.7	4.6	6.6	17.2	25.0	27.0	-2.6	-77.2	5.8	8.3
RIFLE NO. 022225										
RANGE 600 yds.										
TYPE AMMO Bell										
11.	11.7	7.3	7.9	33.3	33.9	43.9	9.7	-69.1	10.2	10.4
13.	7.7	7.4	4.1	21.7	15.2	23.1	5.5	-66.2	6.9	5.0
15.	7.7	4.7	5.5	21.0	22.5	26.4	11.4	-69.9	3.8	7.1
17.	0.0	5.7	5.3	22.3	24.1	27.3	11.4	-90.4	7.0	7.0
19.	9.9	4.5	6.2	24.0	25.2	28.5	1.0	-80.0	6.9	9.7
MEAN	9.0	5.4	6.2	23.7	25.6	31.2	7.0	-66.7	7.5	7.8
RIFLE NO. 002240										
RANGE 600 yds.										
TYPE AMMO Bell										
21.	9.3	7.7	4.5	23.5	12.2	34.4	14.3	-55.2	9.2	5.9
23.	7.0	4.3	4.8	15.5	16.2	20.9	16.4	-78.6	5.2	6.1
25.	6.1	4.1	4.3	14.2	20.5	22.1	21.9	-76.5	5.1	5.8
27.	9.9	5.2	5.2	27.4	20.0	29.7	-12.3	-75.5	8.2	7.0
29.	6.5	5.4	5.1	16.0	20.0	24.0	20.4	-75.2	4.8	6.2
MEAN	7.5	5.1	5.0	20.3	19.5	26.2	11.9	-74.2	6.5	6.2

TGT NO.	Wt	MHD	EVD	RHD	EVD	AS	H	V	STAND H	DEV V
RIFLE NO.	000625					100 yds.		TYPE AMMO	Tracer	
2.	1.5	1.1	.8	4.7	3.8	4.7	-1.6	.4	1.4	1.1
4.	2.1	1.2	1.5	5.1	5.0	5.7	-1.8	2.4	1.6	1.8
6.	1.4	1.1	.8	4.8	2.7	5.5	.3	3.6	1.4	1.0
8.	1.7	.8	1.4	2.6	5.4	5.8	.5	4.2	.9	1.7
10.	1.7	1.1	1.1	4.6	4.0	4.8	1.0	5.8	1.4	1.4
MEAN	1.7	1.1	1.1	4.4	4.2	5.3	-1.1	3.0	1.3	1.4
RIFLE NO.	022295					100 yds.		TYPE AMMO	Tracer	
12.	1.5	.5	1.1	3.7	3.9	4.3	.9	-.6	1.1	1.4
14.	1.6	1.0	1.1	3.8	3.5	4.3	1.2	-.6	1.2	1.3
16.	1.5	.8	1.1	3.3	5.0	5.0	.9	.3	1.0	1.4
18.	1.1	.6	.6	4.1	2.7	4.3	.6	-.1	1.1	.9
20.	1.5	1.1	.9	4.1	3.2	4.3	-1.5	.2	1.3	1.0
MEAN	1.4	.9	.9	3.7	3.7	4.4	.6	-.2	1.1	1.2
RIFLE NO.	022240					100 yds.		TYPE AMMO	Tracer	
22.	1.5	1.2	.9	4.5	3.0	5.4	1.7	4.2	1.5	1.1
24.	2.1	1.0	1.6	4.5	3.2	6.7	2.9	3.3	1.5	2.2
26.	1.7	1.0	.9	3.7	3.3	4.0	1.9	2.1	1.3	1.1
28.	1.3	.7	1.0	3.2	5.2	5.5	2.8	3.7	1.0	1.5
30.	2.2	1.2	1.5	4.5	8.9	9.1	2.5	4.3	1.5	2.3
MEAN	1.7	1.1	1.2	4.1	5.7	6.5	2.4	3.5	1.4	1.7

TGT NC.	MR	MHD	MVD	EHD	EVD	ES	H	V	STAND H	DEV V
RIFLE NO.	000625					RANGE 300 yds.		TYPE AMMO	Tracer	
2.	4.4	3.1	2.2	14.8	10.7	14.8	-4.9	-8.2	4.2	3.0
4.	6.3	3.5	4.7	14.5	14.6	16.2	-2.4	-2.2	4.5	5.5
6.	4.2	3.2	2.2	14.2	8.0	16.2	.3	.6	4.2	2.7
8.	5.5	3.0	4.3	9.5	16.0	17.5	1.6	3.9	2.5	5.2
10.	5.7	3.9	3.4	14.9	12.2	14.9	2.2	7.9	4.9	4.3
MEAN	5.2	3.2	3.4	13.6	12.3	15.9	-.6	.4	4.2	4.1
RIFLE NO.	022295					RANGE 300 yds.		TYPE AMMO	Tracer	
12.	5.0	2.5	2.6	11.6	12.4	12.7	5.1	-10.2	2.5	4.2
14.	5.2	2.7	2.2	12.6	11.9	14.4	4.4	-11.5	4.3	4.0
16.	4.5	2.4	3.0	10.4	16.0	16.2	4.6	-8.9	3.1	4.3
18.	3.4	2.2	2.2	10.4	9.7	10.8	3.9	-9.6	3.1	2.8
20.	5.0	3.5	2.9	12.4	9.6	14.8	.4	-8.5	4.4	3.5
MEAN	4.6	2.8	2.0	11.7	11.9	13.8	3.7	-9.8	3.7	3.8
RIFLE NO.	022248					RANGE 300 yds.		TYPE AMMO	Tracer	
22.	4.2	3.5	2.3	13.9	8.8	16.5	4.8	3.2	4.5	2.8
24.	6.9	3.9	4.9	13.8	26.8	28.1	10.1	1.0	5.0	7.2
26.	5.6	3.7	3.4	13.0	13.2	14.3	6.9	-2.1	4.8	4.3
28.	4.2	2.2	3.1	9.9	14.8	15.5	9.6	1.7	3.1	4.4
30.	6.9	4.2	4.4	14.5	25.3	26.2	8.5	3.3	5.0	6.5
MEAN	5.6	3.5	3.6	13.0	17.8	20.1	8.0	1.4	4.5	5.0

TGT NO.	NR	MRD	MRD	RNGD	RNGD	ES	H	V	STAND DEVI
							H	V	
RIFLE NO. 008625									
				RANGE 600 yds.			TYPE AMO Tracer		
2.	9.5	6.2	29.8	22.6	29.9		-5.9	-87.2	0.5 7.5
4.	14.6	7.6	29.9	21.6	26.7		-2.2	-72.9	0.7 13.1
6.	13.9	6.7	30.1	16.5	32.9		4.5	-70.9	0.9 5.6
8.	11.3	5.4	16.2	21.4	34.4		5.9	-62.2	0.4 10.9
10.	12.3	9.7	25.6	26.7	35.8		8.9	-54.4	11.6 9.3
MEAN	11.5	7.1	28.3	25.8	34.0		2.6	-69.7	9.1 9.3

RIFLE NO. 023295									
				RANGE 600 yds.			TYPE AMO Tracer		
12.	11.2	6.5	29.6	24.9	29.6		17.5	-92.3	0.8 8.9
14.	11.5	6.8	30.2	26.4	33.6		13.5	-94.0	0.7 0.1
16.	10.0	5.7	22.9	30.8	33.9		15.9	-90.3	0.4 0.4
18.	9.0	5.6	19.6	32.0	33.1		12.4	-87.7	0.6 7.5
20.	12.0	9.3	24.0	29.0	40.1		5.1	-87.3	11.0 10.9
MEAN	10.5	6.0	27.5	27.0	32.4		10.0	-90.4	8.7 8.6

RIFLE NO. 023240									
				RANGE 600 yds.			TYPE AMO Tracer		
22.	5.9	4.6	15.5	10.7	15.6		15.4	-76.2	0.5 3.4
24.	12.5	7.2	26.4	57.4	58.8		-6.3	-70.5	9.2 14.7
26.	12.7	6.4	29.3	26.2	31.7		17.4	-75.6	10.7 9.9
28.	9.0	5.9	19.6	27.5	30.9		22.0	-66.0	7.1 6.8
30.	11.1	9.0	22.0	27.3	37.3		22.2	-67.0	10.9 10.7
MEAN	11.1	7.0	25.0	30.2	34.7		14.3	-71.4	8.7 9.5

TGT NO.	IR	MED	MVD	EHD	EVD	ES	H	V	STAND DEV
RIFLE NO.	007721								
				RANGE	100 yds.		TYPE AMMO	Ball	
31.	1.9	1.1	1.3	5.9	4.9	6.2	5.7	6.6	1.7
32.	2.6	1.5	1.9	6.3	3.1	9.5	4.6	3.3	1.9
33.	1.4	.9	.9	3.3	3.5	4.4	2.8	5.2	1.1
34.	1.9	.7	1.7	2.2	9.2	9.2	2.1	5.3	.8
35.	1.8	.7	1.5	3.1	6.5	6.7	2.1	9.3	.9
MEAN	1.9	1.0	1.4	4.2	6.5	7.2	3.5	5.3	1.3
									2.0

RIFLE NO.	003651								
				RANGE	100 yds.		TYPE AMMO	Tracer	
36.	1.6	1.0	1.0	3.5	4.2	4.8	4.2	4.3	1.3
37.	1.1	.9	.5	3.1	2.2	3.5	4.1	2.3	1.1
38.	1.5	.9	1.1	3.2	4.5	5.0	4.5	2.5	1.1
39.	1.4	.3	1.0	3.7	5.2	5.3	4.3	2.4	1.1
40.	1.5	.9	1.0	3.3	3.4	4.1	4.5	2.4	1.2
MEAN	1.4	.0	.2	3.5	3.9	4.5	4.3	2.9	1.2
									1.2

RIFLE NO.	007239								
				RANGE	100 yds.		TYPE AMMO	Tracer	
41.	1.2	.9	.7	2.5	2.5	3.0	4.3	1.7	1.0
42.	1.9	1.3	1.2	6.3	5.0	7.7	3.8	2.9	1.8
43.	1.7	.9	1.2	2.8	5.3	5.3	3.3	1.4	1.1
44.	1.9	1.0	1.4	5.5	4.9	7.1	3.7	1.7	1.5
45.	1.6	1.2	.9	5.0	4.0	5.1	5.0	.5	1.6
MEAN	1.7	1.1	1.1	4.5	4.3	5.6	4.0	1.6	1.4
									1.4

TGT NO.	MR	NJD	MVD	EHD	EVD	ES	H	V	STAND DEV
RIFLE NO.	007239								
46.	1.4	.7	1.0	3.4	3.5	3.7	3.8	1.0	1.2
47.	1.5	1.1	.3	3.9	3.5	4.3	4.1	1.3	1.1
48.	2.1	1.2	1.5	4.3	4.7	6.0	4.2	1.6	1.7
49.	1.2	.7	.3	3.0	3.5	3.5	3.8	.9	1.0
50.	1.7	1.3	.9	4.2	3.9	4.7	4.6	1.5	1.2
MEAN	1.6	1.0	1.0	3.8	3.8	4.4	4.1	1.3	1.2
RIFLE NO.	007721								
51.	1.1	.3	.7	3.4	3.5	4.8	7.1	1.0	1.0
52.	1.0	.6	.6	3.0	2.0	3.0	5.7	.9	.7
53.	1.2	.3	.3	3.6	3.3	3.9	5.7	1.0	1.1
53.	1.6	.6	1.2	2.3	5.4	5.4	5.5	.8	1.7
55.	.9	.5	.6	2.0	2.3	3.0	5.6	.8	.7
MEAN	1.2	.7	.8	3.0	3.4	4.0	5.9	.9	1.0
RIFLE NO.	008651								
56.	1.7	1.2	1.0	3.4	4.3	5.0	5.4	1.4	1.3
57.	1.5	1.1	.9	3.8	3.5	4.4	4.3	1.3	1.1
58.	1.3	.5	1.1	1.3	3.8	3.8	4.0	.7	1.3
59.	1.4	1.1	.7	4.7	2.2	4.7	5.3	1.4	.8
60.	2.1	1.2	1.4	4.2	5.5	5.6	6.8	1.4	1.7
MEAN	1.6	1.0	1.0	3.6	4.0	4.7	5.2	1.2	1.2

TGT NO.	MR	MGD	IND	EHD	EVC	ES	H	V	STAND	ESV
RIFLE NO.	CC7239			RANGE		100 yds.			H	V
61.	1.2	.6	1.1	2.6	4.0	4.3	4.4	10.0	.3	1.4
62.	1.5	1.0	1.0	2.9	3.7	4.6	3.6	10.3	1.1	1.2
63.	1.6	1.0	1.0	3.0	3.7	3.9	4.2	10.5	1.2	1.3
64.	1.5	1.2	.3	4.7	4.1	4.7	2.3	9.7	1.4	1.2
65.	1.4	1.0	1.0	3.5	4.6	5.5	3.2	10.7	1.2	1.3
MEAN	1.5	1.0	1.0	3.3	4.0	4.7	3.6	10.2	1.1	1.3
RIFLE NO.	CC7721			RANGE		100 yds.				
66.	1.3	.3	.9	3.6	4.5	4.3	4.0	3.0	1.0	1.2
67.	1.2	.9	.5	3.7	2.6	3.7	3.1	2.3	1.1	.3
68.	1.0	.6	.7	2.6	1.7	2.9	2.5	1.3	.3	.3
69.	1.1	.7	.3	2.3	3.4	3.6	2.7	2.7	.3	1.0
70.	1.1	.7	.9	2.6	3.3	3.5	2.6	2.2	.9	1.1
MEAN	1.2	.7	.3	3.0	3.1	3.8	3.0	2.4	.9	1.0
RIFLE NO.	CC8651			RANGE		100 yds.				
71.	1.3	1.1	1.3	3.7	5.2	5.7	-3.2	9.7	1.2	1.7
72.	1.2	.3	.7	2.9	3.3	3.4	-9.4	10.9	1.0	1.0
73.	1.2	.6	.3	2.6	3.9	3.9	-9.4	10.3	.3	1.1
74.	1.3	.7	.9	3.5	4.5	4.5	-3.3	9.4	1.0	1.3
75.	1.2	.9	.6	3.9	2.7	3.9	-3.5	10.1	1.2	.9
MEAN	1.3	.3	.9	3.3	3.9	4.3	-3.3	10.2	1.0	1.2

TGT NO.	RA	REL	WZ	SHD	EVZ	ES	H	7	STATE
RIFLE NO.	007221			RANGE	100 yds.			TYPE	TRACER
76.	1.7	1.4	.7	4.0	5.0	5.7	3.3	.3	1.5
77.	1.2	.7	.6	3.3	2.3	4.3	3.5	1.7	1.0
78.	1.5	1.2	.6	5.1	3.2	6.0	1.3	1.6	.9
79.	1.7	1.5	.6	4.9	2.3	4.9	3.2	1.4	.3
80.	1.2	1.2	.6	4.2	1.6	4.5	3.5	2.7	.6
MEAN	1.4	1.1	.7	4.6	3.1	5.1	3.5	1.6	.9
RIFLE NO.	007721			RANGE	100 yds.			TYPE	Ball
31.	1.4	.7	1.0	3.5	6.0	6.4	-2.2	1.3	1.0
32.	1.6	.6	1.3	4.5	5.9	5.3	-1.5	2.1	1.2
33.	1.1	.7	.7	3.2	2.6	3.6	-2.3	.7	1.0
34.	1.1	.7	.7	2.4	2.7	2.3	-3.2	1.4	.3
35.	1.1	.5	.3	1.7	1.1	4.1	-2.9	2.2	.6
MEAN	1.2	.1	.9	3.2	4.2	4.7	-2.6	1.6	.9
1.3									1.3
RIFLE NO.	008021			RANGE	100 yds.			TYPE	Tracer
36.	1.2	1.0	1.1	3.9	4.1	4.3	-3.9	4.2	1.3
37.	1.3	1.1	.6	3.2	2.6	4.6	-4.1	3.7	1.3
38.	1.3	.9	1.3	3.2	6.6	6.6	-4.9	5.0	1.2
39.	1.6	1.1	1.1	3.5	3.5	4.3	-4.9	5.5	1.3
40.	1.5	1.0	.9	3.5	4.3	5.0	-5.9	5.1	1.2
MEAN	1.6	1.0	1.0	3.7	4.2	5.0	-4.8	4.7	1.3

Velocity Data
for Erosion Phase

<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>
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Ammunition: XM196.
Rifle No.: 007239.

21	3125	31	3155	41	3185	51	3175	61	3115
22	3175	32	3155	42	3135	52	3135	62	3067
23	3106	33	3135	43	3125	53	3125	63	3195
24	3155	34	3155	44	3049	54	3135	64	3115
25	3135	35	3175	45	3215	55	3145	65	3125
26	3175	36	3155	46	3049	56	3165	66	3106
27	3155	37	3155	47	3106	57	3086	67	3135
28	3165	38	3125	48	3155	58	3155	68	3135
29	3145	39	3096	49	3175	59	3155	69	3135
30	3106	40	3155	50	3106	60	3106	70	3175
Avg	3144		3146		3130		3138		3130

Ammunition: M193.
Rifle No.: 007721.

21	3106	31	3106	41	3215	51	3115	61	3165
22	3077	32	3058	42	3115	52	3086	62	3155
23	3096	33	3077	43	3086	53	3106	63	3195
24	3049	34	3106	44	3175	54	3125	64	3195
25	3145	35	3067	45	3175	55	3040	65	3195
26	3086	36	3086	46	3049	56	3135	66	3125
27	3077	37	3125	47	3106	57	3165	67	3096
28	3106	38	3106	48	3155	58	3125	68	3058
29	3125	39	3135	49	3175	59	3135	69	3185
30	3040	40	3049	50	3115	60	3125	70	3135
Avg	3091		3092		3136		3116		3150

Ammunition: XM196.
Rifle No.: 008651.

21	3155	31	3115	41	3155	51	3155	61	3077
22	3106	32	3106	42	3096	52	3096	62	3115
23	3135	33	3175	43	3135	53	3096	63	3175
24	3135	34	3067	44	3165	54	3155	64	3135
25	3145	35	3086	45	3165	55	3077	65	3155
26	3115	36	3106	46	3067	56	3125	66	3125
27	3115	37	3135	47	3145	57	3125	67	3058
28	3106	38	3115	48	3175	58	3077	68	3115
29	3145	39	3106	49	3106	59	3175	69	3077
30	3106	40	3175	50	3155	60	3205	70	3106
Avg	3126		3119		3136		3129		3114

<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>
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Ammunition: XM196.
Rifle No.: 007239.

2011	3096	2021	3049	2031	3106	2041	3115	2051	3086
2012	3165	2022	3115	2032	3125	2042	3135	2052	3067
2013	3067	2023	3125	2033	3125	2043	3145	2053	3125
2014	3040	2024	3067	2034	3096	2044	3165	2054	3096
2015	3077	2025	3115	2035	3125	2045	3115	2055	3115
2016	3077	2026	3115	2036	3155	2046	3125	2056	3067
2017	3086	2027	3106	2037	3165	2047	3165	2057	3106
2018	3040	2028	3086	2038	3115	2048	3125	2058	3185
2019	3125	2029	3086	2039	3125	2049	3135	2059	3135
2020	3125	2030	3086	2040	3155	2050	3115	2060	3067
Avg	3090		3095		3129		3134		3105

Ammunition: M193.
Rifle No.: 007721.

2011	3096	2021	3135	2031	3145	2041	3145	2051	3086
2012	3058	2022	3135	2032	3086	2042	3145	2052	3086
2013	3106	2023	3086	2033	3096	2043	3058	2053	3125
2014	3115	2024	3155	2034	3155	2044	3115	2054	3165
2015	3086	2025	3115	2035	3175	2045	3145	2055	3145
2016	3115	2026	3155	2036	3155	2046	3125	2056	3145
2017	3086	2027	3135	2037	3155	2047	3077	2057	3096
2018	3115	2028	3106	2038	3106	2048	3145	2058	3049
2019	3135	2029	3145	2039	3106	2049	3135	2059	3155
2020	3165	2030	3155	2040	3145	2050	3125	2060	3145
Avg	3108		3132		3132		3122		3120

Ammunition: XM196.
Rifle No.: 008651.

2011	3115	2021	3086	2031	3175	2041	3096	2051	3145
2012	3145	2022	3125	2032	3106	2042	3096	2052	3135
2013	3106	2023	3086	2033	3106	2043	3077	2053	3135
2014	3115	2024	3067	2034	3135	2044	3106	2054	3155
2015	3145	2025	3058	2035	3125	2045	3077	2055	3058
2016	3067	2026	3077	2036	3106	2046	3106	2056	3096
2017	3096	2027	3106	2037	3106	2047	3115	2057	3155
2018	3096	2028	3077	2038	3106	2048	3077	2058	3106
2019	3096	2029	3086	2039	3115	2049	3086	2059	3115
2020	3135	2030	3125	2040	3185	2050	3115	2060	3086
Avg	3112		3089		3127		3095		3119

<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>
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Ammunition: XM196.
Rifle No.: 007239.

4011	3049	4021	3067	4031	3067	4041	3115	4051	3145
4012	3040	4022	3067	4032	3049	4042	3125	4052	3049
4013	3077	4023	3077	4033	3086	4043	3058	4053	3049
4014	3106	4024	3067	4034	3067	4044	3106	4054	3115
4015	3058	4025	3096	4035	3077	4045	3115	4055	3096
4016	3106	4026	3125	4036	3106	4046	3115	4056	3135
4017	3106	4027	3106	4037	3058	4047	3115	4057	3086
4018	3115	4028	3086	4038	3096	4048	3086	4058	3049
4019	3106	4029	3106	4039	3077	4049	3067	4059	3115
4020	3067	4030	3077	4040	3106	4050	3077	4060	3106
Avg	3083		3087		3079		3098		3095

Ammunition: M193.
Rifle No.: 007721.

4011	3003	4021	3040	4031	3086	4041	3067	4051	3125
4012	3049	4022	3049	4032	3106	4042	3030	4052	3096
4013	3049	4023	3049	4033	3058	4043	3058	4053	3040
4014	3058	4024	3185	4034	3077	4044	3058	4054	3125
4015	3077	4025	3021	4035	3067	4045	3058	4055	3106
4016	3012	4026	3058	4036	3049	4046	3077	4056	3058
4017	3077	4027	3021	4037	3012	4047	3096	4057	3077
4018	3058	4028	3067	4038	3096	4048	3012	4058	3115
4019	2967	4029	3096	4039	3040	4049	3049	4059	3067
4020	3067	4030	3135	4040	3012	4050	3058	4060	3077
Avg	3042		3072		3060		3056		3089

Ammunition: XM196.
Rifle No.: 008651.

4011	3030	4021	2976	4031	3040	4041	3058	4051	3049
4012	3077	4022	3021	4032	3040	4042	3058	4052	3021
4013	3012	4023	3040	4033	2994	4043	3021	4053	3058
4014	3003	4024	2967	4034	2994	4044	3125	4054	3077
4015	3030	4025	3086	4035	3040	4045	3086	4055	3030
4016	3030	4026	3058	4036	3012	4046	3086	4056	3058
4017	3096	4027	3067	4037	3040	4047	3067	4057	3021
4018	3021	4028	3040	4038	3067	4048	3003	4058	3086
4019	3040	4029	3040	4039	3086	4049	3086	4059	3040
4020	3096	4030	3049	4040	3021	4050	3067	4060	3021
Avg	3044		3034		3033		3066		3046

<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>	<u>Rd</u> <u>No.</u>	<u>Vel,</u> <u>fps</u>
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Ammunition: XM196.
Rifle No.: 007239.

5951	3021	5961	3030	5971	3096	5981	3086	5991	3135
5952	3030	5962	3086	5972	3030	5982	3086	5992	3086
5953	3077	5963	3058	5973	3030	5983	3077	5993	3040
5954	3106	5964	3058	5974	3115	5984	3077	5994	3115
5955	3115	5965	3040	5975	3096	5985	3086	5995	3030
5956	3030	5966	3049	5976	3135	5986	3067	5996	3047
5957	3086	5967	3115	5977	3049	5987	3077	5997	3067
5958	3040	5968	3086	5978	3115	5988	3077	5998	3125
5959	3086	5969	2959	5979	3096	5989	3040	5999	3077
5960	3077	5970	3086	5980	3096	5990	3049	6000	3115
Avg	3066		3057		3086		3072		3084

Ammunition: M193.
Rifle No.: 007721.

5951	3030	5961	2994	5971	3058	5981	3067	5991	3096
5952	2976	5962	3096	5972	3106	5982	3049	5992	3086
5953	3012	5963	3067	5973	3040	5983	3021	5993	3030
5954	3003	5964	3058	5974	3047	5984	3096	5994	3077
5955	3086	5965	3030	5975	3086	5985	3040	5995	2994
5956	3012	5966	3077	5976	3125	5986	3067	5996	3058
5957	3086	5967	2976	5977	3096	5987	3077	5997	3067
5958	3047	5968	3030	5978	3077	5988	3021	5998	3049
5959	3003	5969	3106	5979	3077	5989	3067	5999	3030
5960	3058	5970	3077	5980	3106	5990	3077	6000	3058
Avg	3031		3051		3082		3058		3055

Ammunition: XM196.
Rifle No.: 008651.

5951	2994	5961	3021	5971	2994	5981	3067	5991	3021
5952	3003	5962	3003	5972	2994	5982	3040	5992	3077
5953	2985	5963	3030	5973	3086	5983	2967	5993	3003
5954	3086	5964	3049	5974	3058	5984	2994	5994	2994
5955	2985	5965	3030	5975	3049	5985	3077	5995	3021
5956	3003	5966	3040	5976	2976	5986	3106	5996	3077
5957	2985	5967	3049	5977	2985	5987	2994	5997	3012
5958	3096	5968	3021	5978	3077	5988	3049	5998	3049
5959	2907	5969	3058	5979	3040	5989	3086	5999	3003
5960	2941	5970	3049	5980	3058	5990	3058	6000	3067
Avg	2999		3035		3032		3054		3032

DATE OF GAUGING		FIRING STATUS (Check One)		NUMBER OF ROUNDS		MODEL		MANUFACTURER		CASTING NUMBER	
		BEFORE	AFTER								
Cal. .223" (4) 007239				BEAT HVG.		GAL AR 15					
7 AUG 1964											
PROOF OFFICER				LINDLEY		331-617-40					
DIST. IN (INCHES) FROM		FACE OF FLASH SUPPRESSOR		GAGE MEAS. IN 1/1000 INCH		LANDS. 2190		GROOVES. 2235			
						VERT		HOR			
		1.25				.000		.00		.00	
		2.00									
		3.00									
		4.00									
REAR		5.00									
FACE OF		6.00									
RECIMER		7.00									
		8.00									
		9.00									
18.30		10.00									
17.30		11.00									
16.30		12.00									
15.30		13.00									
14.30		14.00									
13.30		15.00									
12.30		16.00									
11.30		17.00									
10.30		18.00									
9.95		18.35				+ 1		0			
9.45		18.85				1		+ 1			
9.20		19.10				+0001		+0002		+0002 +0003	
REAR SCOPED - of circular, conical tool marks in straight of chamber and forcing cone. Light gas erosion on rear edge of forcing cone. Shape of chamber notably finished. Lands and grooves chambered intermittently throughout bore. Light deposits of metal in bore from 19.00 to 16.00 high surface face of suppression. Heavy deposits on opposite of throughout remainder of bore. Lands and grooves pronounced. Lands and at base of lands forward edge of gas port moderately eroded. Twist of rifling 1 turn in 12 inches HCO											

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

DATE OF GAUGING 11.22.3" (A) 001239		FIRING STATUS (Check One) BEFORE AFTER		NUMBER OF ROUNDS BEFORE AFTER		MODEL M1A1		MANUFACTURER G.I.		CASTING NUMBER	
PROOF OFFICER LINDLEY 331-617-40						REAR FACE OF RECEIPT					
FACE OF RECEIPT						GAUGE READING					
LANDS 2190"						GEOMETRIC 2235					
VERT HOR						VERT HOR					
1.25						1.009					
2.00						1.007					
3.00						.0012					
4.00						.0012					
5.00						.0012					
6.00						.0012					
7.00						.0012					
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74.00						.0012					
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90.00						.0012					
91.00						.0012					
92.00						.0012					
93.00						.0012					
94.00						.0012					
95.00						.0012					
96.00						.0012					
97.00						.0012					
98.00						.0012					
99.00						.0012					
100.00						.0012					

[illegible]

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

DATE		MODEL	MANUFACTURER	CASTING NUMBER	PROOF OFFICER	NUMBER OF ROUNDS	TESTING STATUS (5.0-3.0 mm)	BEFORE	AFTER																																																																																																														
Date: 223"		6017 AR15	Can		LINDLEY	4000																																																																																																																	
Rifle		007239																																																																																																																					
DATE OF CALIBRATING		18 AUGUST 1964																																																																																																																					
Cal. 223" - (17 HP 15) <table border="1"> <thead> <tr> <th>FRANK FINE OF RECEIVER</th> <th>1.00</th> <th>2.00</th> <th>3.00</th> <th>4.00</th> <th>5.00</th> <th>6.00</th> <th>7.00</th> <th>8.00</th> <th>9.00</th> <th>10.00</th> <th>11.00</th> <th>12.00</th> <th>13.00</th> <th>14.00</th> <th>15.00</th> <th>16.00</th> <th>17.00</th> <th>18.00</th> <th>18.35</th> <th>18.85</th> <th>19.10</th> </tr> </thead> <tbody> <tr> <td>LANDS</td> <td>2190"</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>6 GROOVES</td> <td>3.223"</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>VERT</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>HOR</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> * GAGE WILL NOT ENTER PORTS OPEN - Primer to gas erosion encroaching rear edge of bullet 40 ft. Moderate to light heat checking and pitting encroaching more from rear of bullet 40 ft. in primer 4000 forward. This condition shows primer, lead on lead, slight pitting on primer, information on primer, metal deposits do not appear to be as rough as after 2000 rd. metal build up heavy, thickness 17 mils from average end, light erosion on forward edge of gas port.										FRANK FINE OF RECEIVER	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	18.35	18.85	19.10	LANDS	2190"																					6 GROOVES	3.223"																					VERT																						HOR																					
FRANK FINE OF RECEIVER	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	18.35	18.85	19.10																																																																																																		
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MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

CAL. 223" (5) 007721		MODEL		MANUFACTURER		CASTING NUMBER	
RIFLE		0017915		Cali			
DATE OF GAUGING		NUMBER OF ROUNDS		PROOF OFFICER			
7 AUG 1964		BE AT AGE		LINDLEY 331-617-40			
FILING STATUS (Check One)							
BEFORE							
AFTER							
		Twist of rifling 1 turn in 12 inches NO					
		Heavy circumferential tool marks on base of chamber light in throat of chamber all forcing cone. Light esp. appears on rear edge of forcing cone. This is deposits of material that shoot back forward edge of rear part lightly loaded					
		EXPLANATION OF FLASH 1.25 4.000 4.000 4.000 4.000 2.00 3 1 3.00 2 1 4.00 2 1 5.00 1 1 6.00 1 1 7.00 1 1 8.00 1 1 9.00 1 1 10.00 1 1 11.00 1 1 12.00 1 1 13.00 1 1 14.00 1 1 15.00 1 1 16.00 1 1 17.00 1 1 18.00 1 1 18.33 1 1 18.53 1 1 19.10 +.0001 +.0001 +.0003 +.0004					

[illegible]

DATE OF GAUGING		FIRING STATUS	NUMBER	MODEL	NUMBER OF ROUNDS	PROOF OFFICER	MANUFACTURER	CA.
Cal.. 223"	18 AUGUST 1964	BEFORE	007721	Cal. 223"	4000	W.O. 331-617-40	Cal.	
RIFLE		AFTER						
REMARKS: CORRODED - HEAVY AND OCCASIONAL HEAT CHECKING AND NUMEROUS LIGHT STRESS CRACKS ENCIRCLING REAR EDGE OF BULLET SEAL - HEAVY TO LIGHT HEAT CHECKING AND PITTING ENCIRCLING BORE FROM REAR OF BULLET SEAL TO APPROX. 4.00" FORWARD - NUMEROUS LIGHT STRESS CRACKS INTERMITTENTLY THRU OUT THIS AREA - LIGHT HEAT CHECKING AND PITTING THRU OUT REMAINDER OF BORE - HEAVY DEPOSITS OF METAL INTERMITTENTLY AT MIDDLE OF LINER FROM 7.00" TO 16.00" FROM Muzzle END - FORWARD EDGE OF SUPPORT SLIGHTLY ERODED -								
BY OSBORN SCHNITZ PDS. 400								

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

BOLT AR15
CAL. 223 - RIF. REL.

DATE OF GAUGING	FIRING STATUS (Check One)	NUMBER	MODEL	MANUFACTURER	CASTING NUMBER	DIST. IN INCHES				
						LANDS, .2190"		GROOVES, .2235"		
21 Aug. 1964 RIFLE	BEFORE	(5) 007721	BOLT AR15	Calk	X	1.25	+0.0004	+0.0005	+0.0010	+0.0011
						2.00	4	5	9	10
						3.00	4	5	9	10
						4.00	3	4	9	10
						5.00	4	6	9	10
						6.00	4	5	10	10
						7.00	4	5	10	12
						8.00	5	5	10	14
						9.00	5	5	15	17
						10.00	6	9	27	27
						11.00	7	8	27	25
						12.00	9	11	21	21
						13.00	10	13	18	18
						14.00	12	13	17	18
						15.00	15	16	17	19
						16.00	15	15	22	19
						17.00	12	15	21	19
						18.00	11	10	17	18
						18.35	7	9	14	15
						18.55	17	21	17	17
19.10	+0.0028	+0.0028	+0.0016	+0.0015						
REMARKS - Heavy erosion with numerous light stress cracks, heavy heat checking and pitting extending from base of bullet seat to approx 400" forward. Light heat checking on lands throughout remainder of bore. Forward edge of gas port heavily eroded. Light deposits of metal throughout bore.										
By: BLOS Osborne-Schultz 400										

CAL. 223" - (CAL - AR 15)		CASTING NUMBER		MANUFACTURER		MODEL		NUMBER OF ROUNDS		PROOF OFFICER	
DATE OF GAUGING		FIRING STATUS (Check One)		NUMBER		MODEL		NUMBER OF ROUNDS		PROOF OFFICER	
BEFORE		AFTER									
AUG 1964		✓		(6) 008651		COLT AR 15		COLT AR 15		LINDLEY 331-617-40	
RIFLE											
HEADSCOPED - Head. Circumferential tool marks on slope of chamber. Light tool marks in straight of chamber and forcing cone. Light gas erosion on rear edge of forcing cone. Light deposits of metal throughout bore. Forward edge of gas port slightly beveled. Lumps and granules lightly chartered. Twist of rifling 1 turn in 12 inches NO By C.D.G.											

[illegible]

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

CAL. 22.3" - CAL. AR15		CASTING NUMBER		MANUFACTURE		MODEL		NUMBER OF ROUNDS		FIRING STATUS (Check one)		DATE OF GAUGING	
										BEFORE		AFTER	
CAL. 22.3" - CAL. AR15		Cal. 1		PROOF OFFICER LINGLEY- 231-6177-110		Cal. 1 AR15		4000		☒		18 AUG 1964	
MEASUREMENTS FROM LEADS 2.190" GROOVES 2.235" VERT. HOR. VERT. HOR.		1.25 F.0000 +.0003 +.0010 F.0009 3 3 4 9 3 3 4 9 4 4 4 9 4 4 4 10 4 4 5 9 4 4 5 10 3 4 10 13 3 3 12 10 5 4 13 11 3 5 13 12 3 3 15 14 4 4 14 14 2 0 14 14 7 + 6 13 13 5 7 13 13 5 7 12 12 5 6 11 11 7 7 11 10 11 15 12 12 19.10 +.0027 7.00 27 +.00 10 +.00 11		PREFUSED - HEAVY LIGHT STRESS GAUGES WENT CHECKING W/ NUMEROUS LIGHT STRESS GAUGES ENCIRCLING REAR EDGE OF BULLET SHOT - HEAVY TO LIGHT HEAT CHECKING + HITTING ENCIRCLING REAR FROM REAR OF BULLET SHOT (1000X) 11.00" FORWARD - NUMEROUS LIGHT STRESS GAUGES INTERMITTENTLY THRU OUT THE REAR - LIGHT HEAT CHECKING + HITTING THRU OUT REMAINDER OF BULLET - HEAVY TO LIGHT HEAT CHECKING THRU OUT REAR - ENCIRCLING REAR OF BULLET 11.00" FORWARD - ENCIRCLING REAR OF BULLET 11.00" FORWARD -		BY BLDG		OSBORNE 400		SCHANTE			

[illegible]

5.56 7m		19	
NUMBER	CASTING NUMBER	MANUFACTURER	PROOF OFFICER
008625	Col 1	Col 1	Col 1
DATE OF GAUGING	21-JULY-64		
FIRING STATUS (Check One)			
BEFORE	AFTER		
NUMBER OF ROUNDS			
13.5 AT 100			
MODEL			
Col 1			
Twist of Rifling - 1 turn in 12"			
PORTLAND CEMENT -			
LIGHT EROSION ENCIRCLING FORWARD NOSE			
STRAIGHT OF DIAMETER - LIGHT CIRCLING			
TOOL MARKS AND LIGHT ABRASIVE WEAR			
ENCIRCLING FORWARD NOSE - LIGHT CIRCLING			
TOOL MARKS, LIGHT PITTING AND PLATE METAL			
DEPOSITS IN GROOVES - GOOD THROUGHOUT			
MODERATE EROSION ON FORWARD GORE OF GUN HEAD			

[illegible]

[illegible]

5.56 77 BARREL XM 16E1		Casting Number		Manufacturer		Model		Number of Rounds		Firing Status (Check One)		Date of Gauging	
										☐ BEFORE ☒ AFTER			
X 1716E1		X 1716E1		X 1716E1		X 1716E1		X 1716E1		X 1716E1		X 1716E1	
PROOF OFFICER LINDSEY		PROOF OFFICER LINDSEY		PROOF OFFICER LINDSEY		PROOF OFFICER LINDSEY		PROOF OFFICER LINDSEY		PROOF OFFICER LINDSEY		PROOF OFFICER LINDSEY	
W.O. 531-617-40		W.O. 531-617-40		W.O. 531-617-40		W.O. 531-617-40		W.O. 531-617-40		W.O. 531-617-40		W.O. 531-617-40	
DISTANCE (INCHES) FROM		DISTANCE (INCHES) FROM		DISTANCE (INCHES) FROM		DISTANCE (INCHES) FROM		DISTANCE (INCHES) FROM		DISTANCE (INCHES) FROM		DISTANCE (INCHES) FROM	
FACE OF FLASH SUPPRESSOR		FACE OF FLASH SUPPRESSOR		FACE OF FLASH SUPPRESSOR		FACE OF FLASH SUPPRESSOR		FACE OF FLASH SUPPRESSOR		FACE OF FLASH SUPPRESSOR		FACE OF FLASH SUPPRESSOR	
LANDS .2190"		LANDS .2190"		LANDS .2190"		LANDS .2190"		LANDS .2190"		LANDS .2190"		LANDS .2190"	
VERT		VERT		VERT		VERT		VERT		VERT		VERT	
HOR		HOR		HOR		HOR		HOR		HOR		HOR	
1.25		1.25		1.25		1.25		1.25		1.25		1.25	
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5.00		5.00		5.00		5.00		5.00		5.00		5.00	
6.00		6.00		6.00		6.00		6.00		6.00		6.00	
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10.00		10.00		10.00		10.00		10.00		10.00		10.00	
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												ON-HEAD AND EXTENDING INTO FENCING LINE -				
												LANDS LIGHTLY FLATTENED ON FENCING LINE -				
												LIGHT FENCING LINE & THICK SET MARK - VERY				
												LIGHT FENCING LINE FORWARD EDGE OF GROUND -				

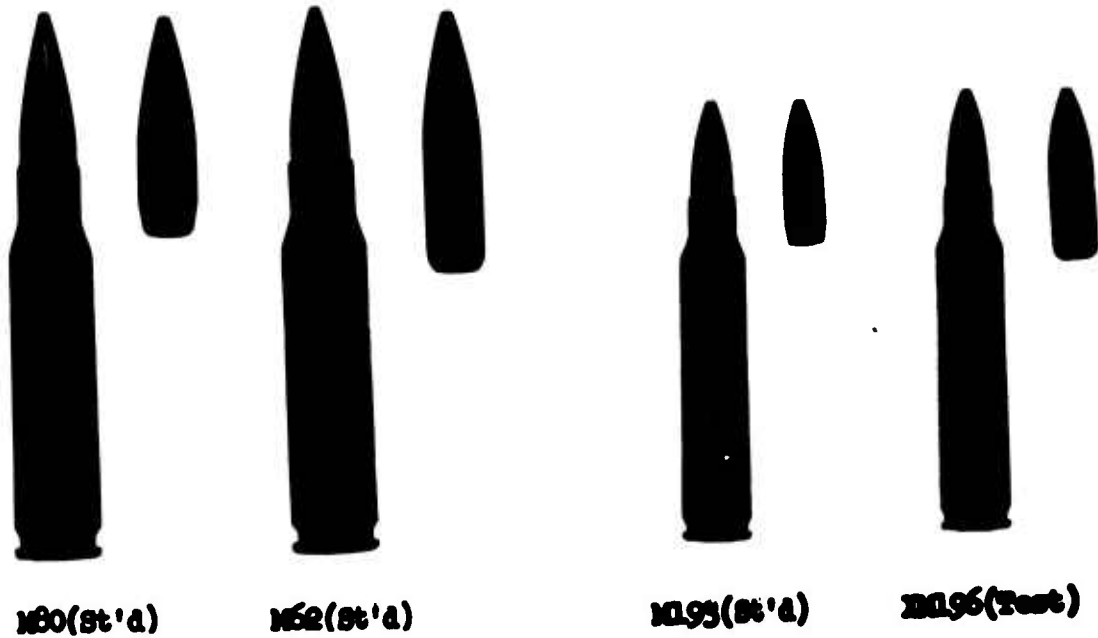
MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

DATE OF GAUGING		FIRING STATUS (Check One)		NUMBER OF ROUNDS		MODEL		MANUFACTURER		CASTING NUMBER																																																																																																																														
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		LANDS. 2995" GROOVES. 3075" <table border="1"> <thead> <tr> <th>FACE</th> <th>VERT</th> <th>HOR</th> <th>VERT</th> <th>HOR</th> </tr> </thead> <tbody> <tr><td>5.20</td><td>+0.007</td><td>+0.008</td><td>+0.010</td><td>+0.011</td></tr> <tr><td>3.20</td><td>08</td><td>09</td><td>11</td><td>11</td></tr> <tr><td>4.00</td><td>09</td><td>09</td><td>11</td><td>12</td></tr> <tr><td>5.00</td><td>10</td><td>04</td><td>11</td><td>13</td></tr> <tr><td>6.00</td><td>12</td><td>10</td><td>12</td><td>14</td></tr> <tr><td>7.00</td><td>12</td><td>11</td><td>13</td><td>14</td></tr> <tr><td>8.00</td><td>12</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>9.00</td><td>12</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>10.00</td><td>13</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>11.00</td><td>14</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>12.00</td><td>13</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>13.00</td><td>12</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>14.00</td><td>12</td><td>12</td><td>14</td><td>14</td></tr> <tr><td>15.00</td><td>13</td><td>12</td><td>14</td><td>13</td></tr> <tr><td>16.00</td><td>13</td><td>10</td><td>14</td><td>13</td></tr> <tr><td>17.00</td><td>13</td><td>11</td><td>13</td><td>14</td></tr> <tr><td>18.00</td><td>13</td><td>12</td><td>12</td><td>14</td></tr> <tr><td>19.00</td><td>12</td><td>12</td><td>12</td><td>14</td></tr> <tr><td>20.00</td><td>12</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>21.00</td><td>12</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>21.17</td><td>12</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>22.17</td><td>12</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>22.27</td><td>12</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>23.47</td><td>+0.012</td><td>+0.012</td><td>+0.013</td><td>+0.014</td></tr> </tbody> </table> Twist of Rifling = 1 TURN IN 12" Roller Groove = LIGHT CIRCUMFERENTIAL TOOL MARKS ENCIRCLING CHAMBER & EXTENDING ON TO COMMENCEMENT OF RIFLING - NO DISCERNIBLE FLATTENED OR FUSING CONE - LIGHT PITCH DEPOSITS THROUGHOUT BORE - LIGHT EROSION ON FORWARD SIDE OF SUBNUT. SCHMIDT-KENIX										FACE	VERT	HOR	VERT	HOR	5.20	+0.007	+0.008	+0.010	+0.011	3.20	08	09	11	11	4.00	09	09	11	12	5.00	10	04	11	13	6.00	12	10	12	14	7.00	12	11	13	14	8.00	12	12	13	14	9.00	12	12	13	14	10.00	13	12	13	14	11.00	14	12	13	14	12.00	13	12	13	14	13.00	12	12	13	14	14.00	12	12	14	14	15.00	13	12	14	13	16.00	13	10	14	13	17.00	13	11	13	14	18.00	13	12	12	14	19.00	12	12	12	14	20.00	12	12	13	14	21.00	12	12	13	14	21.17	12	12	13	14	22.17	12	12	13	14	22.27	12	12	13	14	23.47	+0.012	+0.012	+0.013	+0.014
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APPENDIX II - FINDINGS

<u>TEST PLAN REQUIREMENT</u>	<u>PERFORMANCE</u>
1. Determine the physical characteristics of the test item.	Satisfactory (ref par. 2.1 and Reference 3).
2. Determine the accuracy of the test cartridge.	Satisfactory (ref par. 2.2 and Reference 3).
3. Determine the trace characteristics of the test cartridge.	Satisfactory (ref par. 2.3 and Reference 3).
4. Determine the maximum number of test cartridges that can be safely fired from the M16 rifle without the occurrence of a premature functioning caused by chamber heating.	Satisfactory (ref par. 2.4 and Appendix I).
5. Determine the ability of the test cartridge to withstand vibrations caused by firing the M16 rifle.	Satisfactory (ref par. 2.5).
6. Determine the deflection characteristics of the test cartridge.	(Ref par. 2.6.4.)
7. Determine the erosion characteristics of the test cartridge.	Satisfactory (ref par. 2.7 and Appendix I).
8. Determine the penetration characteristics of the test cartridge.	Satisfactory (ref par. 2.8).
9. Determine if the test cartridge generates sufficient operating energy to insure reliable automatic functioning of the XM16E1 rifle when fired with the weapon held in various positions.	Satisfactory (ref par. 2.9).

APPENDIX III - PHOTOGRAPH



CARTRIDGE, 5.56-MM, TRACER: M196

		DATA	
Standard:	Cartridge, 7.62-MM:	M80, Ball, M80 (Ord. Eng. No. C-8999543)	
	Cartridge, 7.62-MM:	M82, Tracer, M82 (Ord. Eng. No. C-755705)	
	Cartridge, 5.56-MM:	Ball, M193 (MUCM Eng. No. D-10523632)	
Test :	Cartridge, 5.56-MM:	Tracer, M196 (MUCM Eng. No. C-10534193)	
		Standard	Test
Bullet		M80, Wt. 151-3 gr	M196, Wt. 95 gr
		M82, Wt. 141-4 gr	
		M193, Wt. 95 gr	
Case	7.62-MM:	Brass, FA T1-E3	5.56-MM: Brass
	5.56-MM:	Brass	
Propellant	7.62-MM:	WC 846.4, 47.1 gr	5.56-MM: IMR-4473, 25 gr
	5.56-MM:	IMR-4473, 25 gr	
Primer	7.62-MM:	FA-96	5.56-MM: Remington 98M
	5.56-MM:	Remington 98M	
Instrumental Velocity, fps	7.62-MM:	2790 $\pm$ 30 at 78'	5.56-MM: 3800 $\pm$ 40 at 15'
	5.56-MM:	3850 $\pm$ 40 at 15'	
Chamber Pressure, psi	7.62-MM:	90,000 Max.	5.56-MM: 92,000 Max.
	5.56-MM:	92,000 Max.	

View showing the M80, M82 and M193 cartridges with sectioned bullets (standard) on the left and the M196 cartridge with sectioned bullet (test) on the right.

APPENDIX IV - DRAWINGS

NOTE: - This document, drawings, specifications, and/or data are used for any purpose other than for the original use and are not to be used for any other purpose without the written approval of the originator. The use of this document for any other purpose is prohibited. The use of this document for any other purpose is prohibited. The use of this document for any other purpose is prohibited.

PHYSICAL PROPERTIES	DO NOT	APPLY PART NO.	REVISIONS																	
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%;">TYPE</th> <th style="width: 10%;">APPLICATION</th> </tr> <tr> <td>TP</td> <td></td> </tr> <tr> <td>TS</td> <td></td> </tr> <tr> <td>SL</td> <td></td> </tr> <tr> <td>RA</td> <td></td> </tr> <tr> <td>CM</td> <td></td> </tr> <tr> <td>RM</td> <td></td> </tr> </table>	TYPE	APPLICATION	TP		TS		SL		RA		CM		RM				REV	DESCRIPTION	DATE	BY
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PROPELLANT

SPEC MIL-P-3984

TYPE I, CLASS 2, TUBULAR

COLUMN 1	COLUMN 2	COLUMN 3
PART NUMBER	ITEM	LOAD
10523620	DUPONT IMR 4475	25 GRAINS APPROX

NOTES:-

- 1-ACTUAL LOAD WEIGHT TO MEET BALLISTIC REQUIREMENTS.
- 2-COMMERCIAL ITEM LISTED MEETS THE REQUIREMENTS SPECIFIED BY MIL-P-3984
- 3-ALL OTHER SOURCES MUST COMPLY WITH DRAWING REQUIREMENTS AND IN ADDITION THE ITEM MUST BE FUNCTIONALLY EQUIVALENT TO THE MANUFACTURER'S ITEM INDICATED. MUNITIONS COMMAND APPROVAL REQUIRED.

FOR LIST OF PARTS SEE

ENGINEERING PARTS LIST 10523620

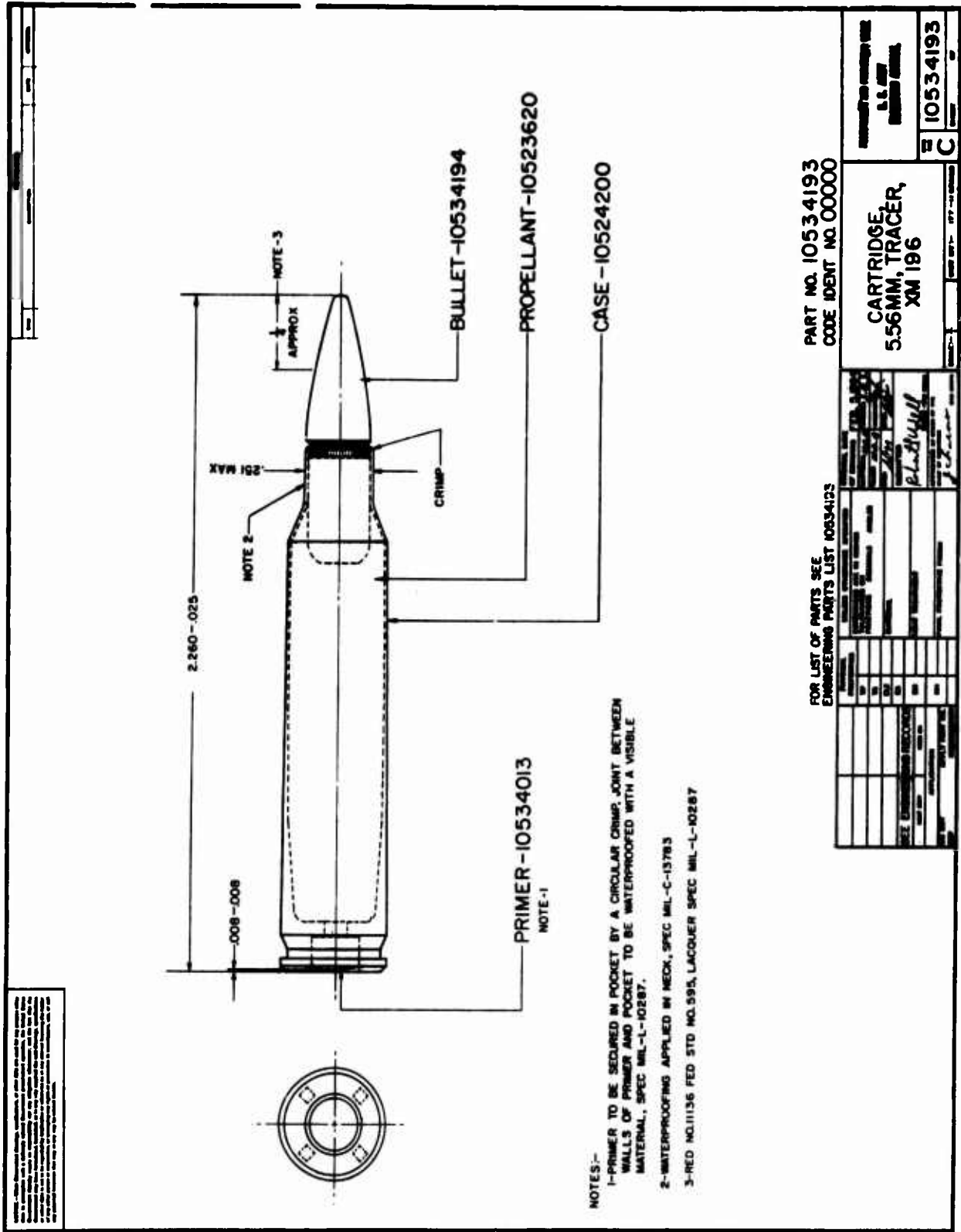
PART NO. 10523620

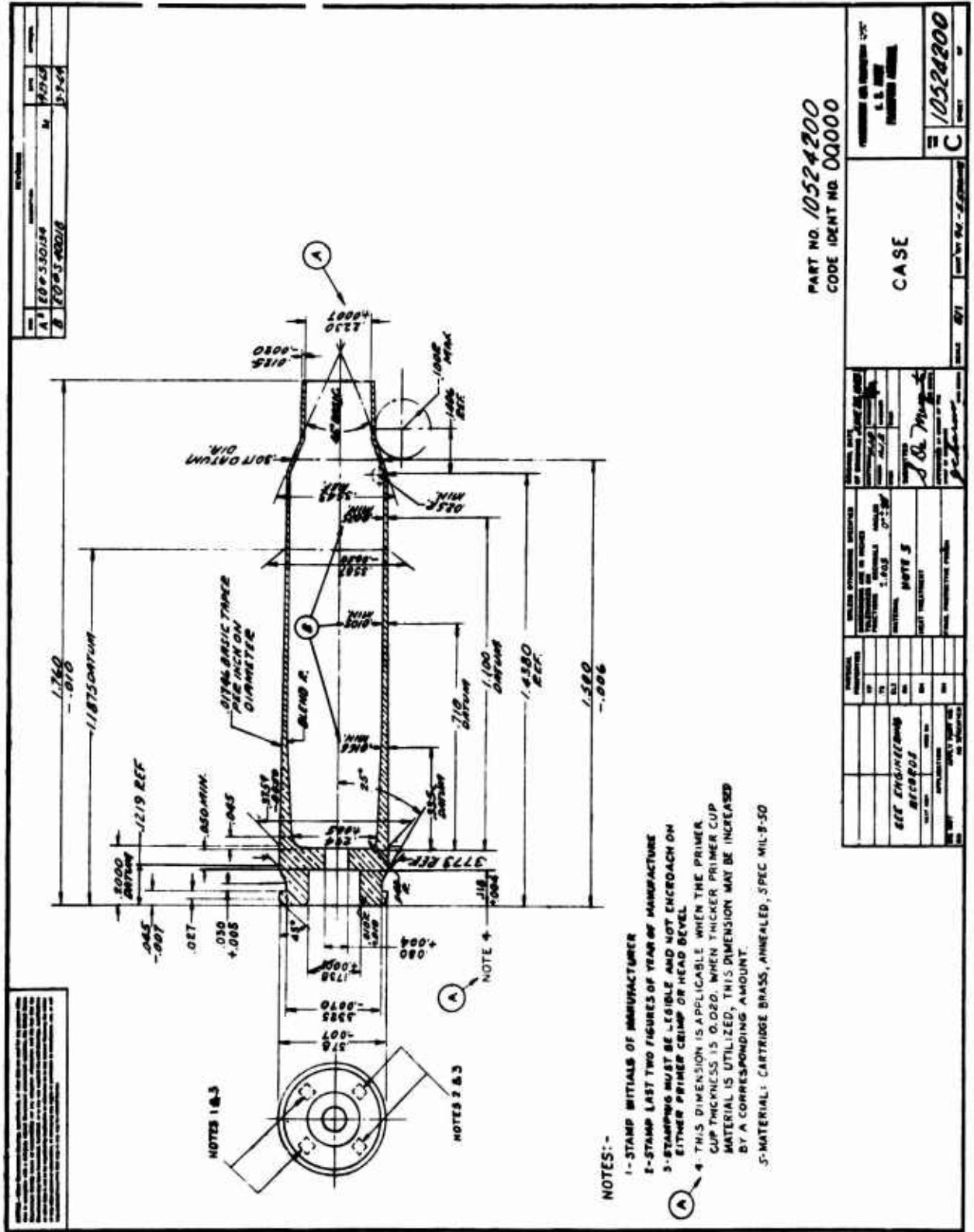
CODE IDENT NO. 000000

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES	ORIGINAL DATE OF DRAWING JAN 25, 1963	M PROPELLANT	PROCUREMENT AND PRODUCTION GROUP U.S. ARMY BASTINGS COMMAN FRANKFORD ARSENAL
MATERIAL	QUANTITY 2 / 1000		
HEAT TREATMENT	APPROVED BY ORDER OF THE CHIEF OF COMMAND		
FINAL PROTECTIVE FINISH	SCALE UNIT WT		

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10523620





REVISED		DATE	APPROVAL
DESCRIPTION			

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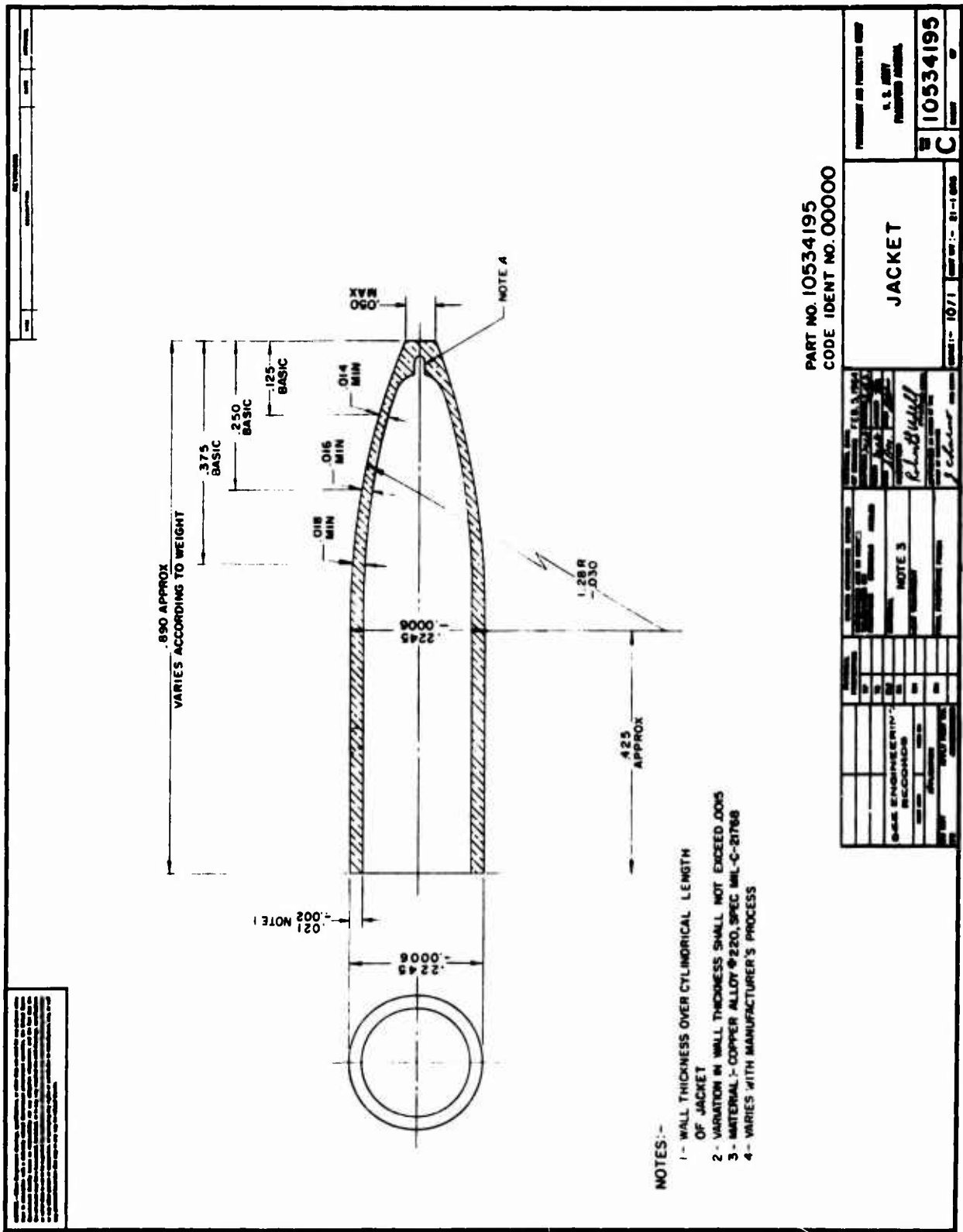
NOTES:-
 1-ALL DIMENSIONS APPROX
 2-POINT FILLER TO BE CONTROLLED BY WEIGHT
 3-MATERIAL:-LEAD ANTIMONY, SPEC MIL-L-13283, GRADE NO1

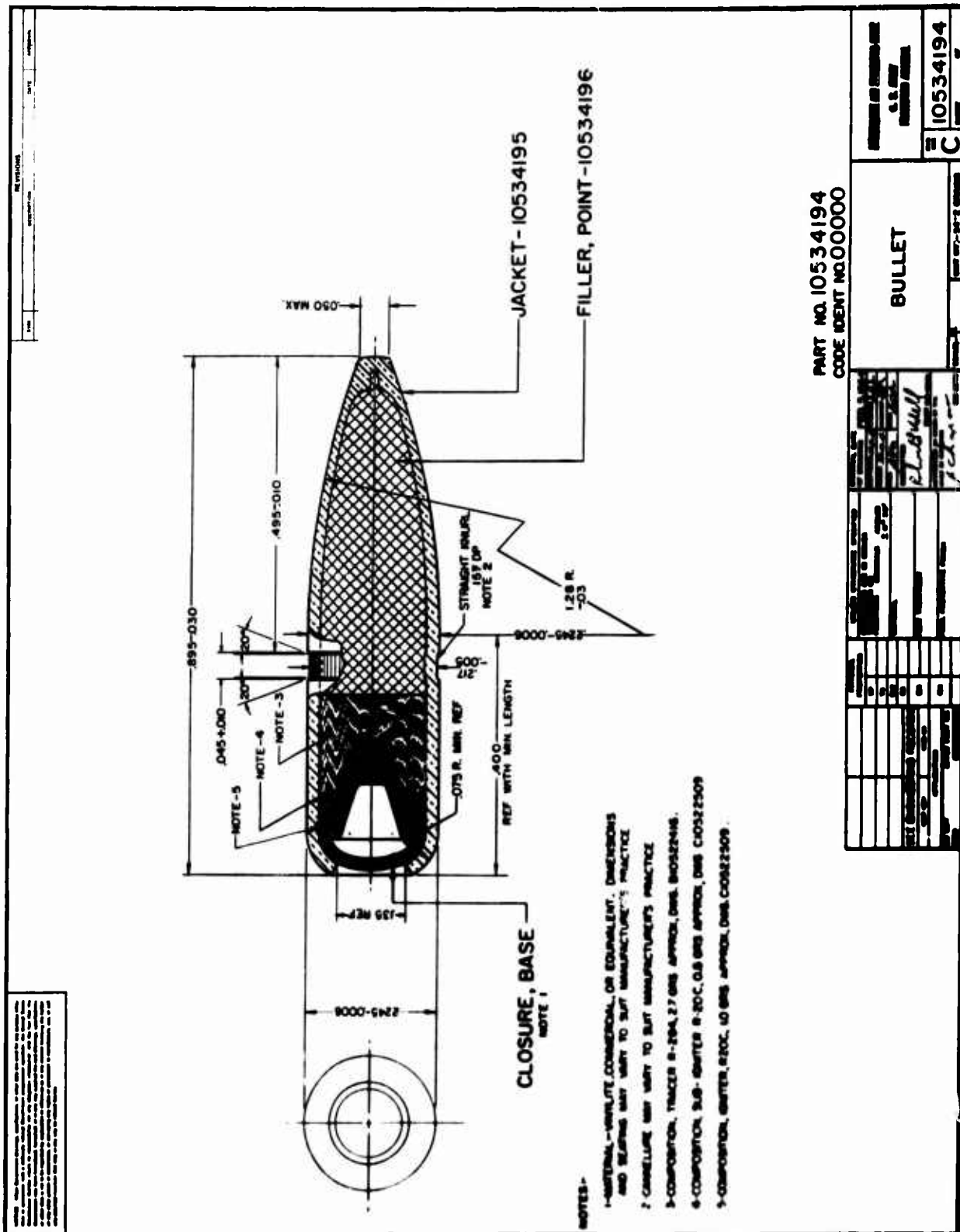
PART NO. 10534196
 CODE IDENT NO. 00000

FILLER, POINT		APPROVED BY JAMES H. H. H. L. L. H. H. H. H. H. H.
SCALE: 1/2" = 1"	UNIT WT: 20-25 GRAMS	10534196 B

ORIGINAL DATE OF DRAWING FEB. 3, 1954	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS DECIMALS ANGLES	PHYSICAL PROPERTIES
DESIGNED BY J. L. H. H.	MATERIAL NOTE 3	TYP TS
CHECKED BY J. L. H. H.	HEAT TREATMENT	RL-2 RL-3
APPROVED BY J. L. H. H.	FINAL PROTECTIVE FINISH	RH RH-1
SEE ENGINEERING RECORDS	SHEET NO. 1	APPLY THIS TO

REVISIONS		DATE	APPROVAL
REV	DESCRIPTION		
(a)-LEAD STYPHNATE TYPE PRIMING COMPOSITIONS SHALL BE USED INGREDIENTS OF COMPOSITION SHALL BE LIMITED TO ANY COMBINATION OF ANY OR ALL OF THE FOLLOWING: LEAD STYPHNATE, NORMAL, FA-PD-MI-2458 OR LEAD STYPHNATE, BASIC, FA-PD-MI-2473; TETRACENE, MIL-T-46938(MU), BARIUM NITRATE, MIL-B-162, LEAD DIOXIDE, FA-PD-MI-2381 ZIRCONIUM, FA-PD-MI-2364, ANTIMONY SULFIDE, MIL-A-159, LIGHT GUM SOLUTION, DWG B10522390; CALCIUM SILICIDE, MIL-C-324, ALUMINUM, MIL-A-512, PENTAERYTHRITE TETRANITRATE (PETN), MIL-P-387, LEAD THIOCYANATE (SULPHOCYANATE), JAN-L-65, NITROCELLULOSE (GRADE B), JAN-N-244 (b)-METALLIC COMPONENTS (CUP AND ANVIL) SHALL BE OF BRASS, SPECIFICATION MIL-B-50 (c)-PRIMER CUP AND ANVIL CONFIGURATION: USE OF FCIL, SHELLAC, SPEC. JAN-S-732 AND LACQUER, SPEC MIL-L-10287 ARE OPTIONAL COMMENSURATE WITH THEIR COMPATIBILITY WITH OTHER COMPONENT AND CARTRIDGE REQUIREMENTS.			
PART NO. 10534013 CODE IDENT NO. 00000		PRIMER, 5.56 MM	
PHYSICAL PROPERTIES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES MATERIAL HEAT TREATMENT FINAL PROTECTIVE FINISH		ORIGINAL DATE OF DRAWING NOV 4 1963 DRAWN BY CHECKED BY APPROVED BY (NAME OF OFFICIAL)	
SEE ENGINEERING RECORDS NEXT PART USED ON APPLICATION APPLY PART AS SHOWN		U.S. ARMY FRANKFORD - RECAL 10534013 B SHEET OF	





APPENDIX V - CORRESPONDENCE

**U. S. ARMY
DEVELOPMENT AND PROOF SERVICES
ABERDEEN PROVING GROUND, MARYLAND 21005**

STEAP-DS-TI

26 OCT 1964

**SUBJECT: First Letter Report on Engineering Test of Cartridge,
5.56-mm, Tracer, XM196, USATECOM Project No. 8-4-0210-02-C**

DPS-1499 (L)

**TO: Commanding General
U.S. Army Test and Evaluation Command
ATTN: AMSTL-BC
Aberdeen Proving Ground, Maryland 21005**

1. References:

- a. Letter, AMSTL-BC, Hq, USATECOM, 3 April 1964,
Subject: Planning Directive for Engineering and Service Test
of Cartridge, Tracer, 5.56-mm, XM196, USATECOM Project No.
8-4-0210-02C.**
- b. Engineering Test Plan for Cartridge, Tracer, 5.56-mm,
XM196, USATECOM Project No. 8-4-0210-02C, dated May 1964.**
- c. Letter, AMSTL-BC, Hq, USATECOM, 14 July 1964,
Subject: Engineering Test of Cartridge, Tracer, XM196, USATECOM
Project No. 8-4-0210-02C.**
- d. Letter, AMSTL-BC, Hq, USATECOM, 17 July 1964,
Subject: Engineering Test of Cartridge, Tracer, XM196, USATECOM
Project No. 8-4-0210-02C.**
- e. Letter, AMSTL-BC, Hq., USATECOM, 9 October 1964,
Subject: Engineering Test of Cartridge, Tracer, XM196, USATECOM
Project No. 8-4-0210-02C.**

FOR INFORMATION ONLY, ACTION BY HIGHER AUTHORITY PENDING

STEAP-DS-TI

SUBJECT: First Letter Report on Engineering Test of Cartridge,
5.56-mm, Tracer, XM196, USATECOM Project No.
8-4-0210-02-C, DPS-1499 (L)

2. Background:

a. The Rifle, 5.56-mm (M16 and XM16E1) and the Cartridge, Ball, M193 have been adopted for use by the U.S. Air Force and by the U.S. Army Special Forces, Airborne, and Air Assault units.

b. The Cartridge, Tracer, 5.56-mm, XM196, is being developed for use with the M16 and XM16E1 rifles.

c. Development and Proof Services has been assigned the responsibility for planning, execution, and reporting of engineer testing of subject cartridge to determine its suitability for use with the M16/XM16E1 rifle.

3. Findings:

Functioning performance of the M16 and XM16E1 rifles with the XM196 tracer cartridge compared favorably with that normally obtained with the standard M193 ball ammunition.

The number of stoppages and parts breakages encountered were exceptionally low in all the weapons.

Cartridge case casualties were neither numerous nor serious, and caused no rifle stoppages.

Muzzle smoke and flash produced by the XM196 tracer was comparable to the M193 ball cartridge, and neither was excessive.

The penetration of the XM196 tracer cartridge, when fired into 1-inch pine boards, is superior to the M193 ball cartridge at ranges of 100 and 300 yards and is comparable to the M193 at 600 yards.

The M16 and XM16E1 rifles functioned without incidence, employing either the ball (standard) or tracer (test) cartridges, when fired at all attitudes.

STEAP-DS-TI

SUBJECT: First Letter Report on Engineering Test of Cartridge,
5.56-mm, Tracer, XM196, USATECOM Project No.
8-4-0210-02-C, DPS-1499 (L)

The XM196 cartridge meets the military specification (MIL-C-60111) requirements for function and casualty, fouling, trace and accuracy.

The data obtained from simultaneous accuracy at 100, 300 and 600 yards indicates that the XM196 tracer cartridge is ballistically matched with the M193 ball cartridge.

A cook-off can be expected with both the XM196 tracer and M193 ball cartridges if more than 120 rounds are fired rapidly.

The effect of vibration on the XM196 cartridge was insignificant insofar as visible damage was concerned. However, the 50 rounds subjected to vibration have not yet been fired for tracer performance.

The erosion characteristics of the XM196 tracer and M193 ball cartridges are comparable. The bores of the three M16 rifles subjected to the erosion test are considered serviceable (based on velocity and bore wear measurements) upon completion of 6000 rounds of firing through each.

Conclusions:

It is concluded that:

- a. The XM196 tracer cartridge performed satisfactorily with respect to loading, feeding, and firing from each of the six 5.56-mm rifles employed in this test.
- b. The test cartridge is compatible with the M16/XM16E1 rifle and can be utilized in firings from that weapon.
- c. The experimental tracer cartridge, as loaded, is ballistically matched with the M193 ball cartridge.
- d. From the firings conducted at Frankford Arsenal and this installation, the 5.56-mm tracer cartridge meets the requirements as outlined in the military specifications (MIL-C-60111).

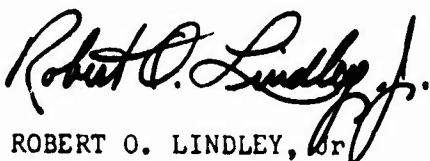
STEAP-DS-TI

SUBJECT: First Letter Report on Engineering Test of Cartridge,
5.56-mm, Tracer, XM196, USATECOM Project No.
8-4-0210-02-C , DPS-1499 (L)

5. Recommendations:

It is recommended that the XM196 tracer cartridge be considered suitable for service use with the M16 and XM16E1 rifles.

SUBMITTED:


ROBERT O. LINDLEY, Jr.
Test Director

APPROVED FOR THE DIRECTOR,
DEVELOPMENT AND PROOF SERVICES:


E. M. SENN
Lt Col., Ord Corps
Deputy Director for
Engineering Testing

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Dir, Marine Corps Landing Force Dev Center, Quantico, Va (1 cy)
U.S. Marine Corps Liaison Officer, USATECOM, APG (1 cy)

4



HEADQUARTERS
U.S. ARMY TEST AND EVALUATION COMMAND
Aberdeen Proving Ground, Maryland 21005

9 OCT 1964

AMSTE-BC

SUBJECT: Engineering Test of Cartridge, Tracer, 5.56mm, XML96
(USATECOM Project No. 8-4-0210-02C)

TO: Commanding Officer
Aberdeen Proving Ground
ATTN: STEAP-DS
Aberdeen Proving Ground, Maryland 21005

1. Reference is made to Planning Directive, Hq USATECOM, subject above, 3 April 1964.
2. Para 9b(1) of the cited reference directed that interim reports of test be submitted to this headquarters within ten (10) working days after completion of testing.
3. Service Test of the XML96 Cartridge by the USA Infantry Board has been completed and the final report of test was forwarded on 10 Sep 1964.
4. There is a requirement that USAMUCOM and the Project Manager M16 be furnished data as to the performance and suitability of the XML96 cartridge for use as soon as possible, in order that type classification action and limited procurement can be undertaken to meet current overseas operational requirements.
5. It is the understanding of this headquarters, based on discussions with the Project Engineer, Mr. Lindley, that engineering test of the XML96 cartridge has been completed with the exception of:
 - a. Brush deflection.
 - b. Observation of trace under certain conditions of visibility.
 - c. Part of the accuracy determination involving 7.62mm ammunition for comparative purposes.
6. The following actions are directed:
 - a. Cancel further brush deflection testing.

8 OCT 1964

AMSTE-BC

SUBJECT: Engineering Test of Cartridge, Tracer, 5.56mm, XM196
(USATECOM Project No. 8-4-0210-02C)

b. Submit to this headquarters not later than 23 October 1964 a partial report, covering the results of testing to date, to include appropriate comments and observations.

c. Upon completion of the above, complete remaining tests, submitting final report not later than thirty (30) days thereafter.

FOR THE COMMANDER:


OLIVER H. ASPINWALL, JR.
Capt, AGC
Asst Admin Officer



OFFICE OF THE COMMANDING GENERAL
U.S. ARMY TEST AND EVALUATION COMMAND
Aberdeen Proving Ground, Maryland 21005

AMSTE-BC

17 JUL 1964

SUBJECT: Engineering Test of Cartridge, Tracer, 5.56MM, XM196 (USATECOM
Project No 8-4-0210-02C)

TO: Commanding Officer
Aberdeen Proving Ground
ATTN: STEAP-DS
Aberdeen Proving Ground, Maryland 21005

1. Reference: Development and Proof Services Plan of Test, subject
above, May 1964.

2. Request that in addition to the tests listed in the reference,
the penetration characteristics of the test cartridge be determined by
firing against pine boards, steel helmets, and armor vests at ranges
of 100, 300, and 600 yards. The report of test will include a comparison
of the results obtained with the penetration characteristics of the M193
5.56MM ball cartridge, the M80 7.62MM ball cartridge, and the M62 7.62MM
tracer cartridge.

FOR THE COMMANDER:

Copy furnished:
CG USAMC ATTN: AMCRD-DW
Pres, USAIB ATTN: STEBC-SA
USACDC LNO, USATECOM

James J. Smith
for **EARL R. EICHENBUECH**
Major, AGC
Asst. Admin. Officer



HEADQUARTERS
U.S. ARMY TEST AND EVALUATION COMMAND
Aberdeen Proving Ground, Maryland 21005

14 JUL 1964

AMSTE-BC

SUBJECT: Engineering Test of Cartridge, Tracer, 5.56MM, XM196 (USATECOM
Project No 84-0210-02C)

TO: Commanding Officer
Aberdeen Proving Ground
ATTN: STEAP-DS
Aberdeen Proving Ground, Maryland 21005

1. Reference is made to Engineering Test Plan for Cartridge, Tracer, 5.56MM, XM196, Development and Proof Services, Aberdeen Proving Ground, May 1964.

2. Request that in addition to the tests outlined in the cited reference, tests be conducted to determine whether the XM196 cartridge generates sufficient operating energy to insure reliable automatic functioning of the M16/XM16E1 rifles when fired with weapon held horizontally; with muzzle depressed 45 degrees below horizontal; and with muzzle depressed 90 degrees below horizontal.

FOR THE COMMANDER:

Copies furnished:

CG USAMC, ATTN: PMSO-AK15

CG USAWECOM, ATTN: PM-AR15

CO Frankford Arsenal, ATTN: SMUFA-390

Pres, USAIB, Ft Benning, Georgia ATTN: STEBC-SA

John Hall
for **EARL R. EICHENBERGER**
Major, AGC
Asst. Admin. Officer

COPY/bm

HEADQUARTERS
U.S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

AMSTE-BC

3 APR 1964

SUBJECT: Planning Directive for Engineering and Service Test of
Cartridge, Tracer, 5.56mm, XM196

TO: President, U. S. Army Infantry Board, Fort Benning, Ga. 31905
President, U. S. Army Arctic Test Board, APO 733, Seattle,
Washington
Commanding Officer, Aberdeen Proving Ground, ATTN: STEAP-DS,
Aberdeen Proving Ground, Maryland 21005

1. References:

- a. AMCTC Item 1736, 18 Feb 1964.
- b. USAMJCOM Commodity Master Plan for Cartridge, 5.56mm, for Rifle, M16.
- c. AR 705-15, w/change 1 dated Oct 1963.

2. Purpose. This is a planning directive for test of the Cartridge, Tracer, 5.56mm, XM196. Upon receipt, addresses are directed to initiate planning in accordance with responsibilities outlined herein.

3. Description of Materiel. The XM196 Tracer Cartridge consists of the standard M193 ball cartridge case and primer assembly. The bullet has a gilding metal jacket around a halved lead core. The pyrotechnic components, which are located to the rear of the halved lead core, consist of the igniter and tracer mix. The assembled bullet weighs approximately 55 grains and is flat-based. The bullet tip is colored orange to facilitate identification.

4. Background.

- a. The Rifle, 5.56mm (M16 and XM16E1) and the Cartridge, Ball, M193 have been adopted for use by the U. S. Air Force and by U. S. Army Special Forces, Airborne, and Air Assault units (ref a).
- b. The cartridge, tracer, 5.56mm, XM196, is being developed for use with the M16/XM16E1 rifles.

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3 APR 1964

AMSTE-BC

SUBJECT: Planning Directive for Engineering and Service Test of Cartridge, Tracer, 5.56mm, XM196

c. Drawings and specifications of the tracer cartridge and reports of ballistic tests performed at Frankford Arsenal will be forwarded by this headquarters to test agencies when available.

5. Test Objective. To determine the suitability of the Cartridge, Tracer, XM196, for use with the M16/XM16E1 Rifle. Since no QMR, military characteristics, or technical characteristics are available for the test cartridge, test agencies will use appropriate 7.62mm weapons and ammunition for control purposes and will determine:

a. The ballistic compatibility of the test cartridge with the M193 ball cartridge, in comparison with that of the 7.62mm M62 tracer relative to the 7.62mm M80 ball cartridge.

b. Commensurate with range-accuracy capability, the overall suitability of the test cartridge for use with the M16/XM16E1 Rifle, in comparison with the suitability of the 7.62mm M62 Tracer with the M14 Rifle.

6. Responsibilities.

a. Development and Proof Service, Aberdeen Proving Ground, Md. is responsible for planning, execution, and reporting of engineer testing. Engineer tests to be conducted will include:

(1) Physical characteristics; safety, cook-off, functioning, and ballistic properties.

(2) Initiation, termination, intensity, and visibility of tracer element.

(3) Within the limitations of facilities available, a determination of cartridge performance under hot, intermediate, and cold climatic conditions and other adverse environments.

(4) The effects of vibration and rough handling should be considered.

b. The U. S. Army Infantry Board, Ft Benning, Georgia is responsible for planning, execution, and reporting of service test to determine the suitability of the test cartridge for use under temperate (intermediate) climatic conditions.

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3 APR 1964

AMSTE-BC

SUBJECT: Planning Directive for Engineering and Service Test of Cartridge, Tracer, 5.56mm, XM196

c. The U. S. Army Arctic Test Board is responsible for planning, execution, and reporting of tests to determine the suitability of the test cartridge for use in the lower limits (-25°F) of intermediate climatic conditions, and to provide data upon the performance and suitability for use of the test cartridge under cold and extreme cold climatic conditions.

d. For definitions of intermediate, cold, and extreme cold climatic conditions, see reference 1c.

7. Coordination. The U. S. Army Infantry Board will informally coordinate the plan of service test with the U. S. Army Combat Developments Command Infantry Agency and the U. S. Army Infantry School.

8. Special Instructions.

a. It is expected that materiel will be available for test in the quantities and on the dates indicated:

(1) Engineering Test: 20,000 rounds, 15 May 1964.

(2) Service Test: 30,000 rounds, 15 May 1964.

(3) Arctic Environmental Test: 30,000 rounds, 1 September 1964.

b. Addressees will advise this headquarters of materiel requirements (other than test ammunition) at the earliest practicable date.

c. USATECOM Project Numbers are assigned as follows:

(1) Engineering Test: 8-4-0210-02C.

(2) Service Test: 8-4-0210-03C.

(3) Arctic Test: 8-4-0210-04C.

d. D&PS will inform this headquarters of funding requirements at the earliest practicable date.

9. Test Plans and Reports.

a. Engineering and Service Test Plans will be submitted to this headquarters (AMSTE-BC) not later than 1 May 1964; Arctic Test Plan will

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3 APR 1964

AMSTL-BC

SUBJECT: Planning Directive for Engineering and Service Test of Cartridge,
Tracer, 5.56mm, XM196

be submitted not later than 30 October 1964. Plans of Test will include an annex indicating those agencies with which informal coordination has been accomplished, and, when appropriate, comments are incorporated into the test and reasons therefor.

b. Reports of test will be submitted by DEPS and U. S. Army Infantry Board as follows:

(1) Interim report: Within ten (10) working days after completion of testing.

(2) Final report: Within thirty (30) days after completion of testing.

c. Instructions for submission of Arctic Test report will be provided separately.

d. Distribution of plans and reports of test: Inclosure 2.

10. Security. This project is UNCLASSIFIED.

FOR THE COMMANDER:

3 Incls

1. USAMCOM Commodity Master
Plan for Cartridge, 5.56mm
2. Distribution for Reports of Test
3. TEAMS Sheets

/s/ Robert A. Bailey
/t/ ROBERT A. BAILEY
1st Lt
Asst Admin Officer

Copies furnished:
USACDC LNO (USATECOM)
USMC LNO (USATECOM)