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Report No. SA-TR1-7024

EROSION TEST ON 5.56MM RIFLE BARRELS

SMALL ARMS WEAPON SYSTEMS STUDY (SAWS)

Technical Report

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Author W. J. Jarrett

Date 30 June 1967

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SPRINGFIELD ARMORY
SPRINGFIELD, MASSACHUSETTS

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EROSION TEST ON 5.56MM RIFLE BARRELS - SMALL ARMS WEAPON SYSTEMS STUDY (SAWS)

Technical Report

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DA PROJECT TITLE: Small Arms Weapon Systems: Rifle Barrel Study; Liaison; Tests

DA PROJECT: 1W523801A30408

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ABSTRACT

Results are reported on limited erosion testing of three barrels each fabricated from AISI/SAE 4150 steel and Cr-Mo-V steel, with and without chromium plated bores. Tabulated test data include projectile velocities, land and groove diameters, temperature versus time curves, and ammunition expenditures. The unplated 4150 steel barrels were rejected after approximately 1900 rounds were fired at 60 shots per minute. Rejection was based upon the projectile instability criterion, exceeding 15-degree yaw. The chromium plated 4150, and the unplated and chromium plated Cr-Mo-V barrels withstood 3600 rounds fired at rates of 60 and 80 shots per minute.

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REPORT
SA-TR 1-7024

SUBJECT

Erosion Tests on 5.56MM Rifle Barrels

Small Arms Weapons Systems Study (SAWS)

OBJECTIVE

To record results of erosion tests on 5.56mm rifle barrels fabricated from AISI/SAE 4150 and chromium-molybdenum-vanadium steels with and without chromium plated bores.

SUMMARY OF RESULTS

All barrels of both steels, Cr-Mo-V and AISI/SAE 4150 resulphurized, with chromium plated bores successfully withstood the firing test of 3600 rounds of ball ammunition fired in 600-round complements at rates of 60 and 80 shots per minute. Three barrels of each material, plated and unplated, were used in these tests.

The barrels made from Cr-Mo-V steel with unplated bores also withstood the 3600 rounds test.

The 3 barrels made from AISI 4150 resulphurized steel with unplated bores, original equipment of the test weapons, were rejected: one, after 1260 rounds fired at the rate of 80 shots per minute; the other two, after 1960 and 1980 rounds fired at the rate of 60 shots per minute.

Rejection was based upon the projectile instability criterion of 15-degree yaw in 6 out of 30 consecutively fired projectiles. A second rejection criterion of the test was a loss of 200 feet/second or more in projectile velocity. No barrels were rejected for exceeding the second rejection criterion.

RECOMMENDATIONS

It is recommended that the barrels made from 4150 resulphurized steel and furnished as original equipment for the 5.56mm rifles be chromium plated to a thickness of .0005 to .0015 inch. This recommendation is based upon the results of these barrel erosion tests.

It is also recommended that further tests be made to determine the rejection point of the plated barrels so that the differences between the plated 4150 and the plated Cr-Mo-V barrels can be determined.

REPORT
SA-TR1-7024

INTRODUCTION

In December 1964, a comprehensive study of all rifles and machine guns either being used by or being submitted to the field forces was initiated by the U.S. Army Materiel Command under a program entitled SAWS - Small Arms Weapon Systems Study. Part of the Springfield Armory assignment in this effort was to conduct engineering tests and to study the erosion resistance of experimental barrels for the 5.56mm weapons.

MATERIEL

Ammunition. 5.56mm, M193, ball; Lots RA 5062, RA 5072, RA 5136

Test Weapons. 5.56mm, Rifles, Code Z
Firing in full automatic mode, approximately 800 shots per minute. Serial Nos. 00958, 001002, 001047.

Test Barrels. Thirteen complete barrel assemblies each consisting of a flash suppressor, a front sight base, and a barrel extension were used in this test. These barrels were coded according to bore treatment and material. A tabulation of the coded barrels is given as follows:

CODE	MATERIAL	BORE TREATMENT
A_1 A_2 A_3	AISI/SAE 4150 Resulphurized Steel	Unplated
B_1 B_2 B_3 B_4	AISISAE 4150 Resulphurized Steel	Chromium plated*
C_1 C_2 C_3	Cr-Mo-V Steel	Unplated
D_1 D_2 D_3	Cr-Mo-V Steel	Chromium plated*

Chronograph. Electronics Counters, Inc.,
Model 453, with Lumiline screens.

*NOTE. Plating thickness of .0005 to .0015 inch in the bore and .0002 in the chamber.

BARREL FABRICATION

The barrels were procured from Manufacturer Code "Z" as standard assemblies. These assemblies were fabricated by Manufacturer Code "Z" with the use of standard tooling and were shipped to Springfield Armory as complete assemblies. The barrels designated for plating were disassembled and plated in Springfield Armory laboratories. The plating procedures used were the techniques established previously at the Armory in the plating of standard rifle barrels. These procedures are described in Springfield Armory report SA-TR18-1082, "Production, Hard-Chromium, plating of the M14 Rifle Barrels at Springfield Armory."

FIRING RATE

The firing rate as expressed in this report is given by the number of shots fired per minute. The number of shots were averaged over a period of ten or more minutes. This period of time is large when the time required to empty a magazine during continuous firing is considered. Since the natural firing rate of the rifles used in this test is approximately 800 shots per minute and the magazine holds 20 rounds, the magazine will be empty after approximately 1.5 seconds of continuous fire. Therefore, spasmodic or burst firing was required to obtain the desired number of shots per minute.

One of the test parameters was the selection of a firing rate that not only would give an over-all barrel temperature great enough to produce a rate of erosion that could be measured after a reasonable number of rounds had been fired but also would represent possible tactical usage of weapons of this class. To measure the over-all barrel temperature at various rates of fire, it was necessary to modify two standard 4150 steel barrels to accept seven thermocouples at various depths and positions in the barrel wall.

Results of the temperature tests are plotted on a temperature vs. time graph and are shown in Figures 1 and 2, Appendix B. Wall thickness indicates the material thickness between the thermocouple junction and the barrel bore surface. It should be noted, however, that some of the thermocouples failed prior to completion of the tests. These failures are indicated by an interrupted temperature trace.

The barrel erosion tests were conducted at both 60 and 80 shots per minute as determined by the temperature tests.

TEST PROCEDURE

Prior to firing, air gage measurements of the bore and groove diameters of each barrel were taken at one inch increments throughout the length of the rifled

TEST PROCEDURE - Continued

portion of the barrel. Even though all of the measured bore and groove diameters were recorded, only those measurements taken at three inches from the breech end of the barrel are shown in the tabulation in Table II, Appendix B. Omission of the other readings in this table was made to reduce the amount of tabulated data since the presented tabulation represents the degree of erosion taking place in each of the barrels. Detailed measurements of the bore and groove diameters are included in Appendix C

Each barrel was then mounted in a test weapon and fired 20 rounds, single shot to obtain projectile instrumental velocities with the barrel at ambient temperature. The instrumental velocities given represent projectile velocities at approximately 25 feet from the muzzle of the gun since the two Lumiline screens, used in obtaining thses velocities, were located 15 feet and 35 feet, respectively, from the muzzle of the gun. The instrumental velocities were averaged for the 20 shots.

The test cycle procedure required that one barrel of each material plated and unplated be fired at 80 shots per minute and two barrels of each material plated and unplated be fired at 60 shots per minute. The test schedule for each barrel required a total of 3600 rounds fired in 600-round complements. At the end of each complement, air gage measurements of the bore and groove diameters were repeated according to the previously established procedure. Instrumental velocity measurements were also repeated at the end of each 600-round complement sequence. Continuous visual inspection of projectile hits on a traversing target, located 100 meters down range, was made to assess the degree of yaw of the striking projectiles. The test cycle procedure was continued until either of two barrel rejection criteria was reached.

The first of the rejection criteria was based upon projectile instability. When 20 per cent of consecutively fired projectiles - 6 out of 30 shots in this test - exhibited a 15-degree yaw upon impact on a paper target located 100 meters down range, the rejection criterion was reached. The second rejection criterion was a loss of 200 feet/second or more in projectile velocity. A check against this rejection criterion was made at the end of each 600-round complement.

TEST RESULTS

The over-all results of the test are summarized and tabulated in Table II of Appendix B. The barrels designated A_1, A_2, and A_3, were made from 4150 resulphurized steel with unplated bores. These barrels were rejected after three of the six test firing cycles. Each firing cycle consisted

TEST RESULTS

of a 600-round complement. Barrel A_1 was fired at the 80-shot per minute schedule and was rejected after 1260 rounds. Rejection was based upon projectile instability - 15-degree yaw in 6 out of 30 consecutively fired projectiles. This barrel resulted in a 20 feet/second loss in velocity at the end of the test. Barrels A_2 and A_3 were fired at the 60-shot per minute schedule and were rejected after 1960 and 1980 rounds, respectively. Rejection of these barrels was based upon the projectile instability criterion. These barrels resulted in a loss in velocity of 36 feet/second for barrel A_2 and 124 feet/second for barrel A_3.

The barrels designated B_1, B_2, B_3, and B_4 were made from 4150 resulphurized steel, but had chromium plated bores. Barrel B_1 was withdrawn from the test after 332 rounds had been fired because of a damaged breech ring. Barrels B_2 and B_3 completed schedules of 3820 and 3736 rounds respectively. The firing rate for barrels B_1, B_2, and B_3 was 60 shots per minute. Barrel B_4 was fired at 80 shots per minute and completed a schedule of 4340 rounds. All barrels of the B group passed both the projectile instability and drop in velocity criteria.

Barrels in the C and D groups were made from Cr-Mo-V steel with the D group having chromium plated bores. All of these barrels were fired a complete schedule and passed both the projectile instability and drop in velocity criteria. All barrels except C_1 and D_1 were fired at 60 shots per minute. Barrels C_1 and D_1 were fired at 80 shots per minute.

Barrel bore and groove diameter measurements were made on each barrel at the end of each 600-round complement. These measurements are summarized in Table II, Appendix B. The change of both bore and groove diameters for barrels in the A group is apparent. Diametrical increases of the bore for barrels A_1, A_2, and A_3 are .0019, .0025, .0022 inch, respectively. The barrels in the other groups did not exhibit such a rate of erosion. It should be noted that metallurgical examination showed indications of extensive coppering in some of the barrels. No attempt was made during this study to evaluate rates of coppering for the two barrel materials in the plated and unplated conditions or the effects of coppering upon barrel performance.

A - Barrel Assembly Drawing

B - Test Data

Figure 1 - Temperature vs. Time 40 Rounds/Minute

Figure 2 - Temperature vs. Time 60 Rounds/Minute

Table I - Velocity and Ammunition Expenditure

Table II - Land and Groove Diameter at 3 Inches from the Breech

C - Tabular Data - Measurement of Land and Groove Diameters Along Longitudinal Axis of Barrel

Table I - Barrel Designation: A_1

Table II - Barrel Designation: A_2

Table III - Barrel Designation: A_3

Table IV - Barrel Designation: B_1

Table V - Barrel Designation: B_2

Table VI - Barrel Designation: B_3

Table VII - Barrel Designation: B_4

Table VIII - Barrel Designation: C_1

Table IX - Barrel Designation: C_2

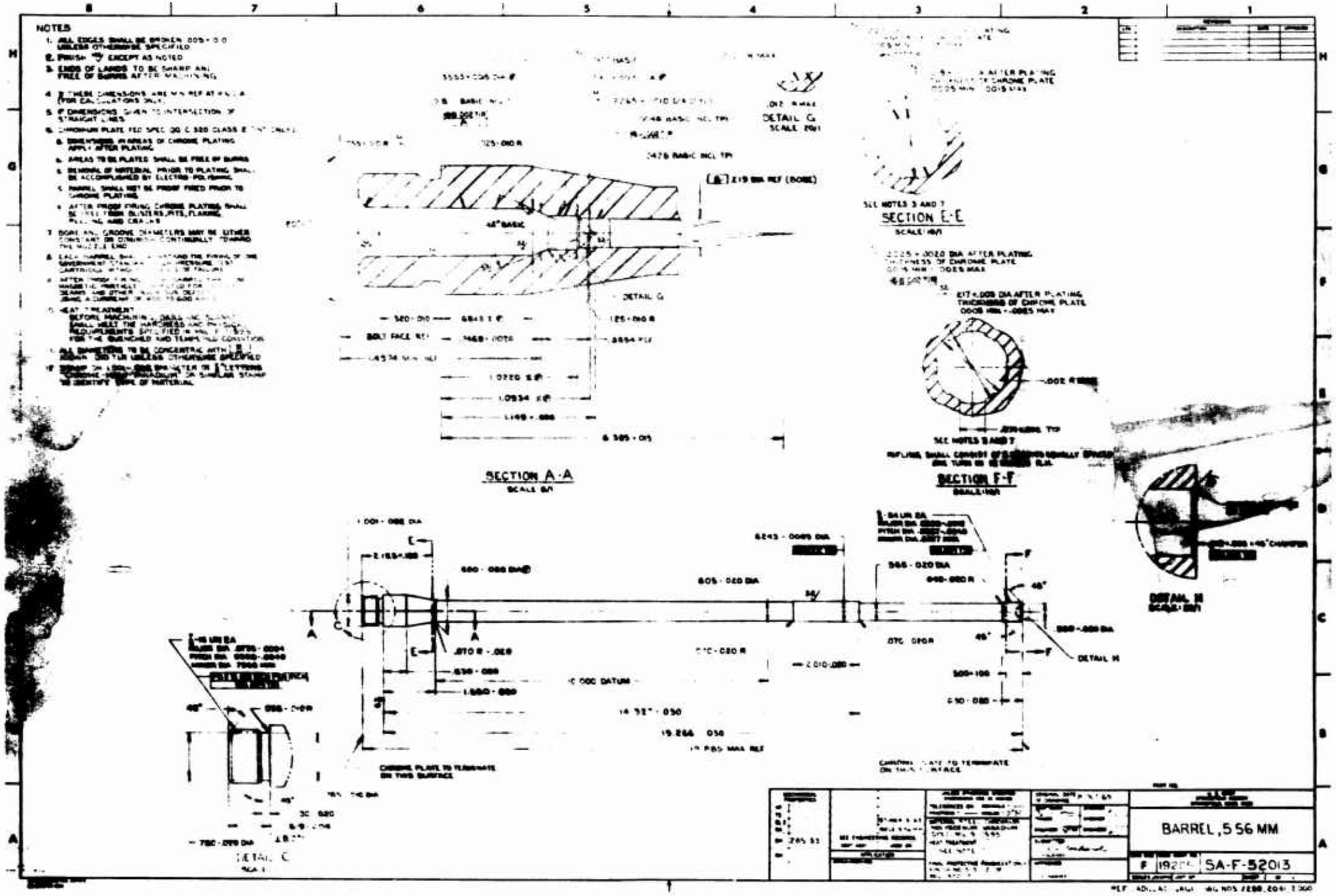
Table X - Barrel Designation: C_3

APPENDIX A

BARREL ASSEMBLY DRAWING

NOTES

1. ALL EDGES SHALL BE BROKEN .005 - .010 UNLESS OTHERWISE SPECIFIED
2. FINISH [illegible] EXCEPT AS NOTED
3. ENDS OF LANDS TO BE SHARP AND FREE OF BURRS AFTER MACHINING
4. [illegible] THESE DIMENSIONS ARE MIN REF AT [illegible] (FOR CALCULATIONS ONLY)
5. IF DIMENSIONS SHOWN TO INTERSECTION OF STRAIGHT LINES
6. CHROMIUM PLATE PER SPEC QQ C 320 CLASS [illegible]
7. DIMENSIONS IN AREAS OF CHROME PLATING APPLY AFTER PLATING
8. AREAS TO BE PLATED SHALL BE FREE OF BURRS
9. REMOVAL OF MATERIAL PRIOR TO PLATING SHALL BE ACCOMPLISHED BY ELECTRO POLISHING
10. BARREL SHALL NOT BE PROOF FIRED PRIOR TO CHROME PLATING
11. AFTER PROOF FIRING CHROME PLATING SHALL BE FREE FROM BLISTERS, PITS, FLAKING, PEELING AND CRACKS
12. BORE AND CHROME DIAMETERS MAY BE EITHER CONSTANT OR CONTINUALLY TAPERED TO THE MUZZLE END
13. EACH BARREL SHALL [illegible] AND THE FIRING OF THE GOVERNMENT STANDARD [illegible] PRESSURE TEST CARTRIDGE [illegible]
14. AFTER PROOF FIRING [illegible] MAGNETIC PARTICLE INSPECTION FOR SEAMS AND OTHER [illegible] SEAMS, A CURRENT OF [illegible]
15. HEAT TREATMENT BEFORE MACHINING [illegible] SHALL MEET THE HARDNESS AND PHYSICAL REQUIREMENTS SPECIFIED IN [illegible] FOR THE QUENCHED AND TEMPERED CONDITION
16. ALL DIMENSIONS TO BE CONCENTRIC WITH [illegible] UNLESS OTHERWISE SPECIFIED
17. STAMP ON LEFT [illegible] DIA AFTER [illegible] LETTERING CHROME [illegible] OR SIMILAR STAMP TO IDENTIFY TYPE OF MATERIAL



TEST DATA

Figure 1 - Temperature vs. Time 40 Rounds/Minute

Figure 2 - Temperature vs. Time 60 Rounds/Minute

Table I - Velocity and Ammunition Expenditure

Table II - Land and Groove Diameter at 3 Inches from the Breech

APPENDIX B

TABULATED DATA

SPRINGFIELD ARMORY

MACHINE GUN BARREL EROSION TEST RESULTS

WEAPON: CODE "X" M.G. CAL.: 5.56 MM

PROGRAM: SAWS DATE: 16 JAN 67

BARREL DESIGNATION NO.	CONSTRUCTION	MANUFACTURER	TUBE MATERIAL	PARTIAL LINER	LINER MATERIAL	BORE TREATMENT	AMMUNITION TYPE	FIRING SCHEDULE RDS/MIN	ROUNDS FIRED	VELOCITY - FT/SEC			REASON FOR REJECTION	REASON FOR TEST TERMINATION
										INITIAL	FINAL	CHANGE		
1	1-PIECE	CODE "X"	4150 STEEL	NO	———	UNPLATED	BALL & TRACER	200	514	3159	3143	-45	NONE	WEAPON FAILURE
2	1-PIECE	CODE "X"	4150 STEEL	NO	———	UNPLATED	BALL & TRACER	200	2509	3164	3155	-9	△	
3	1-PIECE	CODE "X"	4150 STEEL	NO	———	UNPLATED	BALL & TRACER	200	5088	———	———	———	△	
542B	1-PIECE	CODE "X"	4150 STEEL	NO	———	UNPLATED	BALL & TRACER	200	1755	———	———	———	NONE	WEAPON FAILURE
588	1-PIECE	CODE "X"	4150 STEEL	NO	———	UNPLATED	BALL & TRACER	200	7116	3135	3182	+47	△	
590B	1-PIECE	CODE "X"	4150 STEEL	NO	———	UNPLATED	BALL & TRACER	200	4209	3190	3125	-65	△	
S10	1-PIECE	CODE "X"	4150 STEEL	NO	———	UNPLATED	BALL	200	7842	3154	3094	-60	△	
S11	1-PIECE	CODE "X"	4150 STEEL	NO	———	UNPLATED	BALL	200	12476	3134	3083	-51	△	
N1	1-PIECE	CODE "X"	4150 STEEL	NO	———	NITRIDED	BALL	200	29874	3130	3100	-30	△	
N2	1-PIECE	CODE "X"	4150 STEEL	NO	———	NITRIDED	BALL	200	26774	3172	3097	-75	△	
EX.001	2-PIECE	CODE "X"	*	NO	———	UNPLATED	BALL	200	990	3121	———	———	△	
PROTO 1	3-PIECE	S.A.	CR-MO-V STL	YES	STELLITE	CR. PLATED	BALL & TRACER	200	33433	3206	3114	-92	△	
PROTO 2	3-PIECE	S.A.	CR-MO-V STL	YES	STELLITE	CR. PLATED	BALL	200	43994	3199	3092	-107	△	

* STELLITE REAR OR BREECH SECTION WITH CR-MO-V FORWARD SECTION

△ 15° YAW IN 40 OUT OF 200 SHOTS FIRED

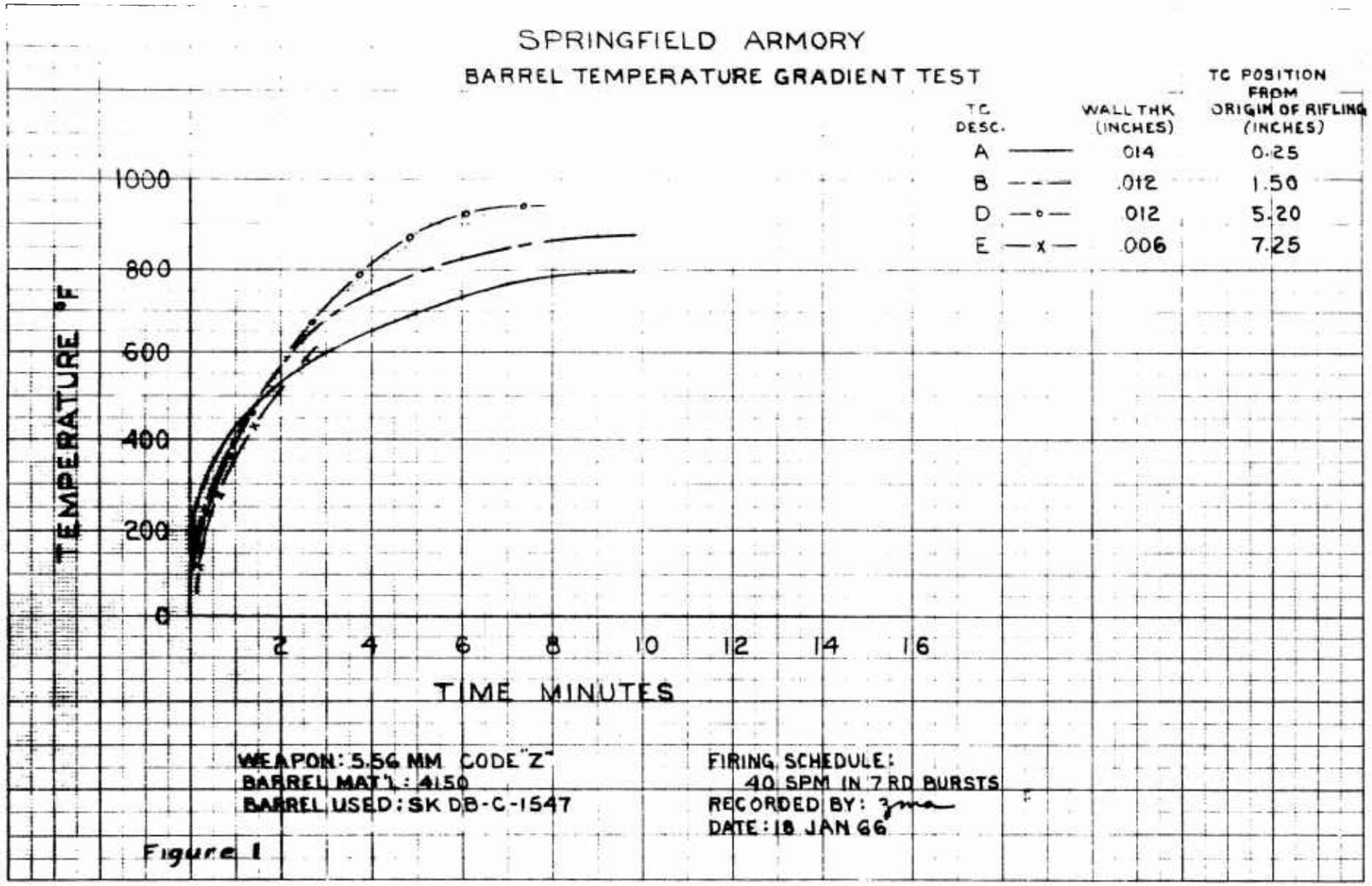

SPRINGFIELD ARMORY
BARREL TEMPERATURE GRADIENT TEST
TC DESC.
WALL THK (INCHES)
TC POSITION FROM ORIGIN OF RIFLING (INCHES)
A 014 0.25
B .012 1.50
D 012 5.20
E .006 7.25
TEMPERATURE °F
1000
800
600
400
200
0
2
4
6
8
10
12
14
16
TIME MINUTES
WEAPON: 5.56 MM CODE "Z"
BARREL MAT'L: 4150
BARREL USED: SK DB-C-1547
FIRING SCHEDULE:
40 SPM IN 7 RD BURSTS
RECORDED BY:
DATE: 18 JAN 66

Figure 1

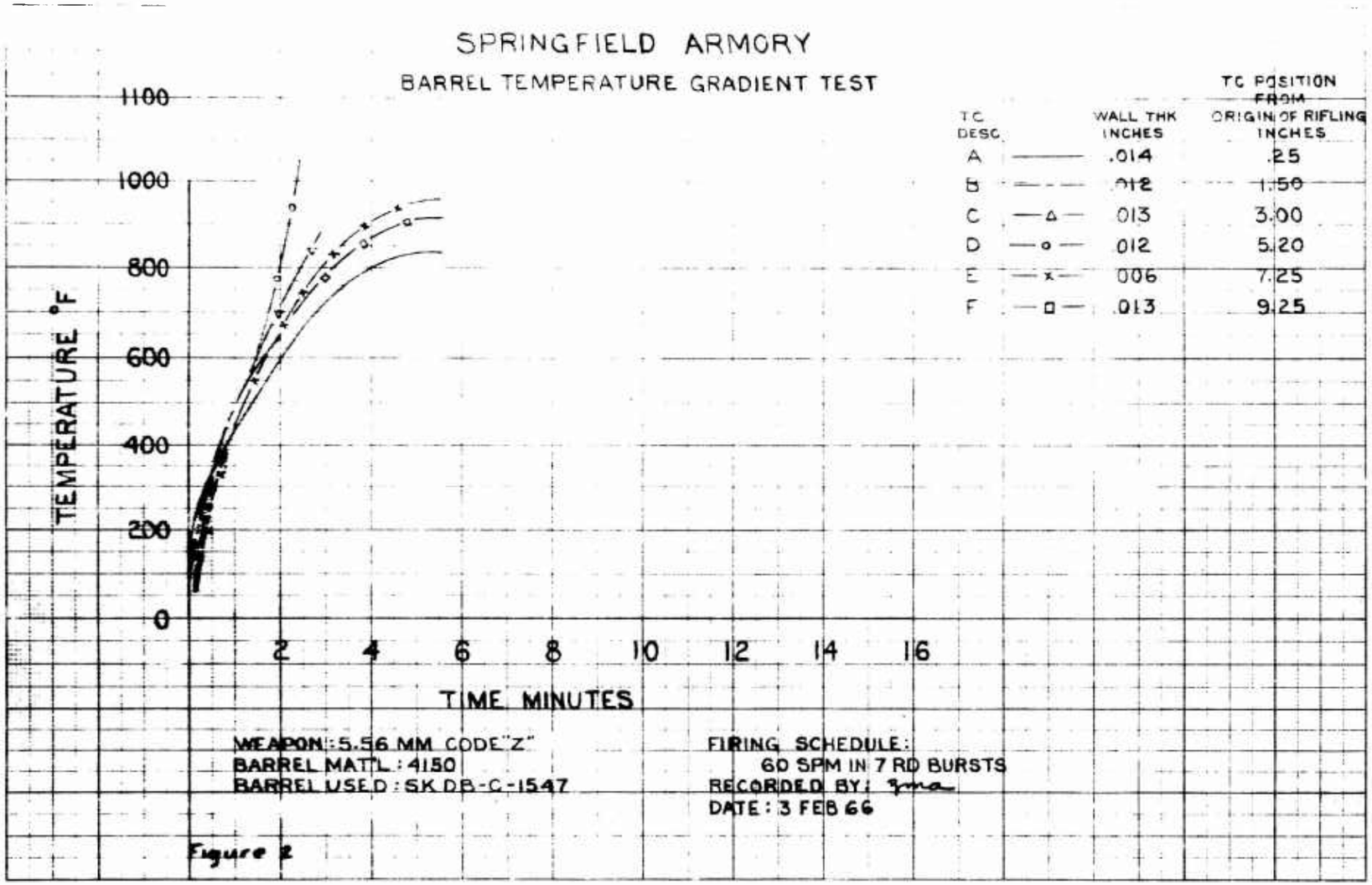

SPRINGFIELD ARMORY
BARREL TEMPERATURE GRADIENT TEST
TC DESC
WALL THK INCHES
TC POSITION FROM ORIGIN OF RIFLING INCHES
A .014 .25
B .012 1.50
C .013 3.00
D .012 5.20
E .006 7.25
F .013 9.25
TEMPERATURE °F
1100
1000
800
600
400
200
0
2
4
6
8
10
12
14
16
TIME MINUTES
WEAPON: 5.56 MM CODE "Z"
BARREL MATL: 4150
BARREL USED: SK DB-C-1547
FIRING SCHEDULE:
60 SPM IN 7 RD BURSTS
RECORDED BY:
DATE: 3 FEB 66

Figure 2

APPENDIX B

TABLE I

SPRINGFIELD ARMORY

RIFLE BARREL EROSION TEST RESULTS

WEAPON: CODE "Z" CAL: 5.56 MM

PROGRAM: SAWS DATE: 11 JAN 67

BARREL DESIGNATION	MATERIAL	BORE CONDITION	FIRING RATE RDS/MIN	INSTRUMENTAL VELOCITY - FT/SEC (25.5 FT.)																			ROUNDS FIRED	REASON FOR REJECTION	REASON FOR TEST TERMINATION
				1ST CYCLE			2ND CYCLE			3RD CYCLE			4TH CYCLE			5TH CYCLE			6TH CYCLE						
				INITIAL *	DURING	AFTER △	BEFORE *	DURING	AFTER △	BEFORE *	DURING	AFTER △	BEFORE *	DURING	AFTER △	BEFORE *	DURING	AFTER △	BEFORE *	DURING	AFTER △	FINAL *			
A1	4150 STEEL	UNPLATED	80	3121	—	—	3105 3134	3081	3101													3108	1260	EXCESSIVE YAW ●	
A2	4150 STEEL	UNPLATED	60	3107	3153	3196	3130 3144	3137	3112	3111	3117	3087										3071	1980	EXCESSIVE YAW ●	
A3	4150 STEEL	UNPLATED	60	3111	3136	3135	3087	3147	3097	3130	3173	2987										2987	1940	EXCESSIVE YAW ●	
B1	4150 STEEL	CHROME PLATED	60	3148	3215																		332		BREECH DAMAGED
B2	4150 STEEL	CHROME PLATED	60	3123	3165	3146	3135	3167	—	3180 3150	3181	3146	3153	3175 3115	—	3130	3170	3142	3108	3103 3086	—	3086	3820		END OF SCHEDULE
B3	4150 STEEL	CHROME PLATED	60	3124	3155	3166	3162	3195	3182	3155	3181	3169	3153	3159	3184	3140	3175		3155	3153	3087	3087	3736		END OF SCHEDULE
B4	4150 STEEL	CHROME PLATED	80	3186 3187 3120	3145	3139	3148	3181	3166	3147	3137	3159	3189 3182	3191 3181	3194	3159	3184	3184	—	—	—	—	4340		END OF SCHEDULE
C1	CR-MO-V STEEL	UNPLATED	80	3095	3121	3106	3127	3150	3138	3161	3138	3178	3135	3130	3151	3118	3165	3166	3184	3174	3184	—	3840		END OF SCHEDULE
C2	CR-MO-V STEEL	UNPLATED	60	3120	3143	3123	3128	3150	3157	3151	3173	3140	3147	3153	3154	3152	3185	—	3140	3192	3191		3810		END OF SCHEDULE
C3	CR-MO-V STEEL	UNPLATED	60	3078	3129	3115	3130	3166	3148	3108	3154	3128	3127	3132	3145	3162	3184	—	3190	3178	3178		3980		END OF SCHEDULE
D1	CR-MO-V STEEL	CHROME PLATED	80	3172	3191	3174	3185	3212	3204	3185	3190	3214	3154	—	3180	3204	3225 3207	—	3177	3197	—	—	3438		END OF SCHEDULE
D2	CR-MO-V STEEL	CHROME PLATED	60	3117	3136	3128	3148	3191	3177	3158 3187	3165 3158	—	3137	3144	3137	3139	3113	—	3164 3165	3185	3166	—	4181		END OF SCHEDULE
D3	CR-MO-V STEEL	CHROME PLATED	60	3155	3204	3192	3205 3175	3230 3205	3200	3186	3200	3192	3178	3172	3169	3194	3187	3186	3175	3167	3156	—	4127		END OF SCHEDULE

* BARREL TEMPERATURE AT AMBIENT

△ BARREL TEMPERATURE ABOVE AMBIENT

● 15° YAW IN 20% OF THE SHOTS

APPENDIX B

TABLE II

SPRINGFIELD ARMORY

MENSURATION* OF LAND AND GROOVE DIAMETERS

WEAPON: CODE "Z" CAL.: 5.56 MM

PROGRAM: SAWS DATE: 11 JAN 67

BARREL DESIGNATION	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
A1	LAND	.2203	.2212	.2222	—	—	—	—
	GROOVE	.2239	.2241	.2243	—	—	—	—
A2	LAND	.2205	.2213	.2224	.2230	—	—	—
	GROOVE	.2239	.2241	.2242	.2244	—	—	—
A3	LAND	.2200	.2206	.2219	.2222	—	—	—
	GROOVE	.2237	.2239	.2240	.2240	—	—	—
B1	LAND	.2200	—	—	—	—	—	—
	GROOVE	.2236	—	—	—	—	—	—
B2	LAND	.2203	.2203	.2204	.2199	.2198	.2196	.2198
	GROOVE	.2239	.2240	.2239	.2237	.2236	.2234	.2234
B3	LAND	.2203	.2201	.2201	.2199	.2197	—	—
	GROOVE	.2239	.2239	.2236	.2237	.2236	—	—
B4	LAND	.2203	.2201	.2200	.2200	△	—	—
	GROOVE	.2237	.2236	.2236	.2234	.2232	—	—
C1	LAND	.2196	.2200	.2199	.2199	.2200	△	—
	GROOVE	.2248	.2247	.2247	.2248	.2247	.2247	.2250
C2	LAND	.2195	.2197	.2195	.2196	.2197	.2198	.2194
	GROOVE	.2244	.2246	.2243	.2243	.2243	.2243	.2244
C3	LAND	.2196	.2196	.2194	.2195	.2193	.2195	.2192
	GROOVE	.2243	.2243	.2243	.2243	.2243	.2244	.2244
D1	LAND	.2191	.2190	.2190	.2190	.2189	.2189	.2189
	GROOVE	.2242	.2240	.2238	.2238	.2238	.2238	.2236
D2	LAND	.2194	.2194	.2191	.2190	.2190	.2190	.2190
	GROOVE	.2243	.2242	.2241	.2240	.2240	.2239	.2238
D3	LAND	.2191	.2189	.2188	.2187	△	—	—
	GROOVE	.2239	.2239	.2237	.2235	.2234	.2231	.2230

* ALL MEASUREMENTS TAKEN AT GAGE POINT 3 INCHES FROM BREECH

△ COPPER DEPOSITS DID NOT ALLOW ENTRY OF GAGE

APPENDIX C

TABULAR DATA

Measurement of Land and Groove Diameters Along Longitudinal Axis of Barrel

Table I - Barrel Designation: A_1

Table II - Barrel Designation: A_2

Table III - Barrel Designation: A_3

Table IV - Barrel Designation: B_1

Table V - Barrel Designation: B_2

Table VI - Barrel Designation: B_3

Table VII - Barrel Designation: B_4

Table VIII - Barrel Designation: C_1

Table IX - Barrel Designation: C_2

Table X - Barrel Designation: C_3

APPENDIX C

TABLE I

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 10 MARCH 66

BARREL DESIGNATION: A1
MATERIAL: 4150 STEEL (RESULPHURIZED)
FIRING RATE: 80 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
3	LAND	.2201	.2211	.2223				
	GROOVE	.2239	.2242	.2245				
4	LAND	.2203	.2210	.2223				
	GROOVE	.2239	.2240	.2242				
5	LAND	.2204	.2211	.2220				
	GROOVE	.2239	.2240	.2242				
6	LAND	.2202	.2212	.2220				
	GROOVE	.2239	.2241	.2242				
7	LAND	.2201	.2211	.2214				
	GROOVE	.2239	.2242	.2243				
8	LAND	.2202	.2211	.2216				
	GROOVE	.2239	.2241	.2244				
9	LAND	.2204	.2207	.2213				
	GROOVE	.2239	.2241	.2244				
10	LAND	.2205	.2207	.2210				
	GROOVE	.2239	.2241	.2244				
11	LAND	.2203	.2210	.2209				
	GROOVE	.2239	.2241	.2243				
12	LAND	.2205	.2205	.2210				
	GROOVE	.2240	.2241	.2243				
13	LAND	.2205	.2207	.2208				
	GROOVE	.2240	.2242	.2243				

CONTINUED

APPENDIX C

TABLE I (CONT.)

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 10 MARCH 66

BARREL DESIGNATION: A1
MATERIAL: 4150 STEEL (RESULPHURIZED)
FIRING RATE: 80 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
14	LAND	.2202	.2205	.2205				
	GROOVE	.2240	.2242	.2244				
15	LAND	.2204	.2205	.2206				
	GROOVE	.2239	.2241	.2243				
16	LAND	.2206	.2207	.2209				
	GROOVE	.2240	.2242	.2245				
17	LAND	.2206	.2209	.2210				
	GROOVE	.2240	.2243	.2245				
18	LAND	.2203	.2206	.2210				
	GROOVE	.2240	.2242	.2245				
19	LAND	.2203	.2207	.2207				
	GROOVE	.2240	.2242	.2244				
20	LAND	.2203	.2207	.2208				
	GROOVE	.2241	.2243	.2245				

APPENDIX C

TABLE II

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 2 MARCH 1966

BARREL DESIGNATION: A2
MATERIAL: 4150 STEEL (RESULPHURIZED)
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
3	LAND	.2209	.2213	.2222	.2229			
	GROOVE	.2240	.2241	.2243	.2245			
4	LAND	.2205	.2212	.2225	.2233			
	GROOVE	.2239	.2241	.2242	.2244			
5	LAND	.2202	.2212	.2224	.2229			
	GROOVE	.2239	.2240	.2241	.2242			
6	LAND	.2204	.2213	.2223	.2228			
	GROOVE	.2239	.2240	.2241	.2243			
7	LAND	.2204	.2212	.2218	.2226			
	GROOVE	.2239	.2240	.2242	.2244			
8	LAND	.2205	.2211	.2216	.2219			
	GROOVE	.2239	.2241	.2243	.2244			
9	LAND	.2203	.2208	.2214	.2219			
	GROOVE	.2239	.2240	.2243	.2246			
10	LAND	.2205	.2212	.2214	.2217			
	GROOVE	.2239	.2241	.2243	.2245			
11	LAND	.2206	.2210	.2213	.2215			
	GROOVE	.2240	.2241	.2243	.2245			
12	LAND	.2204	.2208	.2207	.2210			
	GROOVE	.2240	.2241	.2243	.2245			
13	LAND	.2205	.2208	.2207	.2210			
	GROOVE	.2239	.2241	.2243	.2245			

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APPENDIX C

TABLE II (CONT.)

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 2 MARCH 1966

BARREL DESIGNATION: A2
MATERIAL: 4150 STEEL (RESULPHURIZED)
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
14	LAND	.2205	.2208	.2206	.2210			
	GROOVE	.2239	.2240	.2243	.2245			
15	LAND	.2203	.2206	.2208	.2210			
	GROOVE	.2239	.2241	.2242	.2244			
16	LAND	.2206	.2209	.2208	.2212			
	GROOVE	.2239	.2241	.2244	.2245			
17	LAND	.2205	.2207	.2211	.2215			
	GROOVE	.2240	.2241	.2244	.2246			
18	LAND	.2206	.2209	.2213	.2216			
	GROOVE	.2240	.2241	.2244	.2245			
19	LAND	.2204	.2210	.2211	.2214			
	GROOVE	.2240	.2241	.2244	.2245			
20	LAND	.2205	.2210	.2210	.2214			
	GROOVE	.2240	.2243	.2247	.2249			

APPENDIX C

TABLE III

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 2 SEPT. 66

BARREL DESIGNATION: A3
MATERIAL: 4150 STEEL (RESULPHURIZED)
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
3	LAND	.2200	.2208	.2222	.2222			
	GROOVE	.2238	.2238	.2241	.2240			
4	LAND	.2201	.2206	.2222	.2225			
	GROOVE	.2237	.2238	.2240	.2238			
5	LAND	.2198	.2204	.2217	.2225			
	GROOVE	.2237	.2239	.2240	.2240			
6	LAND	.2202	.2204	.2214	.2217			
	GROOVE	.2237	.2239	.2240	.2241			
7	LAND	.2202	.2203	.2214	.2218			
	GROOVE	.2238	.2239	.2241	.2242			
8	LAND	.2202	.2203	.2204	.2212			
	GROOVE	.2238	.2238	.2241	.2242			
9	LAND	.2203	.2205	.2204	.2208			
	GROOVE	.2238	.2237	.2241	.2240			
10	LAND	.2203	.2202	.2201	.2203			
	GROOVE	.2238	.2238	.2240	.2240			
11	LAND	.2201	.2202	.2203	.2203			
	GROOVE	.2238	.2239	.2241	.2241			
12	LAND	.2201	.2205	.2201	.2204			
	GROOVE	.2238	.2240	.2243	.2242			
13	LAND	.2201	.2202	.2201	.2203			
	GROOVE	.2238	.2240	.2242	.2242			

CONTINUED

APPENDIX C

TABLE III (CONT.)

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 2 SEPT. 66

BARREL DESIGNATION: A3
MATERIAL: 4150 STEEL (RESULPHURIZED)
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
14	LAND	.2202	.2204	.2205	.2204			
	GROOVE	.2238	.2239	.2242	.2240			
15	LAND	.2203	.2200	.2208	.2203			
	GROOVE	.2238	.2240	.2242	.2240			
16	LAND	.2202	.2205	.2207	.2204			
	GROOVE	.2239	.2240	.2243	.2242			
17	LAND	.2202	.2206	.2210	.2207			
	GROOVE	.2239	.2240	.2243	.2241			
18	LAND	.2203	.2206	.2207	.2206			
	GROOVE	.2239	.2240	.2243	.2240			
19	LAND	.2204	.2204	.2209	.2208			
	GROOVE	.2239	.2241	.2243	.2241			
20	LAND	.2203	.2206	.2206	.2198			
	GROOVE	.2240	.2243	.2246	.2239			

APPENDIX C

TABLE IV

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE 2 CALIBER: 5.56MM
PROGRAM: SAWS DATE: 2 MARCH 66

BARREL DESIGNATION: B1
MATERIAL: 4150 STEEL (RESULPHURIZED) - PLATED
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
3	LAND	.2200						
	GROOVE	.2236						
4	LAND	.2198						
	GROOVE	.2236						
5	LAND	.2200						
	GROOVE	.2235						
6	LAND	.2200						
	GROOVE	.2235						
7	LAND	.2202						
	GROOVE	.2235						
8	LAND	.2202						
	GROOVE	.2236						
9	LAND	.2202						
	GROOVE	.2236						
10	LAND	.2199						
	GROOVE	.2236						
11	LAND	.2201						
	GROOVE	.2236						
12	LAND	.2201						
	GROOVE	.2236						
13	LAND	.2202						
	GROOVE	.2236						

CONTINUED

APPENDIX C

TABLE IV (CONT.)

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 2 MARCH 66

BARREL DESIGNATION: B1
MATERIAL: 4150 STEEL (RESULPHURIZED) - PLATED
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
14	LAND	.2201						
	GROOVE	.2236						
15	LAND	.2201						
	GROOVE	.2236						
16	LAND	.2200						
	GROOVE	.2236						
17	LAND	.2198						
	GROOVE	.2234						
18	LAND	.2201						
	GROOVE	.2234						
19	LAND	.2200						
	GROOVE	.2234						
20	LAND	.2200						
	GROOVE	.2233						

APPENDIX C

TABLE V

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 14 JUNE 66

BARREL DESIGNATION: B2
MATERIAL: 4150 STEEL (RESULPHURIZED)-PLATED
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
3	LAND	.2202	.2203	.2203	.2196	.2196	.2198	.2201
	GROOVE	.2240	.2240	.2238	.2237	.2236	.2235	.2234
4	LAND	.2204	.2203	.2203	.2199	.2196	.2194	.2196
	GROOVE	.2239	.2240	.2239	.2235	.2233	.2231	.2231
5	LAND	.2202	.2202	.2204	.2201	.2199	.2196	.2196
	GROOVE	.2239	.2239	.2239	.2237	.2235	.2133	.2133
6	LAND	.2205	.2205	.2205	.2201	.2199	.2196	.2198
	GROOVE	.2239	.2239	.2239	.2238	.2238	.2235	.2236
7	LAND	.2201	.2202	.2202	.2201	.2200	.2200	.2195
	GROOVE	.2239	.2239	.2239	.2239	.2239	.2237	.2237
8	LAND	.2200	.2203	.2203	.2200	.2201	.2198	.2201
	GROOVE	.2239	.2239	.2239	.2239	.2239	.2139	.2138
9	LAND	.2202	.2203	.2203	.2200	.2203	.2200	.2203
	GROOVE	.2239	.2239	.2239	.2239	.2239	.2239	.2239
10	LAND	.2202	.2202	.2202	.2202	.2203	.2204	.2203
	GROOVE	.2239	.2239	.2239	.2239	.2239	.2239	.2239
11	LAND	.2202	.2203	.2203	.2203	.2203	.2204	.2202
	GROOVE	.2239	.2239	.2239	.2239	.2239	.2238	.2239
12	LAND	.2201	.2202	.2202	.2204	.2203	.2202	.2204
	GROOVE	.2239	.2239	.2239	.2239	.2239	.2238	.2239
13	LAND	.2202	.2202	.2202	.2202	.2202	.2201	.2203
	GROOVE	.2239	.2239	.2239	.2239	.2239	.2238	.2239

CONTINUED

APPENDIX C

TABLE V (CONT.)

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 14 JUNE 66

BARREL DESIGNATION: B2
MATERIAL: 4150 STEEL (RESULPHURIZED) -PLATED
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
14	LAND	.2200	.2202	.2202	.2201	.2200	.2200	.2202
	GROOVE	.2239	.2239	.2239	.2238	.2238	.2238	.2238
15	LAND	.2201	.2203	.2203	.2203	.2200	.2201	.2203
	GROOVE	.2239	.2239	.2239	.2239	.2238	.2237	.2237
16	LAND	.2200	.2203	.2202	.2202	.2201	.2202	.2202
	GROOVE	.2238	.2239	.2238	.2238	.2238	.2238	.2237
17	LAND	.2201	.2202	.2202	.2200	.2199	.2198	.2202
	GROOVE	.2237	.2238	.2238	.2237	.2238	.2235	.2236
18	LAND	.2200	.2200	.2202	.2200	.2201	.2199	.2201
	GROOVE	.2237	.2237	.2238	.2237	.2238	2135	.2136
19	LAND	.2201	.2201	.2201	.2201	.2201	.2197	.2199
	GROOVE	.2237	.2238	.2238	.2237	.2238	.2234	.2237
20	LAND	.2200	.2201	.2200	.2203	.2200	--	.2198
	GROOVE	.2238	.2238	.2238	.2238	.2237	.2233	.2237

APPENDIX C

TABLE VI

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 14 SEPT. 66

BARREL DESIGNATION: B3
MATERIAL: 4150 STEEL (RESULPHURIZED) - PLATED
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
3	LAND	.2201	.2199	.2201	.2197	.2193		
	GROOVE	.2239	.2239	.2236	.2237	.2237		
4	LAND	.2203	.2201	.2201	.2201	.2196		
	GROOVE	.2239	.2238	.2234	.2237	.2234		
5	LAND	.2203	.2201	.2201	.2201	.2196		
	GROOVE	.2239	.2239	.2236	.2237	.2234		
6	LAND	.2204	.2202	.2200	.2201	.2199		
	GROOVE	.2239	.2239	.2238	.2237	.2236		
7	LAND	.2203	.2202	.2200	.2201	.2202		
	GROOVE	.2239	.2240	.2239	.2238	.2238		
8	LAND	.2205	.2203	.2201	.2204	.2207		
	GROOVE	.2239	.2239	.2239	.2238	.2238		
9	LAND	.2203	.2203	.2203	.2206	.2203		
	GROOVE	.2240	.2240	.2239	.2239	.2239		
10	LAND	.2205	.2205	.2203	.2204	.2201		
	GROOVE	.2240	.2240	.2239	.2239	.2239		
11	LAND	.2206	.2205	.2203	.2205	.2205		
	GROOVE	.2240	.2240	.2239	.2239	.2239		
12	LAND	.2203	.2202	.2205	.2204	.2203		
	GROOVE	.2240	.2240	.2239	.2240	.2240		
13	LAND	.2206	.2203	.2203	.2204	.2203		
	GROOVE	.2240	.2241	.2239	.2239	.2240		

CONTINUED

APPENDIX C

TABLE VI (CONT.)

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56 MM
PROGRAM: SAWS DATE: 14 SEPT. 66

BARREL DESIGNATION: B3
MATERIAL: 4150 STEEL (RESULPHURIZED) - PLATED
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
14	LAND	.2202	.2201	.2203	.2202	.2202		
	GROOVE	.2240	.2240	.2238	.2238	.2239		
15	LAND	.2202	.2204	.2202	.2202	.2202		
	GROOVE	.2240	.2240	.2238	.2239	.2240		
16	LAND	.2201	.2202	.2203	.2203	.2202		
	GROOVE	.2238	.2238	.2238	.2239	.2239		
17	LAND	.2202	.2202	.2203	.2201	.2203		
	GROOVE	.2239	.2239	.2238	.2239	.2239		
18	LAND	.2203	.2205	.2203	.2204	.2204		
	GROOVE	.2239	.2239	.2239	.2238	.2239		
19	LAND	.2204	.2204	.2203	.2201	.2201		
	GROOVE	.2239	.2240	.2238	.2237	.2238		
20	LAND	.2201	.2200	.2200	.2199	.2199		
	GROOVE	.2238	.2238	.2238	.2237	.2237		

APPENDIX C

TABLE VII

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 28 OCT. 66

BARREL DESIGNATION: B4
MATERIAL: 4150 STEEL (RESULPHURIZED) - PLATED
FIRING RATE: 80 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
3	LAND	.2201	.2200	.2199	.2197	*		
	GROOVE	.2237	.2237	.2235	.2232	.2230		
4	LAND	.2202	.2202	.2199	.2200	*		
	GROOVE	.2237	.2236	.2235	.2232	.2229		
5	LAND	.2203	.2201	.2201	.2202	*		
	GROOVE	.2237	.2236	.2236	.2234	.2233		
6	LAND	.2204	.2200	.2201	.2201	*		
	GROOVE	.2238	.2236	.2236	.2236	.2235		
7	LAND	.2204	.2203	.2201	.2200	*		
	GROOVE	.2238	.2237	.2237	.2237	.2236		
8	LAND	.2204	.2205	.2202	.2204	*		
	GROOVE	.2238	.2237	.2236	.2236	.2236		
9	LAND	.2205	.2203	.2204	.2207	*		
	GROOVE	.2238	.2237	.2237	.2237	.2237		
10	LAND	.2202	.2204	.2205	.2207	*		
	GROOVE	.2238	.2237	.2237	.2237	.2237		
11	LAND	.2202	.2205	.2205	.2204	*		
	GROOVE	.2238	.2237	.2237	.2237	.2237		
12	LAND	.2203	.2200	.2205	.2204	*		
	GROOVE	.2237	.2237	.2237	.2237	.2236		
13	LAND	.2205	.2202	.2205	.2204	*		
	GROOVE	.2238	.2237	.2237	.2237	.2237		

CONTINUED

* COPPERING DID NOT ALLOW ENTRY OF GAGE

APPENDIX C

TABLE VII (CONT.)

MEASUREMENT OF LAND AND GROOVE DIAMETERS
MATERIAL LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 28 OCT. 66

BARREL DESIGNATION: B4
MATERIAL: 4150 STEEL (RESULPHURIZED) - PLATED
FIRING RATE: 80 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
14	LAND	.2203	.2201	.2203	.2204	*		
	GROOVE	.2237	.2237	.2236	.2237	.2237		
15	LAND	.2203	.2201	.2203	.2203	*		
	GROOVE	.2238	.2236	.2242	.2239	.2239		
16	LAND	.2201	.2204	.2202	.2203	*		
	GROOVE	.2237	.2236	.2236	.2237	.2237		
17	LAND	.2202	.2200	.2205	.2203	*		
	GROOVE	.2236	.2237	.2236	.2237	.2237		
18	LAND	.2202	.2201	.2200	.2204	*		
	GROOVE	.2236	.2236	.2235	.2236	.2237		
19	LAND	.2202	.2200	.2198	.2201	*		
	GROOVE	.2235	.2234	.2235	.2235	.2235		
20	LAND	.2203	.2202	.2198	.2101	*		
	GROOVE	.2237	.2234	--	.2237	.2237		

* COPPERING DID NOT ALLOW ENTRY OF GAGE.

APPENDIX C

TABLE VIII

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z
PROGRAM: SAWS

CALIBER: 5.65MM
DATE: 21 SEPT 66

BARREL DESIGNATION: C
MATERIAL: CR-MO-V STEEL
FIRING RATE: 80 RPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
3	LAND	.2197	.2201	.2202	.2201	.2201	*	*
	GROOVE	.2248	.2248	.2247	.2250	.2247	.2248	.2250
4	LAND	.2197	.2280	.2197	.2198	.2198	*	*
	GROOVE	.2248	.2247	.2246	.2248	.2246	.2246	.2250
5	LAND	.2196	.2200	.2199	.2199	.2199	*	*
	GROOVE	.2248	.2247	.2247	.2248	.2247	.2247	.2251
6	LAND	.2195	.2199	.2198	.2197	.2201	*	*
	GROOVE	.2248	.2246	.2246	.2248	.2246	.2247	.2250
7	LAND	.2195	.2196	.2197	.2196	.2199	*	*
	GROOVE	.2246	.2246	.2246	.2248	.2247	.2247	.2250
8	LAND	.2195	.2195	.2191	.2191	.2197	*	*
	GROOVE	.2245	.2246	.2246	.2248	.2247	.2247	.2249
9	LAND	.2193	.2196	.2192	.2193	.2197	*	*
	GROOVE	.2245	.2247	.2246	.2248	.2247	.2247	.2250
10	LAND	.2195	.2195	.2194	.2194	.2195	*	*
	GROOVE	.2245	.2246	.2247	.2248	.2247	.2247	.2250
11	LAND	.2195	.2196	.2193	.2195	.2195	*	*
	GROOVE	.2245	.2246	.2246	.2246	.2246	.2246	.2250
12	LAND	.2195	.2195	.2193	.2195	.2195	*	*
	GROOVE	.2245	.2246	.2246	.2246	.2246	.2247	.2248
13	LAND	.2195	.2197	.2194	.2194	.2194	*	*
	GROOVE	.2244	.2247	.2247	.2246	.2247	.2247	.2247

***COPPERING DID NOT ALLOW ENTRY OF GAGE**

CONTINUED

APPENDIX C

TABLE VIII

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z
PROGRAM: SAWS

CALIBER: 5.65MM
DATE: 21 SEPT 66

BARREL DESIGNATION: C1
MATERIAL: CR-MO-V STEEL
FIRING RATE: 80 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
14	LAND	.2195	.2197	.2193	.2195	.2195	*	*
	GROOVE	.2244	.2245	.2245	.2246	.2245	.2245	.2247
15	LAND	.2195	.2195	.2194	.2196	.2195	*	*
	GROOVE	.2244	.2245	.2246	.2248	.2246	.2246	.2247
16	LAND	.2196	.2200	.2197	.2200	.2196	*	*
	GROOVE	.2245	.2247	.2246	.2247	.2246	.2247	.2248
17	LAND	.2195	.2201	.2196	.2196	.2196	*	*
	GROOVE	.2245	.2247	.2247	.2247	.2247	.2247	.2248
18	LAND	.2195	.2199	.2195	.2200	.2197	*	*
	GROOVE	.2245	.2247	.2247	.2247	.2246	.2247	.2247
19	LAND	.2197	.2200	.2196	.2197	.2198	*	*
	GROOVE	.2245	.2246	.2246	.2246	.2246	.2246	.2247
20	LAND	.2195	.2199	.2194	.2196	.2197	*	*
	GROOVE	.2246	.2248	.2246	.2247	.2247	.2248	.2248

*COPPERING DID NOT ALLOW ENTRY OF GAGE

APPENDIX C

TABLE IX

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z
PROGRAM: SAWS

CALIBER: 5.56MM
DATE: 21 SEPT 66

BARREL DESIGNATION: C2
MATERIAL: CR-MO-V STEEL
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
3	LAND	.2194	.2198	.2198	.2201	.2201	.2203	.2201
	GROOVE	.2244	.2244	.2245	.2244	.2244	.2244	.2244
4	LAND	.2195	.2197	.2197	.2196	.2200	.2196	.2194
	GROOVE	.2244	.2246	.2242	.2242	.2242	.2242	.2243
5	LAND	.2195	.2197	.2193	.2193	.2196	.2192	.2191
	GROOVE	.2244	.2246	.2242	.2242	.2243	.2244	.2243
6	LAND	.2195	.2194	.2193	.2194	.2194	.2199	.2191
	GROOVE	.2244	.2247	.2242	.2242	.2243	.2243	.2244
7	LAND	.2194	.2195	.2194	.2194	.2196	.2200	.2193
	GROOVE	.2244	.2247	.2243	.2243	.2243	.2245	.2245
8	LAND	.2194	.2195	.2195	.2195	.2195	.2202	.2194
	GROOVE	.2244	.2243	.2243	.2243	.2243	.2245	.2245
9	LAND	.2196	.2194	.2194	.2198	.2194	.2203	.2195
	GROOVE	.2243	.2241	.2243	.2243	.2243	.2245	.2245
10	LAND	.2197	.2196	.2193	.2196	.2194	.2202	.2196
	GROOVE	.2243	.2241	.2243	.2243	.2243	.2244	.2245
11	LAND	.2197	.2196	.2198	.2197	.2196	.2204	.2196
	GROOVE	.2243	.2244	.2243	.2243	.2244	.2244	.2245
12	LAND	.2196	.2195	.2194	.2194	.2196	.2204	.2195
	GROOVE	.2244	.2245	.2244	.2244	.2245	.2245	.2246
13	LAND	.2196	.2195	.2195	.2194	.2196	.2206	.2198
	GROOVE	.2243	.2244	.2244	.2244	.2245	.2245	.2246

CONTINUED

APPENDIX C

TABLE IX (CONT.)

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z **CALIBER:** 5.56MM
PROGRAM: SAWS **DATE:** 21 SEPT 66

BARREL DESIGNATION: C2
MATERIAL: CR-MO-V STEEL
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
14	LAND	.2195	.2194	.2196	.2194	.2196	.2206	.2198
	GROOVE	.2243	.2244	.2244	.2245	.2244	.2244	.2245
15	LAND	.2196	.2198	.2196	.2196	.2198	.2207	.2195
	GROOVE	.2243	.2244	.2244	.2245	.2245	.2244	.2244
16	LAND	.2195	.2197	.2198	.2195	.2197	.2208	.2198
	GROOVE	.2244	.2244	.2245	.2245	.2245	.2245	.2245
17	LAND	.2196	.2197	.2197	.2200	.2199	.2206	.2197
	GROOVE	.2244	.2245	.2244	.2245	.2245	.2246	.2245
18	LAND	.2196	.2198	.2199	.2198	.2199	.2209	.2200
	GROOVE	.2244	.2244	.2245	.2245	.2245	.2244	.2245
19	LAND	.2196	.2198	.2196	.2198	.2199	.2206	.2196
	GROOVE	.2244	.2245	.2243	.2243	.2244	.2243	.2244
20	LAND	.2196	.2199	.2197	.2195	.2196	.2207	.2198
	GROOVE	.2245	.2246	.2246	.2246	.2247	.2246	.2247

APPENDIX C

TABLE X

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 1 NOV. 66

BARREL DESIGNATION: C3
MATERIAL: CR-MO-V STEEL
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
3	LAND	.2197	.2198	.2200	.2199	.2200	.2201	.2193
	GROOVE	.2243	.2244	.2245	.2244	.2245	.2245	.2244
4	LAND	.2196	.2195	.2197	.2195	.2195	.2195	.2192
	GROOVE	.2243	.2243	.2244	.2243	.2243	.2244	.2243
5	LAND	.2197	.2196	.2193	.2193	.2193	.2192	.2192
	GROOVE	.2243	.2243	.2242	.2242	.2242	.2244	.2244
6	LAND	.2195	.2194	.2193	.2194	.2194	.2193	.2192
	GROOVE	.2243	.2243	.2243	.2243	.2243	.2244	.2244
7	LAND	.2196	.2196	.2193	.2193	.2191	.2193	.2192
	GROOVE	.2243	.2244	.2243	.2243	.2243	.2244	.2244
8	LAND	.2196	.2196	.2192	.2193	.2195	.2195	.2196
	GROOVE	.2243	.2244	.2243	.2242	.2243	.2244	.2244
9	LAND	.2196	.2196	.2195	.2198	.2197	.2196	.2194
	GROOVE	.2243	.2243	.2243	.2243	.2243	.2244	.2244
10	LAND	.2195	.2195	.2195	.2193	.2195	.2196	.2196
	GROOVE	.2243	.2243	.2243	.2243	.2244	.2244	.2244
11	LAND	.2197	.2194	.2194	.2194	.2198	.2196	.2198
	GROOVE	.2243	.2243	.2244	.2244	.2244	.2245	.2245
12	LAND	.2195	.2196	.2195	.2194	.2195	.2196	.2196
	GROOVE	.2243	.2244	.2244	.2244	.2244	.2245	.2245
13	LAND	.2194	.2195	.2194	.2194	.2195	.2197	.2197
	GROOVE	.2243	.2244	.2244	.2243	.2244	.2244	.2245

CONTINUED

APPENDIX C

TABLE X (CONT.)

SPRINGFIELD ARMORY

MEASUREMENT OF LAND AND GROOVE DIAMETERS
ALONG LONGITUDINAL AXIS OF BARREL

WEAPON: CODE Z CALIBER: 5.56MM
PROGRAM: SAWS DATE: 1 NOV. 66

BARREL DESIGNATION: C3
MATERIAL: CR-MO-V STEEL
FIRING RATE: 60 SPM

DISTANCE FROM BREECH END IN INCHES	BORE FEATURE	FIRING CYCLE						
		0	1	2	3	4	5	6
14	LAND	.2195	.2196	.2195	.2194	.2195	.2198	.2198
	GROOVE	.2243	.2244	.2244	.2242	.2243	.2243	.2244
15	LAND	.2196	.2195	.2193	.2193	.2196	.2196	.2198
	GROOVE	.2243	.2245	.2244	.2244	.2245	.2243	.2245
16	LAND	.2197	.2200	.2195	.2199	.2198	.2196	.2195
	GROOVE	.2243	.2245	.2245	.2245	.2245	.2244	.2245
17	LAND	.2196	.2198	.2196	.2198	.2199	.2197	.2197
	GROOVE	.2243	.2245	.2245	.2245	.2245	.2245	.2245
18	LAND	.2196	.2196	.2196	.2200	.2198	.2197	.2195
	GROOVE	.2243	.2245	.2245	.2244	.2244	.2243	.2245
19	LAND	.2198	.2198	.2198	.2198	.2198	.2196	.2198
	GROOVE	.2243	.2245	.2243	.2243	.2244	.2243	.2245
20	LAND	.2199	.2199	.2197	.2199	.2199	.2198	.2198
	GROOVE	.2244	.2248	.2245	.2244	.2246	.2248	.2248

APPENDIX D

DISTRIBUTION