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FINAL REPORT ON
COMPARISON TESTS
OF
M16A1 RIFLES

BY

FRANKLIN H. MILLER

FEBRUARY 1969

ABERDEEN PROVING GROUND
ABERDEEN PROVING GROUND, MARYLAND

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RDT&E PROJECT NOS. 4420.25.0132.127 AND
4420.16.0132.2.92

USATECOM PROJECT NOS. 8-7-0230-03 AND
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ABSTRACT

Two comparison tests of production M16A1 rifles were conducted concurrently at Aberdeen Proving Ground, Maryland. One test was fired with M193 cartridges loaded with IMR 8208M propellant, the other with M193 cartridges loaded with WC846 (ball) propellant. Testing was initiated in February 1968 and completed 29 November 1968. The evaluation consisted of the following test phases: inspection, extreme temperatures (-65°F and +155°F), adverse conditions (unlubricated, dust, mud, water spray, and humidity), and 10,000-round reliability. Test results show that weapons firing ammunition loaded with WC846 propellant performed satisfactorily in all test conditions except at -65°F; weapons tested with IMR 8208M propellant-loaded ammunition exhibited poor performance in the unlubricated, water-spray, -65°F, and attitudes phase of the 10,000-round reliability subtests. It was concluded that the use of cartridges loaded with IMR 8208M propellant adversely affected weapon performance, and that carbon fouling associated with relatively long cleaning intervals contributed to poor weapon performance at low temperature. Excluding these factors, the weapons tested were concluded to be of normal quality and performance.

FOREWORD

Materiel Test Directorate was responsible for conduct of the test and preparation of the test report.

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USATECOM PROJECT NOS. 8-7-0230-03 AND
8-8-0230-06

FINAL REPORT ON COMPARISON TESTS OF M16A1 RIFLES

FEBRUARY THROUGH 29 NOVEMBER 1968

SECTION 1. INTRODUCTION

1.1 BACKGROUND

The quality-assurance comparison test is a continuing evaluation of production materiel to insure that adequate quality control is being exercised. In such evaluations for 5.56-mm, M16A1 rifles, samples of materiel from production are inspected and subjected to tests to examine functional reliability and performance characteristics under conditions of extreme temperature and various simulated adverse field conditions.

Since the last comparison test (Reference 2), the test sample sizes and test procedures have been changed to insure an over-all evaluation more in accordance with anticipated usage of the materiel. For this reason, direct comparison of the present test results with those of past comparison tests can only be made in part.

Revisions of the present test plan (Reference 9) were required to conform to recent changes in USATECOM test procedures. These changes, affecting the extreme temperatures and reliability subtests, were approved by the cognizant test sponsors.

1.2 DESCRIPTION OF MATERIEL

Ten M16A1 rifles of the latest standard configuration were supplied (i.e., chrome-plated chamber, phosphate-coated bolt and carrier assemblies, redesigned buffer assembly, and closed-end flash suppressor). Weapons and cartridge lots used are listed by subtest in Table 1.2-I.

Table 1.2-I. Weapons, Ammunition, and Subtests

Test No.	Subtest Title	Propellant Type: IMR Weapon No.	IMR APG No.	Ball Weapon No.	Ball APG No.	Ammunition Lot No.: IMR	Ammunition Lot No.: Ball
1	Inspection	884147	1	935144	1A	TW-18149	TW-18209
		884323	2	936877	2A	TW-18149	TW-18209
		884453	3	937633	3A	TW-18149	TW-18209
		884607	4	941978	4A	TW-18149	TW-18209
		885154	5	945623	5A	TW-18149	TW-18209
2	Accuracy - dispersion	884147	1	935144	1A	TW-18149	TW-18209
		884323	2	936877	2A	TW-18149	TW-18209
		884453	3	937633	3A	TW-18149	TW-18209
		884607	4	941978	4A	TW-18149	TW-18209
		885154	5	945623	5A	TW-18149	TW-18209
3	Low temperature (-65°F)	884147	1	935144	1A	TW-18149	TW-18209
		885154	5	945623	5A	TW-18149	TW-18209
4	High temperature (+155°F)	884147	1	935144	1A	TW-18149	TW-18209
		885154	5	945623	5A	TW-18149	TW-18209
5	Unlubricated	884147	1	935144	1A	TW-18153	TW-18209
		885154	5	945623	5A	TW-18153	TW-18209
6	Static dust	884147	1	935144	1A	TW-18153	TW-18209
		885154	5	945623	5A	TW-18153	TW-18209
7	Mud	884147	1	935144	1A	TW-18153	TW-18209
		885154	5	945623	5A	TW-18153	TW-18209
8	Water spray	884147	1	935144	1A	TW-18153	TW-18209
		885154	5	945623	5A	TW-18153	TW-18209
9	Humidity	884147	1	935144	1A	TW-18149	TW-18209
		885154	5	945623	5A	TW-18149	TW-18209
10	Reliability	884323	2	936877	2A	TW-18149	TW-18209
		884453	3	937633	3A	TW-18149	TW-18209
		884607	4	941978	4A	TW-18149	TW-18209

1.3 TEST OBJECTIVES

The objective of this test was to provide USAWECOM (AMSWE-QA) with test results from which performance of M16A1 rifles of current production can be assessed in the following respects:

a. To determine if the item from production is equal to or better than the item approved by type-classification action.

b. To detect any degradation of product quality or reliability created during production.

c. To evaluate the effect of any product changes on the performance, reliability, and maintainability of the present weapon system.

d. To compare the test results of weapons fired with ammunition loaded with IMR 8208M and WC846 (ball) propellants.

1.4 SUMMARY OF RESULTS

1.4.1 Initial Inspection

All test materiel as received was correctly packaged and marked and in satisfactory mechanical condition prior to test firing.

1.4.2 Accuracy - Dispersion Test

All test weapons gave average extreme spreads within the 5.3-inch maximum allowed at 100 meters range when fired from benchrest without bayonet attached. With the M7 bayonet attached, the five weapons fired with IMR propellant ammunition and four of the five using ball propellant ammunition were within the extreme spread limit; the one weapon outside the limit had an extreme spread of 5.4 inches. When the M3 bipod was used as a forward support for the rifle during the prone firing phase, the extreme spread measurement among all weapons varied between 5.5 and 9.4 inches.

Attachment of the M7 bayonet or M3 bipod to the M16A1 rifle causes changes in the location of the center of impact. The magnitude of these changes for individual groups, weapons, and test conditions is given in Appendix I.

Table 1.4-I compares the dispersion results obtained in the previous comparison test (Reference 2) with those of the present evaluation.

1.4.3 Low-Temperature Test (-65°F)

The test results show that, irrespective of the type of ammunition used (i.e., IMR- or ball-propellant loaded), or the test storage condition (i.e., bolt closed, chamber empty; bolt closed, loaded cartridge chambered; or bolt open, chamber empty), that the preponderance of malfunctions occur on the first round of the first magazine used in a low-temperature-conditioned (-65°F) weapon.

Since the low-temperature test results reported in 1965 were based on the firing of 160 rounds per rifle and the present evaluation is based on 3000 rounds, no comparison is made.

Table 1.4-I. Comparison of Dispersion Characteristics

All measurements are given in inches.

Test Condition	Target Measurements					
	January 1965 Test, IMR Propellant		This Test			
			IMR Propellant		Ball Propellant	
	ES	MR	ES	MR	ES	MR
Rifles without attachments	4.8	1.4	4.2	1.3	4.3	1.3
Rifles with M7 bayonet	4.2	1.2	4.0	1.2	4.7	1.4
Rifles with M3 bipod	5.4	1.7	7.0	1.8	6.9	1.9

ES = Extreme spread.
MR = Mean radius.

1.4.4 High-Temperature Test (+155°F)

All weapons performed satisfactorily. The only chargeable malfunctions encountered were two first-round stubs of the bullet méplat during feeding. One malfunction occurred in each of the ball-propellant weapons. For detailed test data refer to Appendix I.

This subtest was not included in the January 1965 comparison test; therefore, no comparison of results can be made.

1.4.5 Unlubricated Test

Testing of the IMR-propellant weapons was terminated prior to the sixth 100-round cycle of the scheduled 1000-round test. This termination was necessitated by the high frequency of feeding-type malfunctions. After inspection of these weapons, the bolt and carrier assemblies were lightly coated with MIL-L-46000A lubricant and the remaining ammunition was fired without a malfunction.

Since the 1965 test consisted of firing a single 100-round cycle only, the first 100 rounds fired in this test are compared in Table 1.4-II.

For detailed data of the remainder of this test refer to Tables 2.6-I, 2.6-II and Appendix I.

Table 1.4-II. Comparison of Malfunction Totals for the First 100 Rounds Fired in Each Unlubricated Test Weapon during the January 1965 and Present Comparison Tests

	1965 Test,	This Test		
	IMR Propellant	IMR Propellant		Ball Propellant
	Rifle 1	Rifle 1	Rifle 2	Rifles 1 and 2
Total	1	4	4	0

Note: One weapon was tested in 1965 and two weapons (each propellant type) in 1968.

1.4.6 Static Dust Test

All weapons performed satisfactorily. The only malfunction encountered was a failure to strip the first round from a fully-loaded magazine in one of the ball-propellant weapons. This condition was readily cleared by application of the bolt-closure assist device. Refer to Appendix I for detailed test data.

No malfunctions occurred in the January 1965 test.

1.4.7 Mud Test

Variations in individual weapon performance were experienced with both IMR- and ball-propellant weapons used in this evaluation. One of the two IMR-propellant weapons completed the test, but gave two malfunctions; the second became inoperable and required cleaning. Of the two ball-propellant weapons, one completed the test without malfunction; the other became inoperable and required cleaning. Use of clean water as a flushing agent was sufficient to return all malfunctioning weapons to an operable condition. For detailed test data, refer to Table 2.8-I.

1.4.8 Water Spray Test

Since similar test procedures were followed in the 1965 test and the present evaluation, a comparison of results is given in Table 1.4-III by malfunction types.

For detailed test data, refer to Tables 2.6-I, 2.6-II, and Appendix I.

Table 1.4-III. Comparative Water-Spray Test Results

Malfunction Types	1965 Test, IMR Propellant	This Test IMR Propellant	This Test Ball Propellant
Failure to feed	1	12	0
Failure to fire	3	0	0
Failure to eject[a]	2	0	0
Total	6	12	0
Malfunction rate per 1000 rounds	10.0	10.0	0

[a]Related to a short recoil condition.

Note: One weapon was tested in 1965, two weapons for each propellant type were tested in this evaluation.

1.4.9 Humidity Test

No malfunctions chargeable to the weapon were encountered during this test or the 1965 evaluation. For detailed test data, refer to Table 2.10-I.

1.4.10 Reliability Test

All the weapons performed satisfactorily in this evaluation except one IMR-propellant weapon, which exhibited a malfunction rate increase in the attitudes firing phase over the rate experienced in the other phases.

The 1965 test procedures were similar, although the firing schedule was different than in the present evaluation. A comparison of these test results is given in Table 1.4-IV. For detailed test data, refer to Tables 2.11-I, 2.11-II, and Appendix I.

Table 1.4-IV. Comparison of Reliability-Test Results for the First 6000 Rounds Fired

	1965 Test		This Test					
	IMR Propellant		APG Test No.					
	Serial No.		IMR Propellant			Ball Propellant		
	101876	1023033	2	3	4	2A	3A	4A
Malfunction rate per 1000 rounds	1.5	2.0	2.7	0.5	1.3	0.2	0.7	0.5
Average cyclic rate, rounds per minute	[a]782	[a]748	732	757	726	907	878	844

[a]In the 1965 test, cyclic rates were not recorded during the attitudes firing test phase, which would tend to lower the figures given.

1.5 CONCLUSIONS

It is concluded that:

a. For any test condition, the use of cartridges loaded with IMR 8208M propellant produces a lower cyclic rate of fire in the M16A1 rifle than does ammunition loaded with WC846 (ball) propellant. This lower rate, which signifies lower effective energy output from the IMR propellant cartridges, adversely influences weapon operation in some instances (e.g., firing the weapon in extreme attitudes or without lubrication) (ref Tables 2.11-I and 2.6-I).

b. Extreme low-temperature (-65°F) performance of both the IMR- and ball-propellant weapons was poor, principally as a result of the adverse effects of carbon deposits in the weapon mechanism associated with relatively long (1000 rounds) cleaning intervals and solidification of the deposits during reconditioning periods (ref Tables 2.4-III, I-II, and I-III).

c. Based upon weapon performance exclusive of the adverse effects of IMR propellant and mechanism fouling cited in a and b above, the weapons tested were of normal quality and compared favorably with weapons previously tested with regard to performance and reliability (ref pars. 2.1 through 2.11).

1.6 RECOMMENDATIONS

It is recommended that:

a. The M16A1 rifles subjected to test be considered of acceptable quality.

b. A study be initiated to determine if changes in ammunition, weapon components, or maintenance procedures are necessary to improve operational reliability in a low-temperature environment.

c. The shortcomings discussed in Appendix II be corrected.

SECTION 2. DETAILS OF TEST

2.1 INTRODUCTION

Legends relating to the various codes for malfunctions and test conditions are shown in Table 2.1-I.

Table 2.1-I. Malfunction and Test Condition Designations

Legend	Description
Stub-1	Bullet méplat of the first round in a fully-loaded magazine strikes the receiver below the feed ramp of the barrel extension during feeding.
FS1	First round failure of bolt to strip cartridge from magazine, cleared by application of bolt-closure assist device.
FS	Failure of bolt to strip other than first round from magazine, cleared by application of bolt-closure assist device.
BOB	Bolt overrides base of cartridge case during chambering cycle.
FC	Failure to chamber round.
FL	Failure of bolt to lock after completed chambering cycle.
FFR	Failure to fire.
SR	Short recoil of bolt. Fired case is ejected, but bolt closes on empty chamber.
FJ	Failure to eject fired case after extraction from chamber.
FBR	Failure of bolt to engage bolt stop after last round in weapon has been fired and ejected.
EFE	Ejector stuck (frozen) in extended position, caused by solidified fouling deposits at -65°F temperature.
EFC	Ejector stuck (frozen) in compressed position, caused by solidified fouling deposits at -65°F temperature.
BFF	Bolt and carrier assemblies stuck (frozen) in forward (locked) position. Caused by solidified fouling deposits at -65°F temperature.
BFR	Bolt and carrier assemblies stuck (frozen) in rearward (bolt-stop) position, caused by solidified fouling deposits accumulated at -65°F temperature.
S	Semiautomatic fire.
B	Automatic fire in bursts of 3 to 5 rounds.
A	Automatic fire in one burst per magazine (20 rounds).

Note: In addition to the test data shown in Appendix I, other round-by-round data are filed in MTD.

2.2 INITIAL INSPECTION AND PRELIMINARY FIRING

2.2.1 Objective

The objective was to determine the following:

a. Adequacy and clarity of marking.

b. Damage to test item as a result of shipment.

c. Compliance of the test weapons with visual and physical inspection requirements.

2.2.2 Criteria

The weapons shall display no shipment damage and shall exhibit clear and adequate markings, in accordance with Reference 6.

The weapons shall pass the visual and physical inspection as specified in par. 11 of Reference 1.

2.2.3 Method

Inspect the test items in accordance with the requirements specified in References 1 and 6. Additionally, record rifle weight, trigger pull, barrel bore dimensions, firing-pin protrusion, and headspace for each test rifle. Determine the average cyclic rate for one 20-round automatic burst fired from each weapon.

2.2.4 Results

Table 2.2-I gives the pretest inspection measurements, less barrel bore dimensions which are given in Appendix I.

The measurement limits (specifications) are as follows:

a. Trigger pull, 5.5 to 8.5 pounds.

b. Firing-pin protrusion, 0.028 to 0.036 inch.

c. Headspace, 1.4646 to 1.4706 inches.

d. Average cyclic rate of fire, 650 to 850 rounds per minute.

The test plan called for the cyclic rate recording on the first 20 rounds fired. Since SAPD-253B requires the rate to be obtained on

rounds 81 through 100 for a 100-round cycle, these rates should be considered for informational purposes only.

Table 2.2-I. Pretest Inspection Measurements

Weapon No. Serial	Test	Rifle Wt, lb	Trigger Pull[a], lb	Firing Pin Protrusion, in.	Head-space, in.	Average 20-Rd Cyclic Rate[b], rd per min
Cartridge Lot and Propellant Type Used: TW-18149, IMR (8208M).						
884147	1	6.8	5.5	[c]0.030	1.4666	724
884323	2	6.8	5.5	.034	1.4656	562
884453	3	6.8	5.5	.036	1.4656	683
884607	4	6.8	6.0	.034	1.4666	684
885154	5	6.8	6.0	.034	1.4666	680
Avg		6.8	5.7	0.034	1.4666	666
Cartridge Lot and Propellant Type Used: TW-18209, Ball (WC846).						
935114	1A	6.8	7.1	0.034	1.4676	859
936877	2A	6.8	7.6	.034	1.4666	836
937633	3A	6.8	7.3	.034	1.4666	811
941978	4A	6.8	7.2	.033	1.4666	823
945623	5A	6.7	7.3	.036	1.4646	775
Avg		6.8	7.3	0.034	1.4666	821

[a]Average of five trials on each weapon.
[b]Weapons were lubricated with MIL-L-46000A prior to start of inspection firing. Each rate represents the first firing from the weapon at APG.
[c]Firing-pin tip slightly deformed. No plating in evidence at point of deformation.

2.2.5 Analysis

All the test weapons satisfied the requirements specified in par. 2.2.2 and all dimensional measurements recorded were within manufacturing tolerances.

2.3 ACCURACY - DISPERSION TEST

2.3.1 Objective

The objective was to determine the accuracy and dispersion characteristics of the basic rifle and any deviation from these characteristics caused by attachment of the M7 bayonet or M3 bipod.

2.3.2 Criteria

The ammunition used for this test shall be in accordance with par. 10.1 of Reference 1. Accuracy and dispersion shall be in accordance with Figure 1 of Reference 1.

2.3.3 Method

Conduct all accuracy firings utilizing a rifleman who holds a current NRA Master classification. Wind velocity is measured at mid-range and shall not exceed ten mph during firing. Immediately prior to firing each weapon for accuracy, fire three warm-up rounds. Do not change the sight setting during the accuracy test. Fire five 10-shot targets semiautomatically with each test rifle as follows: from bench-rest, without bayonet attached; from benchrest with M7 bayonet attached; and from prone position with rifle supported by the M3 bipod. Conduct all firing at a range of 100 meters. Determine for each target the center of impact (CI), mean radius (MR), and extreme spread (ES). Calculate the average for each five-target sample.

2.3.4 Results

Ammunition acceptance records indicate that the cartridge lots, TW-18149 and TW-18209, fired in this subtest were within accuracy limits specified in par. 2.3.2 above (1.2- to 1.4-inch mean radius at 200 yards).

The average dispersion results for weapons firing cartridges loaded with IMR and ball propellant are given in Table 2.3-II and are defined in Table 2.3-I.

The allowable extreme spread (ES) established in SAPD-253B (Reference 1) was 4.8 inches at a range of 100 yards. Since all dispersion tests were directed to be fired at a range of 100 meters, the allowable ES dimension was adjusted to 5.3 inches by linear extrapolation. The average results of test condition A (rifles only) and test condition B (rifles with boyonet attached) were within the extreme-spread requirement. All weapons in test condition C (rifles with M3 bipod attached, prone firing) exceeded 5.3 inches extreme spread by an

average of 32% for the IMR propellant cartridge weapons and 30% for those weapons fired with cartridges loaded with ball propellant.

The attachment of the M7 bayonet or M3 bipod to the M16A1 rifle causes a change in center-of-impact (CI) location. Appendix I contains the individual weapon results relative to this CI location change. Machine-rest dispersion data on each weapon, obtained at the contractor's plant during acceptance firing, are given in Appendix III.

This description of target measurements is applicable to the entire report (Table 2.3-I).

Table 2.3-I. Target Data Legend

Legend	Description
EV	Extreme vertical spread.
MVD	Mean vertical deviation.
VSD	Vertical standard deviation.
EH	Extreme horizontal spread.
MHD	Mean horizontal deviation.
HSD	Horizontal standard deviation.
ES	Extreme spread.
MR	Mean radius.
CI	Center of impact of shot group.
H	Horizontal
V	Vertical

Table 2.3-II. Five-Weapon Average of Dispersion Data

All measurements are given in inches.

	Test Condition	Target Measurements EV	MVD	VSD	EH	MHD	HSD	ES	MR
Cartridge Lot: TW-18149 (IMR propellant).									
Rifles only	A	3.8	0.9	1.2	2.8	0.7	0.9	4.2	1.3
Rifles with M7 bayonet	B	3.5	0.9	1.1	2.8	0.7	0.9	4.0	1.2
Rifles with M3 bipod	C	6.5	1.4	1.9	3.6	0.9	1.2	7.0	1.8
Cartridge Lot: TW-18209 (ball propellant).									
Rifles only	A	3.7	0.9	1.1	3.1	0.8	1.0	4.3	1.3
Rifles with M7 bayonet	B	3.9	1.0	1.2	3.6	0.9	1.1	4.7	1.4
Rifles with M3 bipod	C	6.0	1.4	1.9	4.1	1.0	1.3	6.9	1.9

2.3.5 Analysis

The increase in dispersion recorded during the bipod-supported prone-firing phase is attributed to the bipod and its placement on the weapon since all other conditions were uniform.

2.4 LOW-TEMPERATURE TEST (-65°F)

2.4.1 Objective

The objective was to determine the effects of low temperature upon the operational reliability of the M16A1 rifle.

2.4.2 Criteria

The operational reliability of the rifle shall not be adversely affected by the low-temperature environment.

2.4.3 Method

For purposes of comparison of data with that of the reliability test phase and to conform to recent changes in test techniques, a modification of the test plan relating to environmental test procedures was required. The revised test procedures are as follows: Prior to environmental conditioning, clean, inspect, and lubricate each of three rifles per ammunition type (IMR and ball propellant loaded) in accordance with chapter 3 of Reference 5. Next, condition the ~~six~~ 4 rifles, 30 magazines (5 per rifle) and ~~18~~ 12,000 rounds of ammunition (3000 rounds per rifle) at -65°F for a minimum of six hours prior to test firing. Fire each rifle in 100-round cycles, allowing a minimum of two hours reconditioning time between cycles. Remove only the weapons from the environmental chamber for cleaning and inspection after each 1000 rounds fired, then recondition for six hours before retest. Conduct the sequence of fire for each cycle in the following manner: Sixty rounds semiautomatic, 20 rounds fired automatically in four 5-round bursts, and 20 rounds fired in one automatic burst for cyclic rate of fire record. Assign five numbered magazines to each rifle and progressively rotate these during the firing sequence so that all magazines are subjected to the three modes of fire. During the first 1000-round trial, condition the weapons with the bolt closed on an empty chamber. For the next trial of 1000 rounds, condition the weapon with a loaded cartridge in the chamber and bolt closed (place the selector in the SAFE position). During the last 1000-round trial, condition the rifles with the bolt retracted and chamber empty. Close the dust cover during conditioning in each trial and check selector operation before firing every 100-round cycle.

2.4.4 Results

The results of this subtest are given in Table 2.4-I (IMR propellant) and Table 2.4-II (ball propellant). Table 2.4-III gives data relating to malfunction occurrences by magazine and round number.

2.4.5 Analysis

Compared to results obtained in the ambient-temperature reliability subtest, weapon performance at -65°F was poor. One reason for this reduction in reliability is that fouling in the bolt and carrier and upper receiver of the weapon solidifies during the reconditioning periods between 100-round firing cycles. This freezing prevents free movement of the operating parts until the rifle is reheated by firing several rounds. After thawing out, the weapon performance improves.

During this test, the number of malfunctions varied, dependent upon the storage condition of the weapons. Generally, the best results were obtained by chambering a loaded round prior to each 2-hour reconditioning period. Twenty-five per cent of the total malfunctions encountered with the IMR and ball propellant weapons were accrued under this condition. For storage of the weapons with the bolt closed on an empty chamber, the malfunction percentage for IMR and ball propellant weapons increased to 41% and 48% respectively. Storage of the weapon with bolt open and chamber empty produced 34% and 27% of the total malfunctions. Although these results appear to indicate a performance similarity with the ball propellant weapons between conditioning of the weapons with a loaded round in the chamber and conditioning with the bolt open without a round being chambered, this similarity does not exist due to the nature of the malfunctions. The solidified fouling condition discussed earlier in the analysis plus the fact that the bolt-closure-assist device does not engage the bolt carrier when the bolt is held open by the bolt stop, causes the weapon to be rendered inoperable until the solidified fouling is broken. This allows the bolt to contact the cartridge base, at which point the assist device can be used. In the case of the chambered-round storage condition, the weapon is almost entirely operable from the beginning of the firing cycle.

Table 2.4-I. Low-Temperature Test (-65°F). Malfunction Data for Weapons Fired with IMR 8208M-Propellant-Loaded Ammunition

Weapon Storage Condition	Mal-funct Totals	Malfunction Types													Avg Cyclic Rate of Fire, rd per min
		Stub-1	FS1	FS	BOB	FL	FFR	SR	FJ	FBR	BFF	EFC[a]	EFE[a]	BFR	
Weapon No.: 1.															
Bolt closed, chamber empty	11	0	1	4	0	5	0	1	0	0	0	0	0	0	695
Bolt closed, loaded cartridge in chamber	7	0	0	2	1	0	0	4	0	0	0	0	0	0	694
Bolt open, chamber empty	10	0	0	1	0	8	1	0	0	0	0	0	0	0	699
Subtotal	28	0	1	7	1	13	1	5	0	0	0	0	0	0	
Weapon No.: 5.															
Bolt closed, chamber empty	[b]24	1	2	4	1	4	[b]10	2	0	0	0	0	0	0	705
Bolt closed, loaded cartridge in chamber	10	0	0	3	1	0	0	4	2	0	0	1	0	0	714
Bolt open, chamber empty	13	0	1	4	0	7	0	0	0	1	0	0	0	0	708
Subtotal	[b]47	1	3	11	2	11	[b]10	6	2	1	0	1	0	0	
Total 1 and 5	[b]75	1	4	18	3	24	[b]11	11	2	1	0	1	0	0	

[a]These are causes of simultaneously occurring malfunctions and are not additionallly charged against the weapon.

[b]Subtract seven EFR's from these totals to determine malfunctions chargeable to the weapon.

Table 2.4-II. Low-Temperature Test (-65°F). Malfunction Data for Weapons Fired with Ball WC846-Propellant-Loaded Ammunition

Weapon Storage Condition	Mal-funct Totals	Malfunction Types													Avg Cyclic Rate of Fire, rd per min
		Stub-1	FSI	FS	BOB	FL	FFR	SR	FJ	FBR	BFF	EFC[a]	EFE[a]	BFR	
Weapon No.: 1A.															
Bolt closed, chamber empty	25	0	4	6	0	8	2	0	0	2	3	0	3	0	724
Bolt closed, loaded cartridge in chamber	11	0	0	2	0	3	0	1	4	1	0	3	0	0	728
Bolt open, chamber empty	17	0	0	0	0	9	2	0	0	0	0	0	0	6	719
Subtotal	53	0	4	8	0	20	4	1	4	3	3	3	3	6	
Weapon No.: 5A.															
Bolt closed, chamber empty	22	2	2	5	0	3	1	2	2	2	3	2	0	0	717
Bolt closed, loaded cartridge in chamber	13	0	0	0	0	1	1	0	10	1	0	8	0	0	728
Bolt open, chamber empty	9	0	0	1	0	1	0	0	0	1	0	0	0	6	729
Subtotal	44	2	2	6	0	5	2	2	12	4	3	10	0	6	
Total 1 and 5	97	2	6	14	0	25	6	3	16	7	6	13	3	12	

[a]These are causes of simultaneously occurring malfunctions and are not additionally charged against the weapon.

Table 2.4-III. Results of the Low-Temperature Test (-65°F)

Rd No. of Malfunction from Magazine	Number of Malfunctions, by Magazine, for Ten 100-Round Cycles					Malfunctions	
	First	Second	Third	Fourth	Fifth	Total	Per Cent of Total
Weapon Storage Condition: Bolt closed, chamber empty. Propellant Type: IMR.							
1	14	1		1		16	57
2	5	0		0		5	18
3	2	0		0		2	7
4 to 20	5	0		0		5	18
Subtotal	26	1	0	1	0	28	
Per Cent of Total	92	4	0	4	0		100
Propellant Type: Ball.							
1	23	0	2	0		25	53
2	6	0	1	0		7	15
3	6	0	0	0		6	13
4 to 20	5	1	2	1		9	19
Subtotal	40	1	5	1	0	47	
Per Cent of Total	85	2	11	2	0		100
Weapon Storage Condition: Bolt closed, chamber loaded. Propellant Type: IMR.							
1	9					9	53
2	7					7	41
3	1					1	6
4 to 20	0					0	0
Subtotal	17	0	0	0	0	17	
Per Cent of Total	100	0	0	0	0		100

Table 2.4-III (Cont'd)

Rd No. of Malfunction from Magazine	Number of Malfunctions, by Magazine, for Ten 100-Round Cycles					Malfunctions	
	First	Second	Third	Fourth	Fifth	Total	Per Cent of Total
Propellant Type: Ball.							
1	13		0	0		13	54
2	9		0	0		9	38
3	0		0	0		0	0
4 to 20	0		1	1		2	8
Subtotal	22	0	1	1	0	24	
Per Cent of Total	92	0	4	4	0		100
Weapon Storage Condition: Bolt open, chamber empty. Propellant Type: IMR.							
1	16	0				16	70
2	5	0				5	22
3	0	0				0	0
4 to 20	1	1				2	8
Subtotal	22	1	0	0	0	23	
Per Cent of Total	96	4	0	0	0		100
Propellant Type: Ball.							
1	20	0				20	77
2	3	0				3	12
3	1	0				1	4
4 to 20	1	1				2	7
Subtotal	25	1	0	0	0	26	
Per Cent of Total	96	4	0	0	0		100

Note: Only malfunctions charged to the weapon are included in this table.

2.5 HIGH-TEMPERATURE TEST (+155°F)

2.5.1 Objective

The objective was to determine the effects of high temperature upon the operational reliability of the M16A1 rifle.

2.5.2 Criteria

The operational reliability of the rifle shall not be adversely affected by the high-temperature environment.

2.5.3 Method

For purposes of data comparison with the reliability test phase and conformity to recent changes in test techniques, a modification of the environmental test procedures in the test plan was required. The revised test procedures are as follows: prior to environmental conditioning, clean, inspect, and lubricate each rifle in accordance with chapter 3 of Reference 5; next, condition the rifles, magazines and ammunition at +155°F for a minimum of four hours prior to test firing; fire each rifle a total of 1000 rounds in 100-round cycles; and temperature-condition the weapons for a period of two hours between each cycle. Utilize the firing sequence prescribed in par. 2.4.3.

2.5.4 Results

Over-all performance of both sets of weapons was satisfactory. The weapons using IMR propellant-loaded ammunition had no malfunctions. The only malfunctions chargeable to weapons using ball propellant-loaded ammunition were one first-round stub (stub-1) and one failure to fire (FFR) which occurred during burst fire.

Incorrect reassembly of one weapon during maintenance prior to this subtest caused displacement of the trigger pin. The result was uncontrolled automatic fire in the semiautomatic mode and failure of the trigger to release the hammer in the automatic mode. The right leg of the hammer spring was wedged between the two right-hand coils of the trigger spring, which prevented proper contact with the retainer groove in the trigger pin. After this problem was corrected, the weapon performed in a normal manner.

2.5.5 Analysis

The high-temperature environment (+155°F) did not adversely affect weapon performance.

2.6 UNLUBRICATED TEST

2.6.1 Objective

The objective was to determine if the complete absence of lubrication decreases the functional reliability of the weapon.

2.6.2 Criteria

Functional reliability of the weapon must not be adversely affected by the absence of lubricants.

2.6.3 Method

Prior to test firing, disassemble the weapon and clean all components with PS-661B solvent. Reassemble the weapon without lubrication. Attempt to fire 1000 rounds from each test weapon. Conduct firing in ten 100-round cycles. For each cycle, fire 60 rounds semiautomatic, 20 rounds automatic in bursts of three- to five-rounds each, and 20 rounds in a single automatic burst. Cool the weapon to ambient-range temperature after each cycle.

2.6.4 Results

Table 2.6-I presents the test results in terms of malfunction totals by type for weapons fired with IMR and ball propellant ammunition. The frequency of malfunction occurrence by magazine and round number are given in Table 2.6-II.

Testing of both IMR propellant weapons was prematurely terminated because of excessive malfunctioning. After inspection, the bolt and carrier assemblies of these weapons were lightly coated with MIL-46000A lubricant and fired the remainder of the test without malfunctions.

The ball propellant weapons were fired 1000 rounds each without lubrication.

Table 2.6-I. Function Performance Data for Unlubricated Weapons

Weapon No.	No. Rds Fired	Chargeable Malfunction Totals	No. of Malfunctions, by Types										Remarks
			Stub-1	FSI	FS	BOB	FC	FL	FFR	SR	FJ	FBR	
Weapons fired with IMR propellant-loaded ammunition (cartridge lot TW-18153).													
1	500	72	0	12	50	0	5	5	0	0	0	0	Test terminated due to excessive malfunctioning.
	500	0	0	0	0	0	0	0	0	0	0	0	Remainder of rounds fired after lubrication of bolt and carrier assembly.
5	460	138	0	7	71	17	2	0	0	40	0	1	Test terminated due to excessive malfunctioning.
	540	0	0	0	0	0	0	0	0	0	0	0	Remainder of rounds fired after lubrication of bolt and carrier assembly.
Weapons fired with ball propellant-loaded ammunition (cartridge lot TW-18209).													
1A	1000	15	0	14	0	0	0	1	0	0	0	0	
5A	1000	19	1	9	1	1	0	7	0	0	0	0	

Table 2.6-II. Unlubricated-Test Malfunction Totals for Two Weapons (Each) Using Cartridges Loaded with IMR- and Ball-Propellant

Average Cyclic Rate of Fire[a], rd per min	Rd No. of Malfunct from Magazine	Number of Malfunctions, by Magazine, for Ten 100-Round Cycles[b]					Malfunctions		Total No. Rds Fired, Unlubricated
		First	Second	Third	Fourth	Fifth	Total	Per Cent of Total	
Propellant Type: IMR.									
670/781	1	8	5	5	4	4	26	12	48
661/787	2	9	3	3	1	2	18	9	48
	3	8	2	2	1	0	13	6	48
	4 to 20	81	29	33	9	1	153	73	816
Subtotal		106	39	43	15	7	210		960
Per Cent of Total		50	19	21	7	3		100	
Propellant Type: Ball.									
797	1	10	6	7	7	2	32	94	100
734	2	2	0	0	0	0	2	6	100
	3	0	0	0	0	0	0	0	100
	4 to 20	0	0	0	0	0	0	0	1700
Subtotal		12	6	7	7	2	34		2000
Per Cent of Total		35	18	21	21	6		100	

[a]Cyclic rates for IMR weapons consist of two figures for each weapon (e.g., 670/781). The first number is the average rate obtained for the unlubricated weapon and the second is the average after lubrication. Cyclic rates for ball propellant weapons are for the unlubricated condition only.
[b]All malfunctions in IMR ammunition weapons occurred within the first five cycles.

2.6.5 Analysis

Referring to Table 2.6-II, it is noted that 88% of all malfunctions encountered with the IMR propellant weapons occurred after firing the first round from each magazine; whereas, only 6% occurred after the first round from each magazine with ball propellant weapons. Since both sets of weapons incorporate the latest design components, the expected performance should be similar; therefore, the variation in performance is attributed to the ammunition used.

Table 2.6-I indicates that within each weapon group (IMR and ball propellant), variations in performance exist. The weapons with the highest cyclic rate (Tables 2.2-I and 2.6-II) performed best.

Application of lubricant is necessary to insure that the M16A1 rifle functions properly.

2.7 STATIC DUST TEST

2.7.1 Objective

The objective was to determine the effects of a dusty environment on weapon performance.

2.7.2 Criteria

The functional reliability of the weapon must not be impaired by conditioning in a dusty environment.

2.7.3 Method

Conduct the test in accordance with Reference 4. Use the dust prescribed in Reference 7. Utilize the test weapons previously subjected to the unlubricated test.

2.7.4 Results

The only malfunction encountered during this test was a first-round stub (FS1) in the second magazine of one ball-propellant weapon.

2.7.5 Analysis

The results indicate that properly maintained M16A1 rifles perform satisfactorily after storage in a dusty environment.

2.8 MUD TEST

2.8.1 Objective

The objective was to determine if the weapon is capable of satisfactory operation after immersion in mud.

2.8.2 Criteria

In the event of unsatisfactory performance after immersion in mud, the weapon should require a minimum of maintenance to restore it to operating condition.

2.8.3 Method

Conduct the test in accordance with Reference 4. If an unsuccessful attempt to fire has been made, perform the minimum maintenance required to return the weapon to operation. Test fire with one clean magazine loaded with clean ammunition.

2.8.4 Results

Table 2.8-I gives the results of the mud test.

Table 2.8-I. Results of Mud Test

Magazine No.	No. Rds Fired	Rd No. of Malfunct	No. of Malfunct, by Type FL	FBR	SR	FC	Malfunct Totals	Remarks
IMR Propellant-Loaded Ammunition (TW-18153)								
Weapon No.: 1.								
1	19	3	1				1	
		20		1			1	
2	20	None						No cleaning needed.
Subtotal	39	-	1	1	0	0	2	

Table 2.8-I (Cont'd)

Magazine No.	No. Rds Fired	Rd No. of Malfunct	No. of Malfunct, by Type FL	FBR	SR	FC	Malfunct Totals	Remarks
Weapon No.: 5.								
1	3	1 to 3			3		3	Weapon inoperable.
2	20	1 to 5			5		5	Flushed weapon with clean water.
		6 to 13			8		8	
Subtotal	23	-	0	0	16		16	
Total	62	-	1	1	16	0	18	
		Ball Propellant-Loaded Ammunition (TW-18209)						
Weapon No.: 1A.								
1	20	None						
2	20	None						No cleaning needed.
Subtotal	40	-	0	0	0	0	0	
Weapon No.: 5A.								
1	1	2				1	1	Weapon inoperable.
2	20	None						Flushed weapon with clean water.
Subtotal	21	-	0	0	0	1	1	
Total	61	-	0	0	0	1	1	

2.8.5 Analysis

Function performance of three of the four weapons in this test indicates that the M16A1 rifle design is susceptible to mud penetration into critical areas under the stringent conditions of the standard mud test; however, reliable operation can be restored by flushing operating parts with clean water.

Since weapon operability or nonoperability under the conditions of this test depends upon the extent to which random mud contamination reaches areas critical to the operation of the mechanism, the value of

this test as a measure of weapon-to-weapon quality may be questionable, in view of the small sample sizes involved.

2.9 WATER SPRAY TEST

2.9.1 Objective

The objective was to determine if functional reliability is affected by prolonged contact with a water spray environment.

2.9.2 Criteria

The weapon performance must not be degraded as a result of contact with water spray.

2.9.3 Method

Conduct the test in accordance with Reference 4.

2.9.4 Results

Table 2.9-I gives the results of the water spray test for both IMR- and ball-propellant weapons.

Table 2.9-I. Results of Water-Spray Test. Malfunction Totals for Two Weapons (Each) Using IMR- and Ball-Propellant Ammunition

Rd No. of Malfunct from Magazine	Number of Malfunctions by Magazine for Six 100-Round Cycles					Malfunctions		Total No. Rds Fired
	First	Second	Third	Fourth	Fifth	Total	Per Cent of Total	
Propellant Type: IMR.								
1	0	0	0	0	0	0	0	30
2	3	0	0	0	1	4	24	30
3	4	0	0	0	1	5	29	30
4 to 20	8	0	0	0	0	8	47	510
Subtotal	15	0	0	0	2	17		600
Per Cent of Total	88	0	0	0	12		100	

Table 2.9-I (Cont'd)

Rd No. of Malfunct from Magazine	Number of Malfunctions by Magazine for Six 100-Round Cycles					Malfunctions		Total No. Rds Fired
	First	Second	Third	Fourth	Fifth	Total	Per Cent of Total	
Propellant Type: Ball.								
1	0	0	0	0	0	0	0	30
2	0	0	0	0	0	0	0	30
3	0	0	0	0	0	0	0	30
4 to 20	0	0	0	0	0	0	0	510
Subtotal	0	0	0	0	0	0		600
Per Cent of Total	0	0	0	0	0	0	100	

2.9.5 Analysis

Although the frequency of feeding malfunctions in the IMR propellant weapons was lower than in the unlubricated test (ref par. 2.6), the recurrence of the same type of malfunctions in this test indicates that the water spray partially displaced the lubricant and thereby created an unlubricated condition. Magazine operation is not considered an influencing factor since these were not lubricated and were used in the same weapons during the preceding subtests.

2.10 HUMIDITY TEST

2.10.1 Objective

The objective was to determine the effects of extended conditioning of weapons, magazines, and ammunition in a high-humidity environment.

2.10.2 Criteria

The functional reliability of the weapon must not be impaired by the humidity environment.

2.10.3 Method

Conduct the test in accordance with Reference 4.

2.10.4 Results

No chargeable malfunctions occurred with weapons fired with IMR or ball propellant-loaded ammunition. Table 2.10-I gives a résumé of the firing exercise.

2.10.5 Analysis

The high humidity environment does not adversely influence weapon performance.

Table 2.10-I. Results of High-Temperature - Humidity Test

Weapon No.	Test Day	Magazine No.	No. Rds Fired	Round No. of Malfunct	Stub-1[a]
1	3	-	250	None	
	5	9	250	161	[b]1
	8	-	250	None	
	10	-	250	None	
Subtotal	-	-	1000	-	0
5	3	-	250	None	
	5	-	250	None	
	8	-	250	None	
	10	-	250	None	
Subtotal	-	-	1000	-	0
Total	-	-	2000	-	0
1A	3	-	250	None	
	5	-	250	None	
	8	9	250	161	[b]1
	10	-	250	None	
Subtotal	-	-	1000	-	0
5A	3	-	250	None	
	5	-	250	None	
	8	-	250	None	
	10	-	250	None	
Subtotal	-	-	1000	-	
Total	-	-	2000	-	0

[a]Number of malfunctions, by type.
[b]Charged to deformed magazine.

2.11 RELIABILITY TEST

2.11.1 Objective

The objective was to determine the weapon reliability throughout the firing of 10,000 rounds of ammunition.

2.11.2 Criteria

2.11.2.1 QA Requirements. The weapons must satisfy the performance standards outlined in SAPD 253B (Reference 1) in firing 6000-rounds per weapon.

2.11.2.2 USATECOM Requirements. The weapons must satisfty the performance standards (prorated) required in par. 2.11.2.1 during the firing of an additional 4000 rounds for each weapon tested.

2.11.3 Method

Conduct the test in accordance with Reference 9.

2.11.4 Results

Table 2.11-I gives a detailed breakdown of firings with M7 bayonet and M3 bipod attached, weapon attitudes firing, and benchrest firing. Table 2.11-II gives the malfunction aggregate's, by type, for three weapons (each) using IMR and ball propellant-loaded ammunition.

The average cyclic rates given in Table 2.11-I were recorded for rounds 81 through 100 in each cycle except in the attitudes firings where the rate was an average of five sequentially-fired 20-round bursts (rounds 1 through 100). Since the characteristics of the redesigned buffer in the M16A1 rifle contributes to the increase in cyclic rate for each subsequently fired 20-round burst in a 100-round cycle, the rate averages for attitudes firing should not be directly compared with the other rates obtained throughout the test.

Table 2.11-I. Reliability Test Data for Three Weapons (Each) Using IMR and Ball Propellant-Loaded Ammunition

Test Condition	Mode	Each Weapon: 100-Round Cycle No.	Each Weapon: No. Rds Fired	IMR Propellant (TW-18149): Weapon 2 ACRF, rd per min	Weapon 2 Malfunction Total	Weapon 3 ACRF, rd per min	Weapon 3 Malfunction Total	Weapon 4 ACRF, rd per min	Weapon 4 Malfunction Total	Ball Propellant (TW-18209): Weapon 2A ACRF, rd per min	Weapon 2A Malfunction Total	Weapon 3A ACRF, rd per min	Weapon 3A Malfunction Total	Weapon 4A ACRF, rd per min	Weapon 4A Malfunction Total
Prone, with M3 bipod		2 to 11	1000	799	0	819	0	798	0	937	0	908	1	902	0
		46 to 55	1000	763	1	785	0	760	1	926	0	906	0	846	0
Benchrest, with M7 bayonet		12 to 16	500	752	4	717	0	759	1	888	0	849	0	863	0
		56 to 60	500	728	0	784	0	747	0	928	0	890	0	814	1
Attitudes firing															
Horizontal loose hold	S	23	100	-	3	-	1	-	1	-	0	-	0	-	0
Horizontal loose hold	A	24	100	662	0	679	0	655	0	916	1	909	0	859	0
Horizontal right side up	S	25	100	-	0	-	1	-	0	-	0	-	0	-	0
Horizontal right side up	A	26	100	711	0	739	0	714	0	900	0	882	0	849	0
Horizontal left side up	S	27	100	-	0	-	0	-	0	-	0	-	0	-	0
Horizontal left side up	A	28	100	679	0	724	0	683	0	891	0	869	1	838	0
-80° depression normal hold	S	31	100	-	0	-	0	-	0	-	0	-	0	-	0
-80° depression normal hold	A	32	100	650	0	725	0	672	0	867	0	842	0	798	0
-80° depression loose hold	S	33	100	-	0	-	0	-	0	-	0	-	0	-	0
-80° depression loose hold	A	34	100	[a]672	6	659	0	613	4	872	0	835	0	783	0
+80° elevation normal hold	S	35	100	-	0	-	0	-	0	-	0	-	0	-	0
+80° elevation normal hold	A	36	100	717	0	727	0	696	0	877	0	827	0	820	0

[a]Only one rate obtainable because of weapon stoppages.

Table 2.11-I (Cont'd)

Test Condition	Mode	Each Weapon: 100-Round Cycle No.	Each Weapon: No. Rds Fired	IMR Propellant (TW-18149) Weapon 2: ACRF, rd per min	Weapon 2: Malfunction Total	Weapon 3: ACRF, rd per min	Weapon 3: Malfunction Total	Weapon 4: ACRF, rd per min	Weapon 4: Malfunction Total	Ball Propellant (TW-18209) Weapon 2A: ACRF, rd per min	Weapon 2A: Malfunction Total	Weapon 3A: ACRF, rd per min	Weapon 3A: Malfunction Total	Weapon 4A: ACRF, rd per min	Weapon 4A: Malfunction Total
+80° elevation loose hold	S	37	100	-	1	-	0	-	0	-	0	-	0	-	0
+80° elevation loose hold	A	38	100	674	0	703	0	652	0	871	0	847	0	804	0
Benchrest, weapon only		1 to 60	1600	773	1	795	1	766	1	925	0	884	2	861	2
All conditions		1 to 60	6000	732	16	757	3	726	8	907	1	878	4	844	3
Benchrest, weapon only		61 to 100	4000	814	3	795	1	768	3	934	1	911	4	849	0
All conditions		1 to 100	10000	764	19	777	4	740	11	916	2	889	8	846	3

ACRF = Average cyclic rate of fire.

Table 2.11-II. Malfunction Data for Reliability Subtest

Weapon No.	100-Round Cycle No.	Malfunct Totals	No. of Malfunctions, by Type						
			Stub-1	FSI	FS	BOB	FC	SR	FBR
Weapons Fired with Lot TW-18149 (IMR Propellant) Ammunition									
2	1 to 60	16	4	1	0	5	-	2	4
	61 to 100	3	1	0	0	0	-	0	2
	1 to 100	19	5	1	0	5	-	2	6
3	1 to 60	3	0	2	1	0	-	0	0
	61 to 100	1	0	1	0	0	-	0	0
	1 to 100	4	0	3	1	0	-	0	0
4	1 to 60	8	0	1	0	3	-	1	3
	61 to 100	3	2	0	0	0	-	0	1
	1 to 100	11	2	1	0	3	-	1	4
2 to 4	1 to 60	27	4	4	1	8	-	3	7
	61 to 100	7	3	1	0	0	-	0	3
	1 to 100	34	7	5	1	8	-	3	10
Weapons Fired with TW-18209 (Ball Propellant) Ammunition									
2A	1 to 60	1	0	0	-	-	1	-	-
	61 to 100	1	0	1	-	-	0	-	-
	1 to 100	2	0	1	-	-	1	-	-
3A	1 to 60	4	2	2	-	-	0	-	-
	61 to 100	4	1	1	-	-	2	-	-
	1 to 100	8	3	3	-	-	2	-	-
4A	1 to 60	3	2	1	-	-	0	-	-
	61 to 100	0	0	0	-	-	0	-	-
	1 to 100	3	2	1	-	-	0	-	-
2A to 4A	1 to 60	8	4	3	-	-	1	-	-
	61 to 100	5	1	2	-	-	2	-	-
	1 to 100	13	5	5	-	-	3	-	-

2.11.5 Analysis

With the exception of one IMR propellant weapon which failed to satisfy the Quality Assurance Test Requirement (e.g., 11 total malfunctions or less in 6000 rounds) all weapons performed satisfactorily during the 6000-round and additional 4000-round trials.

SECTION 3. APPENDICES

APPENDIX I - TEST DATA

Table I-I. Accuracy and Dispersion Data for 100-Meter Firings

Weapon No.	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
1	1.10	5.2	.9	1.4	2.3	.6	.7	5.4	1.2	-3.9	-.6
	1.20	3.0	.7	1.0	3.1	.7	.9	3.9	1.1	-3.0	.8
	1.30	5.4	1.4	1.7	2.1	.5	.7	5.4	1.6	-2.9	1.3
	1.40	4.4	1.1	1.4	3.1	.8	1.0	5.0	1.5	-2.0	1.4
	1.50	3.7	1.0	1.2	4.0	.9	1.2	4.3	1.4	-3.3	1.2
	mean	4.3	1.0	1.4	2.9	.7	.9	4.8	1.4	-3.0	.8
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
1	1.60	1.9	.6	.7	4.0	.9	1.2	4.0	1.2	-1.8	-.5
	1.70	3.2	.9	1.1	2.7	.5	.7	3.2	1.2	-2.8	.2
	1.80	2.9	.7	.9	4.9	1.0	1.4	5.1	1.3	-3.1	-.1
	1.90	3.9	.9	1.1	2.9	.8	.9	4.0	1.3	-1.8	-.7
	1.10	4.3	1.2	1.4	2.4	.7	.9	4.6	1.5	-1.6	-1.2
	mean	3.2	.9	1.1	3.4	.8	1.0	4.2	1.3	-2.2	-.5
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
1	1.11	7.3	1.7	2.3	2.4	.6	.7	7.5	1.9	-2.3	-4.0
	1.12	7.2	1.3	1.9	4.4	1.1	1.4	8.2	1.8	-2.9	-3.7
	1.13	6.3	1.1	1.8	3.2	1.0	1.2	6.5	1.7	-.6	-4.3
	1.14	6.5	1.2	1.8	1.9	.5	.6	6.5	1.5	-1.0	-2.3
	1.15	5.7	1.4	1.8	3.2	.7	1.0	5.9	1.6	-1.4	-1.0
	mean	6.6	1.4	1.9	3.0	.8	1.0	6.9	1.7	-1.6	-3.1
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
2	2.10	4.8	1.0	1.4	4.4	.9	1.3	4.8	1.6	-1.4	4.3
	2.20	4.3	.9	1.2	3.4	1.2	1.3	5.3	1.6	-2.0	3.9
	2.30	3.5	1.0	1.2	2.1	.5	.6	3.5	1.2	-1.6	.9
	2.40	3.5	.9	1.1	3.9	.8	1.2	4.0	1.4	-1.2	.6
	2.50	2.6	.8	.9	2.1	.4	.6	2.6	1.0	-.6	2.0
	mean	3.7	.9	1.2	3.2	.8	1.0	4.1	1.3	-1.4	2.3

Table I-I (Cont'd)

Weapon No.	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
2	2.60	3.2	.9	1.1	2.5	.8	.9	3.9	1.3	-.7	-.8
	2.70	3.1	.8	1.0	4.7	1.0	1.3	4.8	1.4	-1.2	-2.0
	2.80	3.5	.7	1.0	3.6	.6	1.0	4.0	1.1	-1.4	-2.4
	2.90	3.7	.8	1.1	2.0	.8	.9	3.8	1.3	-.8	-.4
	2.10	3.2	.9	1.0	1.5	.4	.5	3.4	1.0	-.5	-.7
	mean	3.3	.8	1.0	2.9	.7	.9	4.0	1.2	-.9	-1.3
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
2	2.11	6.3	1.5	2.0	3.2	.7	.9	6.9	1.7	-.4	-3.2
	2.12	6.4	1.0	1.7	3.9	1.2	1.4	7.0	1.8	-1.7	-3.1
	2.13	5.8	1.1	1.7	3.2	.9	1.1	6.2	1.6	-2.6	-3.3
	2.14	6.8	1.8	2.2	6.4	1.9	2.5	9.1	2.8	.4	-.3
	2.15	6.9	1.6	2.3	2.8	.7	.9	6.9	1.9	2.2	-3.1
	mean	6.4	1.4	2.0	3.9	1.1	1.4	7.2	2.0	-.4	-2.6
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
3	3.10	4.2	1.0	1.3	1.7	.5	.6	4.4	1.2	-.9	10.6
	3.20	3.8	.9	1.2	2.5	.7	.8	4.0	1.2	-1.5	9.1
	3.30	1.8	.6	.6	3.1	.6	.9	3.1	.9	-1.3	8.9
	3.40	2.9	.6	.8	2.4	.5	.7	3.3	.9	-2.2	7.8
	3.50	3.8	.8	1.1	3.4	.7	1.0	4.1	1.2	-1.8	9.1
	mean	3.3	.8	1.0	2.6	.6	.8	3.8	1.1	-1.5	9.1
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
3	3.60	4.3	1.1	1.3	3.8	.8	1.1	4.7	1.5	-.5	7.4
	3.70	4.1	.8	1.2	2.1	.6	.7	4.4	1.1	-.5	4.7
	3.80	2.8	.5	.8	1.9	.4	.6	2.9	.8	.3	4.5
	3.90	3.7	.9	1.1	2.9	.7	.9	4.0	1.2	-.1	5.1
	3.10	4.4	.9	1.2	2.9	.7	1.0	4.4	1.3	.1	5.8
	mean	3.9	.8	1.1	2.7	.7	.8	4.1	1.2	-.1	5.5

Table I-I (Cont'd)

Weapon No.	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
3	3.11	5.5	1.0	1.5	2.0	.4	.6	5.5	1.2	-1.9	3.6
	3.12	3.2	.7	.9	3.0	.8	1.0	3.6	1.1	-4.6	1.5
	3.13	7.0	1.4	2.0	2.2	.5	.7	7.0	1.6	-2.6	2.7
	3.14	4.0	1.3	1.6	4.3	1.1	1.4	4.9	1.8	-2.4	5.3
	3.15	7.2	1.7	2.2	3.4	1.0	1.3	8.0	2.2	2.5	2.0
	mean	5.4	1.2	1.6	3.0	.8	1.0	5.8	1.6	-1.8	3.0

	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
4	4.10	3.6	.9	1.1	1.4	.4	.5	3.6	1.0	-.2	8.3
	4.20	3.1	.9	1.1	2.0	.6	.7	3.4	1.2	-.2	8.2
	4.30	4.0	.8	1.2	3.7	.9	1.2	4.4	1.4	.4	7.9
	4.40	5.2	1.1	1.5	2.6	.8	1.0	5.8	1.5	-.7	7.4
	4.50	2.8	.6	.8	4.6	1.1	1.4	4.7	1.3	-.2	7.0
	mean	3.7	.8	1.1	2.9	.8	.9	4.4	1.3	-.2	7.8

	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
4	4.60	4.6	1.2	1.5	2.2	.6	.7	4.8	1.4	.7	4.6
	4.70	3.0	.8	1.0	2.8	.6	.8	3.1	1.2	1.1	6.7
	4.80	3.2	.7	1.0	2.6	.8	.9	3.6	1.2	-.1	5.6
	4.90	3.5	1.0	1.2	3.4	.9	1.1	4.9	1.4	.6	6.6
	4.10	2.9	.9	1.0	3.1	.7	.9	3.7	1.2	.4	5.8
	mean	3.4	.9	1.1	2.8	.7	.9	4.0	1.3	.5	5.8

	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
4	4.11	9.8	1.6	2.6	7.3	1.6	2.1	11.5	2.5	-1.6	7.3
	4.12	7.9	1.8	2.5	5.5	1.4	1.8	8.1	2.5	-1.0	3.2
	4.13	8.3	2.2	2.7	5.4	2.0	2.1	9.4	3.1	-2.5	3.2
	4.14	8.5	1.6	2.3	6.4	1.4	2.0	8.5	2.2	.7	1.9
	4.15	6.9	1.3	1.9	3.2	.8	1.0	7.0	1.7	1.3	2.8
	mean	8.3	1.7	2.4	5.6	1.4	1.8	8.9	2.4	-.6	3.7

Table I-I (Cont'd)

Weapon No.	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
5	5.10	4.2	.8	1.2	2.4	.6	.7	4.3	1.1	4.4	7.1
	5.20	2.8	.6	.8	2.2	.6	.8	3.0	.9	3.9	6.2
	5.30	3.4	.8	1.0	2.2	.6	.7	3.5	1.0	4.2	5.7
	5.40	3.7	.9	1.1	3.5	.8	1.1	4.4	1.3	3.9	5.4
	5.50	4.9	1.2	1.5	2.3	.6	.8	5.1	1.4	3.4	4.3
	mean	3.8	.8	1.1	2.5	.6	.8	4.0	1.2	3.9	5.8
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
5	5.60	3.9	1.0	1.3	1.4	.4	.5	4.1	1.2	4.3	4.0
	5.70	3.7	1.0	1.2	2.6	.6	.8	4.0	1.3	4.2	3.3
	5.80	3.7	.9	1.1	3.3	.8	1.1	3.9	1.4	4.4	5.2
	5.90	3.8	1.1	1.3	1.0	.3	.4	3.8	1.2	4.4	4.9
	5.10	3.3	.8	1.0	2.5	.6	.8	3.4	1.2	4.7	3.7
	mean	3.7	1.0	1.2	2.2	.6	.7	3.8	1.2	4.4	4.2
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
5	5.11	5.7	1.5	2.0	3.8	.8	1.1	6.2	1.8	2.8	2.4
	5.12	5.2	.9	1.4	2.7	.6	.8	5.4	1.3	3.5	4.3
	5.13	6.3	1.4	1.8	2.1	.6	.8	6.5	1.6	6.1	.3
	5.14	8.1	1.3	2.2	2.3	.6	.7	8.1	1.6	4.2	.6
	5.15	4.3	.9	1.2	2.5	.5	.7	4.4	1.2	2.8	-.1
	mean	5.9	1.2	1.7	2.7	.6	.8	6.1	1.5	3.9	1.6

Ball Propellant Weapons

	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
1A	1.10	3.5	.7	1.0	1.8	.4	.5	3.5	.9	-1.4	8.6
	1.20	3.3	.9	1.1	2.3	.5	.7	3.3	1.1	-1.5	9.0
	1.30	3.8	.7	1.1	2.6	.5	.7	3.8	1.0	-2.3	9.3
	1.40	2.8	.7	.9	3.6	1.0	1.2	3.7	1.3	-2.1	11.0
	1.50	3.2	.9	1.1	3.4	.6	.9	3.6	1.2	-1.7	9.7
	mean	3.3	.8	1.0	2.7	.6	.8	3.6	1.1	-1.8	9.5

Table I-I (Cont'd)

Weapon No.	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
1A	1.60	3.9	1.1	1.3	3.5	.7	1.0	4.0	1.4	.2	9.1
	1.70	2.7	.6	.8	2.9	.8	1.0	2.9	1.1	-.7	7.8
	1.80	6.0	1.3	1.7	3.4	.8	1.0	6.4	1.6	-1.0	5.9
	1.90	5.2	1.4	1.8	3.9	.9	1.2	5.3	1.9	-1.2	7.3
	1.10	3.1	.6	.9	2.3	.6	.8	3.6	.9	-.8	7.4
	mean	4.2	1.0	1.3	3.2	.8	1.0	4.5	1.4	-.7	7.5
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
1A	1.11	3.4	1.1	1.3	4.2	1.0	1.2	5.3	1.6	-4.3	5.6
	1.12	3.8	1.1	1.3	4.7	.8	1.3	6.0	1.5	.9	3.0
	1.13	5.6	1.4	1.8	2.7	.7	.9	5.6	1.7	-4.7	4.5
	1.14	4.2	1.6	1.8	3.6	.8	1.0	4.9	1.8	-4.4	6.3
	1.15	5.3	1.1	1.6	2.7	.8	1.0	5.7	1.4	-1.8	5.3
	mean	4.5	1.3	1.6	3.6	.8	1.1	5.5	1.6	-2.9	4.9
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
2A	2.10	3.1	.8	1.1	1.2	.4	.5	3.2	1.0	-.6	6.2
	2.20	4.1	1.0	1.4	5.3	1.1	1.6	5.8	1.7	-1.1	6.9
	2.30	2.7	.7	.9	2.3	.6	.7	3.5	1.0	-.8	5.9
	2.40	2.3	.6	.8	3.3	.7	1.0	3.5	1.0	-1.3	6.8
	2.50	3.5	.7	1.0	2.1	.5	.7	3.5	1.0	-1.5	7.7
	mean	3.1	.8	1.0	2.8	.7	.9	3.9	1.1	-1.1	6.7
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
2A	2.60	4.7	1.1	1.4	3.9	1.0	1.2	4.8	1.6	-.2	5.7
	2.70	4.1	.8	1.2	3.1	.8	1.0	5.1	1.2	-.0	4.9
	2.80	3.4	1.2	1.4	2.5	.6	.8	3.8	1.4	.3	2.6
	2.90	3.5	.7	1.0	2.3	.6	.7	4.0	1.0	-.4	4.2
	2.10	2.6	.7	.8	2.3	.6	.7	2.9	.9	-.2	4.8
	mean	3.7	.9	1.2	2.8	.7	.9	4.1	1.2	-.1	4.5

Table I-I (Cont'd)

Weapon No.	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
2A	2.11	5.5	1.5	1.9	2.6	.7	1.0	5.5	1.9	-2.7	5.6
	2.12	3.9	.8	1.1	3.6	.9	1.1	4.6	1.3	-4.2	4.2
	2.13	8.5	1.9	2.6	1.9	.4	.6	8.5	2.0	.5	4.6
	2.14	2.8	.6	.8	2.3	.6	.7	2.8	1.0	-1.7	4.4
	2.15	6.0	.8	1.5	2.6	.7	.8	6.1	1.3	-.5	4.3
	mean	5.3	1.1	1.6	2.6	.7	.8	5.5	1.5	-1.7	4.6
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
3A	3.10	5.5	1.0	1.4	3.2	.7	.9	5.5	1.3	-.3	6.7
	3.20	2.8	.5	.8	4.0	.8	1.2	4.0	1.2	-.1	5.9
	3.30	2.9	.8	1.0	2.6	.6	.8	3.3	1.1	.1	5.8
	3.40	2.7	.5	.7	3.8	1.1	1.3	3.8	1.3	-.1	5.7
	3.50	3.4	.5	.8	2.9	.9	1.1	3.5	1.1	-.7	5.5
	mean	3.5	.7	1.0	3.3	.8	1.1	4.0	1.2	-.2	5.9
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
3A	3.60	3.4	.6	.9	2.7	.7	.9	3.4	1.0	-.3	5.2
	3.70	3.5	.9	1.1	4.2	1.1	1.3	5.0	1.5	.1	4.2
	3.80	5.0	1.1	1.5	3.9	.9	1.3	6.0	1.5	-.4	4.6
	3.90	4.1	1.0	1.4	2.8	.8	1.0	4.1	1.4	-.7	4.5
	3.10	2.5	.7	.9	3.7	1.0	1.3	4.5	1.3	-.7	3.7
	mean	3.7	.9	1.1	3.5	.9	1.1	4.6	1.3	-.4	4.5
	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
3A	3.11	3.4	.7	1.0	4.9	1.1	1.4	5.9	1.4	-.8	7.0
	3.12	2.9	.7	.9	5.1	1.1	1.5	5.7	1.4	-2.4	4.6
	3.13	5.8	1.1	1.6	5.7	1.3	1.7	7.7	1.9	.6	3.1
	3.14	4.5	.9	1.2	4.3	1.2	1.4	4.7	1.6	-3.0	5.2
	3.15	4.4	1.1	1.3	4.3	1.4	1.6	5.1	1.9	.9	6.4
	mean	4.2	.9	1.2	4.9	1.2	1.5	5.8	1.6	-1.0	5.3

Table I-I (Cont'd)

Weapon No.	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
4A	4.10	4.3	1.3	1.5	5.4	1.4	1.7	6.6	2.0	1.5	8.9
	4.20	3.5	.8	1.0	3.2	.8	1.0	4.2	1.2	1.6	9.0
	4.30	3.7	.8	1.1	3.4	.8	1.1	4.3	1.3	3.3	10.5
	4.40	5.1	1.5	1.7	4.7	1.2	1.5	5.6	2.0	4.9	9.5
	4.50	4.6	.8	1.2	3.2	.7	.9	5.5	1.1	5.5	8.6
	mean	4.2	1.0	1.3	4.0	1.0	1.3	5.2	1.5	3.4	9.3

	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
4A	4.60	5.7	1.4	1.8	2.2	.6	.8	5.9	1.6	2.2	6.8
	4.70	4.4	1.2	1.5	4.6	.8	1.2	5.4	1.6	3.0	5.4
	4.80	4.7	1.2	1.5	4.9	1.1	1.5	5.6	1.7	3.1	6.0
	4.90	3.2	.9	1.2	2.2	.6	.7	3.3	1.2	3.9	6.6
	4.10	4.0	1.3	1.5	3.5	.7	1.0	5.0	1.5	4.5	6.2
	mean	4.4	1.2	1.5	3.5	.8	1.0	5.0	1.5	3.3	6.2

	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
4A	4.11	9.8	2.6	3.1	5.3	1.4	1.8	9.8	3.2	2.8	5.9
	4.12	7.4	1.7	2.2	3.2	.9	1.1	7.4	2.1	3.6	6.1
	4.13	10.7	2.3	3.2	5.5	1.8	2.1	11.4	3.2	3.0	7.4
	4.14	9.8	1.8	2.7	3.6	.9	1.1	10.0	2.2	4.7	6.4
	4.15	8.2	1.7	2.4	4.9	1.1	1.5	8.2	2.3	3.1	5.9
	mean	9.2	2.0	2.7	4.5	1.2	1.5	9.4	2.6	3.4	6.3

	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
5A	5.10	3.6	.7	1.0	1.0	.2	.3	3.6	.8	.5	6.1
	5.20	3.5	1.0	1.2	3.4	1.0	1.3	4.0	1.6	.7	6.7
	5.30	5.1	1.1	1.5	2.3	.8	.9	5.1	1.4	.3	6.9
	5.40	4.4	1.0	1.3	3.9	.8	1.2	5.7	1.4	.9	7.3
	5.50	4.6	1.7	1.9	3.5	1.2	1.3	5.1	2.1	-.1	5.3
	mean	4.2	1.1	1.4	2.8	.8	1.0	4.7	1.5	.4	6.5

Table I-I (Cont'd)

Weapon No.	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
5A	5.60	4.3	1.1	1.4	5.3	1.5	1.9	6.4	1.9	-2.2	5.3
	5.70	2.2	.5	.7	4.2	1.1	1.4	4.2	1.3	-1.7	3.5
	5.80	3.2	1.0	1.1	4.2	.9	1.2	4.4	1.5	-1.0	5.9
	5.90	3.5	1.2	1.3	5.6	1.3	1.7	5.8	1.8	-1.2	4.3
	5.10	4.4	1.0	1.3	5.7	1.2	1.6	5.9	1.8	-1.0	4.5
	mean	3.5	.9	1.2	5.0	1.2	1.6	5.4	1.7	-1.4	4.7

	tgt no.	ev	mvd	vsd	eh	mhd	hsd	es	mr	ci h	ci v
5A	5.11	5.3	1.2	1.6	7.8	1.8	2.3	8.9	2.3	-1.7	2.9
	5.12	7.9	2.1	2.6	5.6	1.7	2.0	8.4	2.9	-2.7	5.9
	5.13	5.5	1.4	1.8	3.7	1.1	1.4	6.1	1.9	-.6	.6
	5.14	11.6	2.4	3.3	2.8	.8	1.0	11.7	2.7	-3.6	1.7
	5.15	4.6	1.2	1.5	5.3	1.2	1.6	6.7	1.8	-.9	3.4
	mean	7.0	1.6	2.2	5.0	1.3	1.7	8.4	2.3	-1.9	2.9

EV = Extreme vertical.
MVD = Mean vertical dispersion.
VSD = Vertical standard deviation.
EH = Extreme horizontal.
MHD = Mean horizontal dispersion.
HSD = Horizontal standard deviation.
ES = Extreme spread.
MR = Mean radius.
CI = Center of impact.
H = Horizontal.
V = Vertical.

Table I-II. Reliability Test Firing Schedule

Cycle No.	Rd No. From	Rd No. To	Mode of Fire	Firing Position: Benchrest, Rifle Only	Firing Position: Benchrest, Rifle and Bayonet	Firing Position: Prone, Rifle and Bipod	Remarks
1	1	60	S	X			Record velocity at 20 feet.
	61	80	B	X			
	81	100	A	X			Record cyclic rate on all automatic fire.
2	101	200				X	Mode of fire same as cycle 1.
3	201	300				X	Mode of fire same as cycle 1.
4	301	400				X	Mode of fire same as cycle 1.
5	401	500				X	Mode of fire same as cycle 1.
6	501	600				X	Mode of fire same as cycle 1.
7	601	700				X	Mode of fire same as cycle 1.
8	701	800				X	Mode of fire same as cycle 1.
9	801	900				X	Mode of fire same as cycle 1.
10	901	1000				X	Mode of fire same as cycle 1.
Clean, inspect, lubricate.							
11	1001	1100				X	Mode of fire same as cycle 1.
12	1101	1200			X		Mode of fire same as cycle 1.
13	1201	1300			X		Mode of fire same as cycle 1.
14	1301	1400			X		Mode of fire same as cycle 1.
15	1401	1500			X		Mode of fire same as cycle 1.
16	1501	1600			X		Mode of fire same as cycle 1.
17	1601	1700		X			Mode of fire same as cycle 1.

Table I-II (Cont'd)

Cycle No.	Rd No. From	Rd No. To	Mode of Fire	Firing Position: Benchrest Rifle Only	Firing Position: Benchrest Rifle and Bayonet	Firing Position: Prone Rifle and Bipod	Remarks
18	1701	1800		X			Mode of fire same as cycle 1.
19	1801	1900		X			Mode of fire same as cycle 1.
20	1901	2000		X			Mode of fire same as cycle 1.
Clean, inspect, lubricate.							
21	2001	2100		X			Record velocity. Same mode of fire.
22 to 28	2101	2800	-				Attitudes firing par. A-F (Ref 4).
29	2801	2900		X			Mode of fire same as cycle 1.
30	2901	3000		X			Mode of fire same as cycle 1.
Clean, inspect, lubricate.							
31 to 38	3001	3800	-				Attitudes firing par. G-N (Ref 4).
39	3801	3900		X			Mode of fire same as cycle 1.
40	3901	4000		X			Mode of fire same as cycle 1.
Clean, inspect, lubricate.							
41	4001	4100		X			Mode of fire same as cycle 1.
42	4101	4200		X			Mode of fire same as cycle 1.
43	4201	4300		X			Mode of fire same as cycle 1.
44	4301	4400		X			Mode of fire same as cycle 1.
45	4401	4500		X			Mode of fire same as cycle 1.
46	4501	4600				X	Mode of fire same as cycle 1.
47	4601	4700				X	Mode of fire same as cycle 1.

Table I-II (Cont'd)

Cycle No.	Rd No. From	Rd No. To	Mode of Fire	Firing Position: Benchrest: Rifle Only	Firing Position: Benchrest: Rifle and Bayonet	Firing Position: Prone: Rifle and Bipod	Remarks
48	4701	4800				X	Mode of fire same as cycle 1.
49	4801	4900				X	Mode of fire same as cycle 1.
50	4901	5000				X	Mode of fire same as cycle 1.
Clean, inspect, lubricate.							
51	5001	5100				X	Mode of fire same as cycle 1.
52	5101	5200				X	Mode of fire same as cycle 1.
53	5201	5300				X	Mode of fire same as cycle 1.
54	5301	5400				X	Mode of fire same as cycle 1.
55	5401	5500				X	Mode of fire same as cycle 1.
56	5501	5600			X		Mode of fire same as cycle 1.
57	5601	5700			X		Mode of fire same as cycle 1.
58	5701	5800			X		Mode of fire same as cycle 1.
59	5801	5900			X		Mode of fire same as cycle 1.
60	5901	6000			X		Mode of fire same as cycle 1.
Clean, inspect, lubricate.							
61 to 70	6001	7000		X			Rd 1 to 10, vel; 11 to 20, target; gage bore. Use same modes of fire as cycle 1.
Clean, inspect, lubricate.							
71 to 80	7001	8000		X			Use same modes of fire as cycle 1.

Table I-II (Cont'd)

Cycle No.	Rd No. From	Rd No. To	Mode of Fire	Firing Position: Benchrest, Rifle Only	Firing Position: Benchrest, Rifle and Bayonet	Firing Position: Prone, Rifle and Bipod	Remarks
			Clean, inspect, lubricate.				
81 to 90	8001	9000		X			Same as cycle 61 to 70.
			Clean, inspect, lubricate.				
91 to 100	9001	10,000		X			Same as cycle 71 to 80.
			Clean, inspect, lubricate.				
	10,001	10,200					Fire for accuracy - velocity; take bore measurements.
			Clean, inspect, lubricate.				

Note: The "X" indicates use of weapon.

Table I-III. Velocity Measurement Data for Reliability Test Weapons

Instrumental point at 20 feet, base distance = 10 feet.

	Ctg Lot TW-18149 (IMR)			Ctg Lot TW-18209 (Ball)		
Test Rd No.	Weapon No. 2 Vel, fps	Weapon No. 3 Vel, fps	Weapon No. 4 Vel, fps	Weapon No. 2A Vel, fps	Weapon No. 3A Vel, fps	Weapon No. 4A Vel, fps
1	3165	3155	3115	3155	3077	3145
2	3145	3155	3145	3115	3125	3135
3	3135	3096	3106	3096	3155	3185
4	3096	3175	3145	3135	3135	3125
5	3145	3115	3145	3145	3125	3115
6	3165	3165	3125	3125	3135	3145
7	3125	3135	3145	3125	3155	3115
8	3145	3165	3145	3125	3106	3165
9	3125	3175	3145	3175	3195	3115
10	3135	3185	3145	3135	3145	3135
Mean	3138	3152	3136	3123	3135	3137
2001	3135	3086	3086	3125	3105	3077
2002	3125	3096	3058	3086	3067	3115
2003	3096	3115	3077	3067	3077	3135
2004	3105	3058	3096	3154	3086	3165
2005	3096	3067	3077	3175	3086	3125
2006	3086	3049	3096	3135	3105	3165
2007	3135	3115	3105	3175	3115	3135
2008	3125	3115	3030	3154	3135	3145
2009	3077	3096	3086	3165	3105	3135
2010	3115	3105	3077	3145	3145	3145
Mean	3110	3090	3079	3138	3103	3134
4001	3086	3115	3086	3058	3049	3067
4002	3096	3105	3096	3096	3105	3067
4003	3049	3096	3058	3125	3115	3096
4004	3086	3086	3049	3105	3155	3115
4005	3096	3077	3067	3155	3135	3096
4006	3058	3086	3058	3105	3145	3125
4007	3077	3077	3115	3175	3096	3155
4008	3105	3030	3105	3125	3145	3077
4009	3086	3105	3086	3105	3125	3165
4010	3125	3030	3096	3105	3165	3145
Mean	3086	3081	3082	3115	3124	3111

Table I-III (Cont'd)

Test Rd No.	Ctg Lot TW-18149 (IMR) Weapon No. 2 Vel, fps	Weapon No. 3 Vel, fps	Weapon No. 4 Vel, fps	Ctg Lot TW-18209 (Ball) Weapon No. 2A Vel, fps	Weapon No. 3A Vel, fps	Weapon No. 4A Vel, fps
6001	3086	3086	3096	3115	3135	3165
6002	3105	3105	3105	3125	3145	3105
6003	3096	3096	3096	3086	3115	3155
6004	3125	3086	3155	3135	3125	3145
6005	3105	3096	3115	3096	3155	3125
6006	3086	3086	3105	3105	3135	3145
6007	3105	3145	3077	3155	3175	3096
6008	3120	3125	3067	3096	3155	3125
6009	3096	3145	3115	3115	3145	3125
6010	3145	3086	3105	3145	3155	3135
Mean	3107	3106	3104	3117	3144	3132
8001	3135	3215	3105	3215	3135	3145
8002	3077	3077	3086	3165	3155	3155
8003	3215	3145	3215	3175	3155	3175
8004	3215	3105	3077	3096	3135	3145
8005	3135	3077	3135	3105	3145	3135
8006	3105	3215	3145	3165	3185	3165
8007	3096	3135	3125	3155	3175	3155
8008	3155	3096	3086	3175	3195	3165
8009	3105	3096	3096	3195	3175	3175
8010	3096	3086	3145	3165	3155	3145
Mean	3133	3125	3122	3161	3161	3156
10001	3115	3135	3155	3205	3155	3205
10002	3175	3145	3155	3195	3105	3165
10003	3077	3115	3165	3145	3155	3155
10004	3105	3135	3155	3125	3195	3215
10005	3135	3155	3105	3125	3205	3195
10006	3125	3095	3125	3155	3195	3195
10007	3155	3115	3135	3145	3165	3215
10008	3165	3165	3145	3165	3205	3226
10009	3155	3155	3077	3155	3195	3185
10010	3185	3125	3105	3175	3205	3205
Mean	3139	3134	3132	3159	3178	3196

Barrel Measurement Data

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

5.56 MM Barrel	
DATE OF GAUGING	6 FEB 68
FIRING STATUS (Check One) BEFORE	X
FIRING STATUS (Check One) AFTER	
NUMBER	8841470 (1)
MODEL	M16A1
MANUFACTURER	
CASTING NUMBER	
NUMBER OF ROUNDS	B.F. AT APG
PROOF OFFICER	MILLER W.O.

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0002"	+.0002"	+.0002"	+.0002"
19.70	2.00	2	2	2	1
18.70	3.00	3	2	3	3
17.70	4.00	2	2	2	3
16.70	5.00	2	2	2	3
15.70	6.00	2	3	2	2
14.70	7.00	2	3	2	2
13.70	8.00	1	2	2	2
12.70	9.00	1	4	2	2
11.70	10.00	2	3	2	2
10.70	11.00	1	+1	2	2
9.70	12.00	1	-1	2	2
8.70	13.00	2	0	2	2
7.70	14.00	2	0	3	2
6.70	15.00	2	+2	2	2
5.70	16.00	1	3	2	2
4.70	17.00	0	1	2	2
3.70	18.00	0	2	2	2
3.35	18.35	1	1	2	2
2.85	18.85	2	3	3	1
2.60	19.10	+.0002	+.0003	+.0003	+.0002

BORESCOPE REMARKS:

MONK. OSBORNE

STEAP-DS Form 106 (Part I) • 17 JUNE 64 I-15

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER	MANUFACTURER	PROOF OFFICER	NUMBER	MODEL	NUMBER OF ROUNDS	FIRING STATUS (Check One) BEFORE	FIRING STATUS (Check One) AFTER	DATE OF GAUGING
X		W.O. MILLER	5.56 MM Barrel	M16A1	B.F. AT APG			6 FEB 68

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0005	+.0005	+.0003	+.0003
19.70	2.00	4	5	3	3
18.70	3.00	5	4	3	3
17.70	4.00	4	4	3	3
16.70	5.00	5	4	3	3
15.70	6.00	4	5	3	3
14.70	7.00	5	4	3	3
13.70	8.00	6	4	3	3
12.70	9.00	5	6	3	3
11.70	10.00	4	5	3	3
10.70	11.00	5	4	3	3
9.70	12.00	5	3	2	2
8.70	13.00	5	4	2	2
7.70	14.00	4	4	2	2
6.70	15.00	4	4	2	2
5.70	16.00	3	4	2	2
4.70	17.00	4	4	2	2
3.70	18.00	4	4	2	2
3.35	18.35	3	4	2	2
2.85	18.85	6	3	2	2
2.60	19.10	+.0004	+.0004	+.0002	+.0002

BORESCOPE REMARKS:

MONK OSBORNE

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER	X
MANUFACTURER	
PROOF OFFICER	MILLER ORD.
MODEL	M16A1
NUMBER OF ROUNDS	B.F. AT APG
NUMBER	884453 (3)
FIRING STATUS (Check One) BEFORE	✓
FIRING STATUS (Check One) AFTER	
5.56 MM Barrel	
DATE OF GAUGING	6 FEB 68

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0005	+.0005	+.0005	+.0004
19.70	2.00	6	6	6	6
18.70	3.00	6	6	6	6
17.70	4.00	6	6	6	6
16.70	5.00	6	5	6	6
15.70	6.00	7	6	6	6
14.70	7.00	5	6	5	5
13.70	8.00	5	6	6	7
12.70	9.00	7	6	6	6
11.70	10.00	6	5	6	6
10.70	11.00	6	5	6	6
9.70	12.00	6	6	6	6
8.70	13.00	5	6	6	6
7.70	14.00	5	4	5	5
6.70	15.00	4	5	5	6
5.70	16.00	4	6	6	7
4.70	17.00	6	6	7	6
3.70	18.00	6	6	6	6
3.35	18.35	6	5	6	6
2.85	18.85	6	6	6	6
2.60	19.10	+.0006	+.0006	+.0006	+.0006

BORESCOPE REMARKS:

MONK OSBORNE

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0002	+.0003	+.0002	+.0005
19.70	2.00	2	2	3	3
18.70	3.00	2	2	4	3
17.70	4.00	2	2	4	3
16.70	5.00	2	2	3	4
15.70	6.00	3	2	4	4
14.70	7.00	2	2	3	4
13.70	8.00	2	1	3	3
12.70	9.00	4	2	5	4
11.70	10.00	4	3	4	4
10.70	11.00	1	3	3	3
9.70	12.00	+1	+2	3	3
8.70	13.00	−1	0	4	4
7.70	14.00	+1	0	4	4
6.70	15.00	2	+1	4	4
5.70	16.00	0	1	4	4
4.70	17.00	+1	0	4	4
3.70	18.00	1	+1	4	4
3.35	18.35	2	1	4	4
2.85	18.85	2	1	4	4
2.60	19.10	+.0002	+0002	+.0004	+.0004

BORESCOPE REMARKS:

MONK OSBORNE

CASTING NUMBER: X

MANUFACTURER: PROOF OFFICER MILLER W.O.

MODEL: M16A1 NUMBER OF ROUNDS B.F. AT APG

NUMBER: 8846 07 (4) FIRING STATUS (Check One) BEFORE ✓ AFTER

5.56 MM Barrel DATE OF GAUGING 6 FEB 1968

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER: PROOF OFFICER MILLER W.O.

MODEL: M16A1 NUMBER OF ROUNDS B.F. AT APG

NUMBER: 885154 (5) FIRING STATUS (Check One) BEFORE ✓ AFTER

5.56 MM Barrel DATE OF GAUGING 6 FEB 1968

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0004	+.0005	+.0001	+.0001
19.70	2.00	4	5	0	0
18.70	3.00	4	4	+ 1	+ 1
17.70	4.00	4	4	1	1
16.70	5.00	4	5	1	1
15.70	6.00	4	4	1	2
14.70	7.00	3	4	+ 1	1
13.70	8.00	5	4	0	0
12.70	9.00	5	4	+ 1	+ 2
11.70	10.00	4	5	1	2
10.70	11.00	4	4	1	2
9.70	12.00	4	4	1	1
8.70	13.00	4	4	1	1
7.70	14.00	4	4	1	1
6.70	15.00	4	4	1	2
5.70	16.00	3	4	1	2
4.70	17.00	3	3	1	1
3.70	18.00	2	4	1	1
3.35	18.35	3	3	1	1
2.85	18.85	4	4	1	1
2.60	19.10	+.0004	+.0004	+.0001	+.0001

BORESCOPE REMARKS:

MONK OSBORNE.

5.56 M/M CAST MEAS B.F.

DISTANCE (INCHES) FROM NOMINAL BREECH FACE

				1.558	1.778			
	.200	1.200	1.4337	1.552	1.772	1.815	2.0211	
	DIA. SPECS.	A	B	C*	D*	E*	F	G	A1	
		.3787	.3614	.3573	.257	.256	.2265	.220		
		.3767	.3594	.3563	.256	.254	.2245	.210	.200	
	NO								.2576	DIST
(1)	884147	.3828	.3611	.3572	.2566	.2561	.2289	.2243	.3788	DIA
				(1.4319)	(1.5507)	(1.7729)				
									.2324	DIST
(2)	884323	.3827	.3613	.3572	.2560	.2554	.2271	.2221	.3786	DIA
				(1.4312)	(1.5503)	(1.7743)				
									.2837	DIST.
(3)	884453	.3829	.3605	.3556	.2579	.2557	.2277	.2239	.3790	DIA.
				(1.4343)	(1.5481)	(1.7734)				
									.2279	DIST
(4)	884607	3813	.3615	.3571	.2564	.2560	.2276	.2236	3788	DIA.
				(1.4317)	(1.5505)	(1.7731)				
									.2430	
(5)	885154	.3818	.3612	.3572	.2566	.2555	.2297	.2236	.3788	DIA.
				(1.4308)	(1.5493)	(1.7725)				

FOR: F. H. MILLER
AT NOD
DATE 7, FEB. 68
W.O.
BY: MANR

NOTE: CAST MARKED AND MEASURED
IN THE 12 O'CLOCK PLANE
* C, D, + E ARE DIST. + DIA. TO SHARP CORNERS
A1 IS THE DIST. WHERE THE DIA. FOR "A" FALLS
.330 DATUM DIM. USED AS REF.

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER: MILWAUKEE

MODEL: M16A1

NUMBER OF ROUNDS: 8,5,12,25

NUMBER: 235114

FIRING STATUS (Check One): BEFORE ✓ AFTER

5.56 MM Barrel

DATE OF GAUGING: 19 NOVEMBER 68

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	±.0004	±.0005	±.0007	±.0007
19.70	2.00	3	3	7	5
18.70	3.00	0	1	6	5
17.70	4.00	1	0	4	5
16.70	5.00	1	0	4	5
15.70	6.00	1	0	4	5
14.70	7.00	0	1	4	4
13.70	8.00	0	0	4	4
12.70	9.00	1	1	5	4
11.70	10.00	1	2	5	5
10.70	11.00	1	1	5	5
9.70	12.00	1	1	5	5
8.70	13.00	1	1	5	5
7.70	14.00	1	0	6	5
6.70	15.00	2	2	6	5
5.70	16.00	3	3	6	6
4.70	17.00	3	3	6	6
3.70	18.00	2	3	6	6
3.35	18.35	2	3	6	6
2.85	18.85	2	3	6	7
2.60	19.10	±.0003	±.0003	±.0016	±.0007

BORESCOPE REMARKS: Heavy to light circumferential tool marks extending throughout bore, more pronounced in grooves.

By: Osborne - Monk

BY: OSBORNE

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER:

MODEL: M16A1

NUMBER: 936477 (#2)

NUMBER OF ROUNDS: BE 1005

FIRING STATUS (Check One): BEFORE ✓ AFTER

DATE OF GAUGING: 19 MARCH 68

5.56 MM Barrel

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0001	+.0004	+.0005	+.0005
19.70	2.00	3	3	6	5
18.70	3.00	2	1	6	5
17.70	4.00	0000	- 1	4	4
16.70	5.00	- 1	2	4	3
15.70	6.00	1	3	4	3
14.70	7.00	3	3	3	3
13.70	8.00	2	3	3	3
12.70	9.00	1	2	4	4
11.70	10.00	- 1	3	4	4
10.70	11.00	0	- 1	4	5
9.70	12.00	+ 1	0	4	5
8.70	13.00	0	0	5	5
7.70	14.00	- 2	0	5	5
6.70	15.00	+ 1	0	6	5
5.70	16.00	1	+ 2	5	5
4.70	17.00	2	1	5	6
3.70	18.00	2	1	5	6
3.35	18.35	2	1	5	6
2.85	18.85	2	2	5	6
2.60	19.10	+.0002	+.0002	+.0005	+.0006

BORESCOPE REMARKS: Heavy to light circumferential tool marks extending throughout bore, more pronounced in grooves. Light deposits throughout bore.

By: Osborne - Monk

BY: OSBORNE

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER:

MODEL: M16A1

NUMBER OF ROUNDS: B.F. 1PC

NUMBER: 9376333 (#3A)

FIRING STATUS (Check One): BEFORE X AFTER

DATE OF GAUGING: 19 MARCH 68

5.56 MM Barrel

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	.0000	-.0001	-.0001	-.0002
19.70	2.00	-1	1	2	2
18.70	3.00	3	3	1	2
17.70	4.00	2	4	2	2
16.70	5.00	3	4	2	3
15.70	6.00	3	4	2	2
14.70	7.00	4	3	3	2
13.70	8.00	4	2	3	4
12.70	9.00	4	4	3	3
11.70	10.00	3	3	2	3
10.70	11.00	2	3	1	2
9.70	12.00	2	3	1	2
8.70	13.00	3	4	1	2
7.70	14.00	1	3	2	2
6.70	15.00	1	1	2	2
5.70	16.00	-1	1	1	2
4.70	17.00	+1	0	1	1
3.70	18.00	0	0	1	1
3.35	18.35	0	-1	1	1
2.85	18.85	0	0	1	1
2.60	19.10	+.0001	.0000	-.0001	-.0001

BORESCOPE REMARKS: Light circumferential tool marks, with light ~~xxxxxxxx~~ deposits extending throughout bore, more pronounced in grooves. Edges of lands lightly chipped in forcing cone area.

BY: OSBORNE

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER:

MODEL: M16A1

NUMBER: 24/2278 (#4A)

FIRING STATUS (Check One): BEFORE ✓ AFTER

NUMBER OF ROUNDS: 3,5[illegible]

DATE OF GAUGING: 19 MARCH 68

5.56 MM Barrel

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0005	+.0001	+.0005	+.0005
19.70	2.00	5	4	6	5
18.70	3.00	3	5	6	6
17.70	4.00	4	5	7	6
16.70	5.00	5	4	7	6
15.70	6.00	3	3	5	5
14.70	7.00	+ 1	4	5	5
13.70	8.00	− 2	3	5	3
12.70	9.00	+ 2	3	5	4
11.70	10.00	2	3	5	5
10.70	11.00	3	4	5	6
9.70	12.00	3	4	6	6
8.70	13.00	2	3	6	5
7.70	14.00	4	4	7	6
6.70	15.00	3	4	4	5
5.70	16.00	5	4	5	6
4.70	17.00	5	6	6	6
3.70	18.00	6	6	6	7
3.35	18.35	6	6	6	7
2.85	18.85	6	6	6	7
2.60	19.10	+.0006	+.0006	+.0007	+.0007

BORESCOPE REMARKS: Light circumferential tool marks, with light deposits extending throughout bore, more pronounced in grooves. Edges of lands lightly chipped in forcing cone area.

34' ASSORTED

DA Form 106 (Part I) 17 JUNE 64 I-25

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER:

MODEL: M16A1

NUMBER OF ROUNDS: 5.E. 1225

NUMBER: 9456623 (EA)

FIRING STATUS (Check One): BEFORE ✓ AFTER

DATE OF GAUGING: 19 NOVEMBER 68

5.56 MM Barrel

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0009	+.0010	+.0011	+.0010
19.70	2.00	10	7	12	12
18.70	3.00	9	7	13	13
17.70	4.00	9	7	12	13
16.70	5.00	8	8	13	12
15.70	6.00	5	6	12	11
14.70	7.00	4	6	11	11
13.70	8.00	5	6	11	11
12.70	9.00	5	6	11	11
11.70	10.00	6	6	11	11
10.70	11.00	6	6	10	11
9.70	12.00	7	6	11	10
8.70	13.00	5	5	10	10
7.70	14.00	6	6	11	10
6.70	15.00	7	8	11	11
5.70	16.00	8	7	11	12
4.70	17.00	8	7	11	12
3.70	18.00	8	7	11	12
3.35	18.35	8	6	11	12
2.85	18.85	8	8	11	11
2.60	19.10	+.0008	+.0008	+.0011	+.0011

BORESCOPE REMARKS: Light circumferential tool marks, with light deposits extending throughout bore, more pronounced in grooves. Edges of lands lightly chipped in forcing cone area.

BY: OSBORNE

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER: F. MILLER

PROOF OFFICER: 324-850-70

MODEL: M16A1

NUMBER OF ROUNDS: 6,000

NUMBER: 8843 23 (2)

FIRING STATUS (Check One): BEFORE ; AFTER X

5.56 MM Barrel

DATE OF GAUGING: 11 April 1968

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0003	+.0003	+0002	+.0002
19.70	2.00	5	4	2	3
18.70	3.00	5	4	4	4
17.70	4.00	5	4	5	5
16.70	5.00	5	5	5	5
15.70	6.00	4	3	4	4
14.70	7.00	3	5	4	4
13.70	8.00	5	4	5	5
12.70	9.00	6	6	7	8
11.70	10.00	7	6	13	14
10.70	11.00	7	9	14	14
9.70	12.00	7	8	13	14
8.70	13.00	9	8	13	13
7.70	14.00	9	8	12	12
6.70	15.00	9	10	11	11
5.70	16.00	11	11	13	13
4.70	17.00	13	14	14	14
3.70	18.00	19	19	12	12
3.35	18.35	21	19	10	10
2.85	18.85	21	21	9	8
2.60	19.10	+.0028	+.0028	+.0008	+.0007

BORESCOPE REMARKS: (Chamber Chrome Plated). Light circumferential gouges on forward edge of chamber slope. Moderate circumferential tool marks encircling the bore. Moderate to light heat checking and erosion encircling the bullet seat and extending into the bore (approx.) 3". Moderate longitudinal stress cracks in grooves in this area. Heavy scoring on driving edges of lands at forcing cone, becoming moderate to light on non-driving edges and center of landsextending to gas port area. Heavy erosion and moderate heat checking on forward edge of gas port. Moderate metal deposits throughout bore.

Gas port covers entire land from driving edge.

By: Schantz

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER: PROOF OFFICER W.O. 3241-960-70 F. MILLER

MODEL: M16A1

NUMBER OF ROUNDS: 6000

NUMBER: 8844 53 (3)

FIRING STATUS (Check One): BEFORE / AFTER ✓

DATE OF GAUGING: 11 April 1968

5.56 MM Barrel

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+0005	+0006	+.0006	+.0005
19.70	2.00	6	6	8	7
18.70	3.00	6	7	9	9
17.70	4.00	6	6	9	10
16.70	5.00	6	6	9	10
15.70	6.00	4	6	10	8
14.70	7.00	3	5	9	8
13.70	8.00	3	6	12	8
12.70	9.00	9	7	15	15
11.70	10.00	10	9	19	19
10.70	11.00	9	10	21	19
9.70	12.00	9	11	21	17
8.70	13.00	11	10	20	19
7.70	14.00	11	11	16	16
6.70	15.00	12	11	15	16
5.70	16.00	14	13	18	19
4.70	17.00	17	17	20	20
3.70	18.00	20	19	17	17
3.35	18.35	22	20	14	14
2.85	18.85	24	21	13	13
2.60	19.10	+.0029	+.0029	+.0013	+.0012

BORESCOPE REMARKS: (Chamber Chrome Plated). Moderate circumferential and diagonal gouges in the main powder chamber. Moderate circumferential tool marks encircling the bore. Moderate to light heat checking and erosion encircling the bullet seat and extending into the bore (approx.) 3". Moderate longitudinal stress cracks in grooves in this area. Heavy scoring on driving edges of lands at forcing cone, becoming moderate to light on non-driving edges and center of lands extending to gas port area. Heavy erosion and moderate heat checking on forward edge of gas port. Moderate metal deposits throughout bore.

Gas port covers 80% of land from non-driving edge.

By: Schantz

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER: F. MILLER W.O. 3241-980-70

PROOF OFFICER: [illegible]

MODEL: M16A1

NUMBER OF ROUNDS: 6,000

NUMBER: 8846607 (4)

FIRING STATUS (Check One): BEFORE ☐ AFTER ☑

DATE OF GAUGING: 11 APRIL 1968

5.56 MM Barrel

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0002	+.0002	+.0004	+.0003
19.70	2.00	2	3	4	5
18.70	3.00	3	2	5	4
17.70	4.00	4	3	5	5
16.70	5.00	4	3	6	7
15.70	6.00	4	3	6	6
14.70	7.00	1	1	6	5
13.70	8.00	2	2	4	6
12.70	9.00	5	6	10	11
11.70	10.00	7	7	17	17
10.70	11.00	7	7	19	18
9.70	12.00	7	7	19	19
8.70	13.00	8	6	16	19
7.70	14.00	7	8	13	16
6.70	15.00	8	8	14	13
5.70	16.00	11	12	19	13
4.70	17.00	17	17	16	18
3.70	18.00	17	18	13	15
3.35	18.35	18	19	13	14
2.85	18.85	22	22	10	10
2.60	19.10	+.0027	+.0027	+.0009	+.0040

BORESCOPE REMARKS: (Chamber Chrome Plated). Moderate circumferential and diagonal gouges in the main powder chamber. Moderate circumferential tool marks encircling the bore. Moderate to light heat checking and erosion encircling the bullet seat and extending into the bore (approx.) 3". Moderate longitudinal stress cracks in grooves in this area. Heavy scoring on driving edges of lands at forcing cone, becoming moderate to light on non-driving edges and center of lands extending to gas port area. Heavy erosion and moderate heat checking on forward edge of gas port. Moderate metal deposits throughout bore.

Gas port covers 80% of land from driving edge.

By: Schantz

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER: F. MILLER

PROOF OFFICER: W.O. 324. 9-70

MODEL: M16A1

NUMBER OF ROUNDS: 6,000

NUMBER: 9368777 2A

FIRING STATUS (Check One): BEFORE ; AFTER X

DATE OF GAUGING: 11 APRIL 1988

5.56 MM Barrel

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0003	+.0003	+.0006	+.0005
19.70	2.00	3	3	7	6
18.70	3.00	3	3	6	7
17.70	4.00	3	3	5	5
16.70	5.00	3	3	4	3
15.70	6.00	3	3	4	4
14.70	7.00	3	2	3	5
13.70	8.00	3	3	5	5
12.70	9.00	+ 2	+ 3	5	4
11.70	10.00	− 2	− 3	3	3
10.70	11.00	− 1	1	4	4
9.70	12.00	+ 2	− 1	4	3
8.70	13.00	2	0	5	4
7.70	14.00	1	+ 1	6	5
6.70	15.00	+ 1	2	6	5
5.70	16.00	0	+ 1	5	5
4.70	17.00	0	0	4	5
3.70	18.00	− 6	− 6	5	7
3.35	18.35	4	5	7	7
2.85	18.85	− 1	− 1	7	6
2.60	19.10	+.0009	+.0010	+.0005	+.0005

BORESCOPE REMARKS: (Chamber Chrome plated). Several small indents in main powder chamber. Heavy to moderate circumferential tool marks encircling bore. Moderate to light heat checking and erosing encircling bullet seat and extending into bore (approx.) 2.5". Light longitudinal stress cracks in this area. Moderate scoring on lands and grooves from forcing cone forward (approx.) 1". Moderate to light pitting on lands and grooves throughout remainder of bore. Moderate metal deposits throughout bore. Forward edge of gas port moderately heat checked and eroded.

Gas port starts at driving edge and covers entire land.

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: [X]

MANUFACTURER: F. Miller

PROOF OFFICER: W.O. 3221-9805-70

MODEL: M16A1

NUMBER OF ROUNDS: 6,000

NUMBER: 937633

FIRING STATUS (Check One): BEFORE [ ] AFTER [✓]

DATE OF GAUGING: 14 APRIL 1968

5.56 MM Barrel

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0001	+.0001	-.0002	-.0002
19.70	2.00	0	1	2	2
18.70	3.00	0	0	2	1
17.70	4.00	0	+1	1	2
16.70	5.00	0	1	1	-2
15.70	6.00	+1	2	2	0
14.70	7.00	+1	1	2	-3
13.70	8.00	-1	1	2	2
12.70	9.00	0	+1	3	2
11.70	10.00	-2	-1	1	1
10.70	11.00	5	3	1	1
9.70	12.00	3	-3	1	1
8.70	13.00	-1	0	1	1
7.70	14.00	0	+1	1	1
6.70	15.00	+1	+1	1	1
5.70	16.00	+1	-1	1	1
4.70	17.00	0	0	1	1
3.70	18.00	-1	-2	1	1
3.35	18.35	-1	-1	1	1
2.85	18.85	0	0	1	1
2.60	19.10	+.0009	+.0010	-.0001	-.0001

BORESCOPE REMARKS: (Chamber Chrome Plated). Moderate circumferential gouges in straight of chamber. Light circumferential tool marks encircling the bore. Moderate to light heat checking and erosion encircling the bullet seat and extending into the bore (approx.) 1.5". Light longitudinal stress cracks in grooves in this area. Heavy to moderate scoring on lands from forcing cone forward (approx.) 1.5". Moderate scoring and pitting in grooves in this area. Heavy metal deposits at base of lands. Moderate metal deposits throughout remainder of bore. Heavy erosion and moderate heat checking on forward edge of gas port.

Gas port covers entire land from driving edge.

By: Schantz

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER: PROOF OFFICER: F. MILLER W.O. 324-960-70

MODEL: M16A1

NUMBER OF ROUNDS: 6,000

NUMBER: 941978 (12)

FIRING STATUS (Check One): BEFORE ; AFTER X

DATE OF GAUGING: 11 APRIL 1968

5.56 MM Barrel

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0005	+.0005	+.0006	+.0005
19.70	2.00	6	7	6	6
18.70	3.00	7	6	7	9
17.70	4.00	8	8	9	9
16.70	5.00	8	7	9	10
15.70	6.00	7	8	9	8
14.70	7.00	7	7	9	9
13.70	8.00	7	6	7	7
12.70	9.00	6	7	7	7
11.70	10.00	6	6	7	7
10.70	11.00	6	7	9	9
9.70	12.00	7	6	9	9
8.70	13.00	6	6	9	9
7.70	14.00	6	7	9	8
6.70	15.00	1	1	7	6
5.70	16.00	5	5	7	6
4.70	17.00	5	4	8	7
3.70	18.00	6	6	10	10
3.35	18.35	5	6	10	10
2.85	18.85	6	6	9	9
2.60	19.10	+.0012	+.0012	+.0008	+.0008

BORESCOPE REMARKS: (Chamber Chrome Plated). Several light indents in main powder chamber. Moderate circumferential tool marks encircling bore. Moderate to light heat checking and erosion encircling bullet seat and extending into bore (approx.) 3". Moderate longitudinal stress cracks in grooves in this area. Heavy scoring on lands at forcing cone. Light pitting with light metal deposits on lands and grooves throughout bore. Heavy erosion and moderate heat checking on forward edge of gas port.

Gas port covers entire land from driving edge.

By: Schantz

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER

MANUFACTURER

PROOF OFFICER - E. MILLER, N.O. 324-300-70

MODEL M16A1

NUMBER OF ROUNDS 10,000

NUMBER 884323 ([redacted]2)

FIRING STATUS (Check One) BEFORE ✓ AFTER

5.56 MM Barrel

DATE OF GAUGING 25 APR

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0005	+.0004	+.0003	+.0001
19.70	2.00	6	5	3	4
18.70	3.00	5	5	5	4
17.70	4.00	6	4	6	6
16.70	5.00	8	7	7	6
15.70	6.00	6	5	5	5
14.70	7.00	5	4	5	4
13.70	8.00	7	3	4	5
12.70	9.00	7	8	8	15
11.70	10.00	13	12	20	[illegible]
10.70	11.00	12	14	23	27
9.70	12.00	13	13	26	28
8.70	13.00	15	15	24	23
7.70	14.00	17	17	23	24
6.70	15.00	21	23	20	21
5.70	16.00	24	26	23	24
4.70	17.00	30	29	28	26
3.70	18.00	31	27	20	26
3.35	18.35	29	28	19	23
2.85	18.85	22	33	15	14
2.60	19.10	+.0037	+.0036	+.0025	+.0015

BORESCOPE REMARKS: (Chamber Chrome Plated). Light circumferential gouges on forward edge of chamber slope. Moderate circumferential tool marks encircling the bore. Heavy to moderate heat checking and erosion encircling the bullet seat and extending into the bore (approx.) 15". Heavy longitudinal stress cracks in grooves in this area. Very heavy to heavy scoring on driving edges of lands at forcing cone, becoming moderate to light on non-driving edges and center of lands extending to gas port area. Heavy erosion and moderate heat checking on forward edge of gas port. Heavy metal deposits throughout bore.

DERKIN
SCHMITZ

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER: PROOF OFFICER - ENGLAND W. O. 324-4460-70

MODEL: M16A1

NUMBER OF ROUNDS: 10,000

NUMBER: 8844453(S/N 3)

FIRING STATUS (Check One): BEFORE ☐ AFTER ☑

5.56 MM Barrel

DATE OF GAUGING: 25 APRIL 1968

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0001	+.0004	+.0002	+.0002
19.70	2.00	3	3	5	4
18.70	3.00	4	4	5	5
17.70	4.00	5	5	6	8
16.70	5.00	6	5	8	8
15.70	6.00	4	3	7	6
14.70	7.00	3	2	6	6
13.70	8.00	3	2	5	5
12.70	9.00	8	8	16	14
11.70	10.00	14	13	25	27
10.70	11.00	14	14	26	30
9.70	12.00	14	15	28	28
8.70	13.00	16	15	24	28
7.70	14.00	18	19	24	28
6.70	15.00	25	26	23	25
5.70	16.00	31	32	15	20
4.70	17.00	35	35	30	30
3.70	18.00	35	36	34	33
3.35	18.35	36	37	28	27
2.85	18.85	37	36	19	18
2.60	19.10	+.0037	+.0039	+.0028	+.0019

BORESCOPE REMARKS: (Chamber Chrome Plated). Moderate circumferential and diagonal gouges in the main powder chamber. Moderate circumferential tool marks encircling the bore. Heavy to moderate heat checking and erosion encircling the bullet seat and extending into the bore (approx.) 15". Heavy longitudinal stress cracks in grooves in this area. Very heavy to heavy to moderate scoring on driving edges of lands at forcing cone, becoming moderate to light on non-driving edges and center of lands extending to gas port area. Heavy erosion and heat checking on forward edge of gas port. Heavy to moderate metal deposits throughout bore.

DEPKIN
SCHANTZ

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER: FN MINIMI

PROOF OFFICER - W. 0,325-960-70

MODEL: M16A1

NUMBER OF ROUNDS: 10,000

NUMBER: 884607 ([redacted])

FIRING STATUS (Check One): BEFORE ___ AFTER X

DATE OF GAUGING: 25 April 1967

5.56 MM Barrel

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0002	+.0001	+.0008	+.0003
19.70	2.00	3	4	5	4
18.70	3.00	3	3	6	6
17.70	4.00	3	4	8	7
16.70	5.00	4	3	7	7
15.70	6.00	4	3	7	5
14.70	7.00	2	3	6	4
13.70	8.00	6	2	6	5
12.70	9.00	5	7	14	12
11.70	10.00	11	14	27	23
10.70	11.00	14	12	29	32
9.70	12.00	14	13	29	31
8.70	13.00	15	15	28	25
7.70	14.00	17	17	27	25
6.70	15.00	23	25	24	23
5.70	16.00	29	29	24	20
4.70	17.00	34	32	30	26
3.70	18.00	33	33	31	26
3.35	18.35	34	34	26	27
2.85	18.85	31	36	18	15
2.60	19.10	+.0036	+.0040	+.0022	+.0018

BORESCOPE REMARKS: (Chamber Chrome Plated). Moderate circumferential and diagonal gouges in the main powder chamber. Moderate circumferential tool marks encircling the bore. Heavy to moderate heat checking and erosion encircling the bullet seat and extending into the bore (approx.) 10.00". Heavy to moderate longitudinal stress cracks in grooves in this area. Heavy scoring on driving edges of lands at forcing cone, becoming moderate to light on non-driving edges and center of lands extending to gas port area. Heavy erosion and heat checking on forward edge of gas port. Moderate metal deposits throughout bore.

DEPKIN
SCHMITZ

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER: PROOF OFFICER - FRAZIER W.O. 324-9760-70

MODEL: M16A1

NUMBER OF ROUNDS: 10,000

NUMBER: 936877 (#2A)

FIRING STATUS (Check One): BEFORE ___ AFTER X

5.56 MM Barrel

DATE OF GAUGING: 25 APRIL 1968

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	.0000	+.0002	+.0005	+.0006
19.70	2.00	+.0004	04	06	06
18.70	3.00	05	03	04	04
17.70	4.00	04	02	04	04
16.70	5.00	03	02	04	03
15.70	6.00	01	03	05	03
14.70	7.00	02	02	03	02
13.70	8.00	02	03	04	04
12.70	9.00	02	00	04	05
11.70	10.00	03	00	03	03
10.70	11.00	01	00	04	04
9.70	12.00	02	+ 02	04	04
8.70	13.00	02	02	04	04
7.70	14.00	03	02	05	05
6.70	15.00	02	01	05	05
5.70	16.00	02	00	03	04
4.70	17.00	*	*	03	03
3.70	18.00	*	*	08	06
3.35	18.35	*	*	08	07
2.85	18.85	*	*	07	07
2.60	19.10	*	*	+.0007	+.0007

*Gage would not enter.

BORESCOPE REMARKS: (Chamber Chrome Plated). Several small indents in main powder chamber. Heavy to moderate circumferential tool marks encircling bore. Moderate to light heat checking and erosion encircling bullet seat and extending throughout bore. Moderate longitudinal stress cracks in this area. Moderate scoring on lands and grooves from forcing cone forward (approx.) 5.00". Lands flattened from forcing cone area to (approx.) 2" forward. Heavy to moderate pitting on lands and grooves throughout remainder of bore. Moderate metal deposits throughout bore, becoming heavy in last 8" of muzzle end. Forward edge of gas port heavily heat checked and eroded.

DEPKIN
SCHMNTZ

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER	X
MANUFACTURER	PROOF OFFICER - F. MILLER W. O. 334-9-70-70
MODEL	M16A1
NUMBER OF ROUNDS	10,000
NUMBER	937633 (#3A)
FIRING STATUS (Check One)	BEFORE / AFTER X
5.56 MM Barrel	DATE OF GAUGING 25 APRIL 1968

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0001	+.0001	-.0002	-.0001
19.70	2.00	00	01	02	01
18.70	3.00	00	00	01	01
17.70	4.00	+ 01	00	00	01
16.70	5.00	01	+ 01	- 01	00
15.70	6.00	01	01	02	00
14.70	7.00	00	00	02	00
13.70	8.00	+ 01	00	02	- 01
12.70	9.00	- 02	- 01	02	02
11.70	10.00	03	04	01	02
10.70	11.00	03	04	02	01
9.70	12.00	01	02	01	01
8.70	13.00	00	02	01	01
7.70	14.00	00	01	01	01
6.70	15.00	- 01	00	01	01
5.70	16.00	01	- 01	01	01
4.70	17.00	00	01	01	01
3.70	18.00	- 02	01	00	01
3.35	18.35	03	01	00	01
2.85	18.85	07	+.0001	00	02
2.60	19.10	+.0008	+.0014	.0000	- 01

BORESCOPE REMARKS: (Chamber Chrome Plated). Moderate circumferential gouges in straight of chamber. Light circumferential tool marks encircling the bore. Heavy to moderate heat checking and erosion encircling the bullet seat and extending into the bore (approx.) 5". Moderate longitudinal stress cracks in grooves in this area. Heavy to moderate scoring on lands from forcing cone forward (approx.) 5". Moderate scoring and pitting in grooves in this area. Heavy metal deposits at base of lands. Moderate metal deposits throughout remainder of bore. Heavy erosion and moderate heat checking on forward edge of gas port.

DEPKIN
SCHMITZ

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

5.56 MM Barrel

CASTING NUMBER: X

MANUFACTURER: PROOF OFFICER - F. MILLER W.O. 324-960-70

MODEL: M16A1

NUMBER OF ROUNDS: 10,000

NUMBER: 941928 (#4A)

FIRING STATUS (Check One): BEFORE ; AFTER X

5.56 MM Barrel

DATE OF GAUGING: 25 [illegible] 1968

Dist. (inches) From Rear Face of Barrel	Dist. (inches) From Face of Flash Suppressor	Meas. indicated in .0001 of an inch. LANDS .2190" Vert.	LANDS .2190" Hor.	Grooves .2235" Vert.	Grooves .2235" Hor.
20.	1.35	+.0006	+.0004	+.0005	+.0005
19.70	2.00	6	6	6	5
18.70	3.00	5	6	6	6
17.70	4.00	6	6	5	6
16.70	5.00	7	6	6	7
15.70	6.00	5	8	5	6
14.70	7.00	6	7	4	4
13.70	8.00	5	7	5	6
12.70	9.00	4	7	6	5
11.70	10.00	3	2	6	5
10.70	11.00	4	4	7	6
9.70	12.00	5	5	7	6
8.70	13.00	5	3	6	6
7.70	14.00	4	5	9	5
6.70	15.00	2	3	5	5
5.70	16.00	3	4	7	5
4.70	17.00	3	4	7	7
3.70	18.00	3	6	9	9
3.35	18.35	3	3	10	9
2.85	18.85	6	7	9	9
2.60	19.10	+.0014	+.0017	+.0009	+.0007

BORESCOPE REMARKS: (Chamber Chrome Plated.). Several light indents in main powder chamber. Moderate circumferential tool marks encircling bore. Heavy to moderate heat checking and erosion encircling bullet seat and extending into bore (approx.) 16". Heavy to moderate longitudinal stress cracks in grooves in this area. Heavy scoring on lands at forcing cone. Moderate to light pitting with moderate to light metal deposits on lands and grooves throughout bore. Heavy erosion and moderate heat checking on forward edge of gas port.

DEPKIN
SCHANTZ

APPENDIX II - DEFICIENCIES AND SHORTCOMINGS

1. Deficiencies

None.

2. Shortcomings

Shortcoming	Suggested Corrective Action	Remarks
1. Loose bolt carrier key. Improper staking of screws.	Use locking type screws or increase amount of metal displaced during staking operation.	Observed during 6000-round maintenance period.
2. Detent, take-down pin (FSN 1005-992-6654) reverse assembled. Part does not lock pin in assembled position.	Change part design from single- to double-ended configuration so that reverse assembly is not possible.	Observed after firing 400 rounds.

DEPARTMENT OF THE ARMY
ROCK ISLAND ARSENAL
ROCK ISLAND, ILLINOIS 61201

IN REPLY REFER TO:
SWERI- QAT

2 April 1968

SUBJECT: Targeting and Accuracy Data, M16 Rifle

Commanding Officer
Aberdeen Proving Ground
ATTN: STEAP-DS-TI, Bldg 350,
Mr F. H. Miller
Aberdeen Proving Ground, Maryland 21005

1. Reference fonecon between Mr Miller and Mr Beckmann, 14 Mar 68, requesting subject data.

2. Following is data received via Hartford, DCAS, from Colt's Inc:

Rifle	Target Spread		When Shipped
884147	4.8"	100 yds	20 Nov 67
884323	4.0"	100 yds	20 Nov 67
884453	1.9"	100 yds	20 Nov 67
884607	2.4"	50 yds	20 Nov 67
885154	4.8"	100 yds	20 Nov 67
935114	2.0"	50 yds	31 Jan 68
936877	4.0"	100 yds	31 Jan 68
937933	2.0"	50 yds	17 Jan 68
941978	1.8"	50 yds	31 Jan 68
945623	2.0"	50 yds	31 Jan 68
946123	3.0"	100 yds	31 Jan 68
947177	1.6"	50 yds	31 Jan 68
947105	2.4"	50 yds	31 Jan 68

FOR THE COMMANDER:

E. M. Beckmann

E. M. BECKMANN
Chief, QA Test & Reliability Branch
Quality Assurance Division

TECOM OUTGOING MESSAGE

RESERVED FOR COMMUNICATION CENTER

DATE: 28 FEB 68
ACTION: COMPT
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INFO: TECH SUPPORT
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XO

68 FEB 27 21 31

DTG

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UNCLASSIFIED			
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PRECEDENCE			
ACTION	ROUTINE		
INFO	"		

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Dave

DISTRIBUTION – TECOM

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MBT-70	

FROM: CG USATECOM APG MD

TO: CG USA MATERIEL COMMAND PROJECT MANAGER
ROCK ISLAND ILLINOIS

CG USA WEAPONS COMMAND ROCK ISLAND ILLINOIS

INFO CO APG APG MD (MAIL)

CO FRANKFORD ARSENAL PHILADELPHIA PA

UNCLAS TEC 1277 FROM AMSTE-BC FOR AMCPM-RS;
AMSWE-QA INFO FOR STEAP-CO-P; STEAP-DS-TI; SMUFA-B2000

SUBJECT: QUALITY ASSURANCE TESTS OF M16A1 RIFLE

1. REFERENCES:

A. QUALITY ASSURANCE TEST OF M16A1 RIFLES, DATED 17 APRIL 1967, USATECOM PROJECT NO 8-7-0230-03.

B. MSG, APG 2104, DATED 17 FEB 67, SUBJECT AS ABOVE.

C. MSG, RI 33975, DATED 14 DEC 67, SUBJECT AS ABOVE.

D. LETTER, AMCPM-RS, DATED 6 FEB 68, SUBJECT: M16 RIFLE AND AMMUNITION TESTING.

2. THIS COMMAND DESIRES TO EXPAND THE RELIABILITY PHASE OF REFERENCED TEST FROM 6000 ROUNDS TO 10000 ROUNDS FOR EACH OF THREE WEAPONS. THE EXPANSION IS REQUIRED TO PROVIDE A BASIS TO COMPARE

DATE	TIME
27	2130Z
MONTH	YEAR
FEB	68
PAGE NO. 1	NO. OF PAGES 2

DRAFTER: TYPED OR PRINTED NAME AND TITLE — 3608
Charles L Crider
CHARLES L. CRIDER
Proj Officer
Inf Mat Test Dir

RELEASER: SIGNATURE
TYPED OR PRINTED NAME AND TITLE
COL GS
Dir, Inf Mat Test Dir

SECURITY CLASSIFICATION
UNCLASSIFIED

REGRADING INSTRUCTIONS

WEAPON PERFORMANCE WITH THE INITIAL PRODUCT TEST OF CHROME PLATED CHAMBERS. ADDITIONAL SUPPORT REQUIREMENTS ARE 12,000 ROUNDS OF LOT LOADED BALL CARTRIDGES AND $5,000. IT IS DESIRED THAT THE ADDITIONAL AMMUNITION BE PROVIDED FROM THE SAME LOT (TW 18149) AS THE ORIGINAL SHIPMENT OF 49,200 ROUNDS. IF NOT AVAILABLE, A COMPARABLE LOT IS ACCEPTABLE.

3. IT WAS AGREED DURING A MEETING AT THIS COMMAND ON 14, 15 FEB WITH PROJECT MANAGER, RIFLES, TO CONDUCT A QUALITY ASSURANCE TEST USING BALL PROPELLANT. SUPPORT REQUIREMENTS ARE 60,000 ROUNDS OF BALL PROPELLANT BALL CARTRIDGES AND $34,500. USATECOM PROJECT NO. 8-8-0230-06 IS APPLICABLE.

4. REQUEST THIS COMMAND BE ADVISED OF THE ANTICIPATED DATE OF RECEIPT OF THE REQUIREMENTS FOR THE ABOVE TESTS.

MFR: The requirements for these tests were verbally coordinated with DPS, APG and relayed verbally to AMCPM-RS on 27 Feb 68.

APPENDIX IV - REFERENCES

1. Springfield Armory Purchase Description, SAPD-253B, Acceptance Testing Specification for Rifles, 5.56-MM, M16 and XM16E1, 29 April 1966 with Amendment 1, 24 October 1966.

2. Keele, Eric J., Final Report of Comparison Test of Rifle, 5.56-MM, XM16E1. USATECOM Project No. 8-4-0230-02-F. Aberdeen Proving Ground. Report No. DPS-1541, January 1965.

3. Hendricks, George E., Final Report of Comparison Test of Rifle, 5.56-MM, M16. USATECOM Project No. 8-4-0230-01-F. Aberdeen Proving Ground. Report No. DPS-1471, October 1964.

4. TECP 700-700, Interim Pamphlet 20-20.

5. TM 9-1005-249-14 for Rifle, 5.56-MM, M16; Rifle, 5.56-MM, XM16E1; and Launcher, Grenade, 40-MM, XM148, 1 August 1966.

6. Military Specification MIL-P-14232B(Ord), 28 Mary 1962. Parts, Equipment, and Tools for Ordnance Materiel, Packaging of.

7. Military Specification MIL-E-5272C(ASG), 13 April 1959, Environmental Testing, Aeronautical and Associated Equipment, General Specification For.

8. Wilson, Allan J., Final Report on Engineering Test of Small Arms Weapons System (SAWS) (U). USATECOM Project No. 8-5-0450-03, Aberdeen Proving Ground. Report No. DPS-1970, Volume 2 (Confidential Report).

9. Comparison Test Plan, Rifle, 5.56-MM, XM16E1, 24 January 1967, Headquarters, US Army Weapons Command.

APPENDIX V - DISTRIBUTION LIST

USATECOM Project No. 8-7-0230-03

Addressee	Final Report
Commanding General US Army Test and Evaluation Command Aberdeen Proving Ground Aberdeen Proving Ground, Maryland 21005	
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Unclassified
Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)*

Materiel Test Directorate
Aberdeen Proving Ground, Maryland 21005

2a. REPORT SECURITY CLASSIFICATION

Unclassified

2b GROUP

3. REPORT TITLE

COMPARISON TESTS OF M16A1 RIFLES

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Final Report February through 29 November 1968

5. AUTHOR(S) *(Last name, first name, initial)*

Miller, Franklin H.

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
February 1969	143	9

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
Not applicable b. PROJECT NO. c. USATECOM Project Nos. 8-7-0230-03 and 8-8-0230-06 d.	DPS-3030
	9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)*

10. AVAILABILITY/LIMITATION NOTICES

This document may be further distributed by any holder only with specific prior approval of Commanding General, US Army Weapons Command, ATTN: AMSWE-QA.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
None	USAWECOM

13. ABSTRACT

Two comparison tests of production M16A1 rifles were conducted concurrently at Aberdeen Proving Ground, Maryland. One test was fired with M193 cartridges loaded with IMR 8208M propellant, the other with M193 cartridges loaded with WC846 (ball) propellant. Testing was initiated in February 1968 and completed 29 November 1968. The evaluation consisted of the following test phases: inspection, extreme temperatures (-65°F and +155°F), adverse conditions (unlubricated, dust, mud, water spray, and humidity), and 10,000-round reliability. Test results show that weapons firing ammunition loaded with WC846 propellant performed satisfactorily in all test conditions except at -65°F; weapons tested with IMR 8208M propellant-loaded ammunition exhibited poor performance in the unlubricated, water-spray, -65°F, and attitudes phase of the 10,000-round reliability subtests. It was concluded that the use of cartridges loaded with IMR 8208M propellant adversely affected weapon performance, and that carbon fouling associated with relatively long cleaning intervals contributed to poor weapon performance at low temperature. Excluding these factors, the weapons tested were concluded to be of normal quality and performance.

DD FORM 1 JAN 64 1473

Unclassified
Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Rifle, caliber 5.56-mm, M16A1 Quality Assurance Comparison Test Reliability under ideal and (simulated adverse environmental conditions						

INSTRUCTIONS

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13. ABSTRACT: Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.

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