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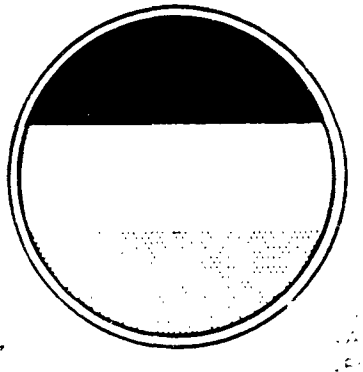
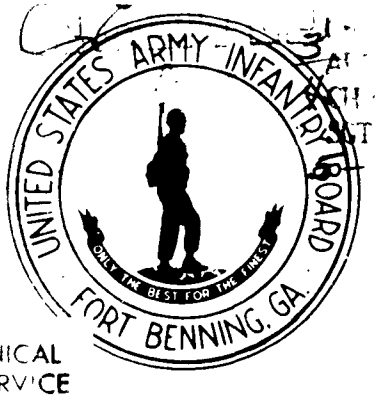
UNITED STATES ARMY INFANTRY BOARD

FORT BENNING, GEORGIA

REPORT OF PROJECT





Group 4

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eport of Project Nr 2787 - Armalite (AR-15)

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UNITED STATES ARMY INFANTRY BOARD
Fort Benning, Georgia

UNCLASSIFIED

27 May 1958

REPORT OF PROJECT NR 2787
EVALUATION OF SMALL CALIBER HIGH VELOCITY RIFLES - ARMALITE (AR-15)
(DA PROJECT 502-08-006) (U)

1. AUTHORITY.

a. Directive.--Ltr, ATDEV-3 474/4 (24 Feb 58), USCONARC, 24 Feb 58, subject: "Evaluation of Small Caliber High Velocity Rifles."

b. Purpose.--To determine the potential of the Armalite (AR-15) Small Caliber High Velocity Rifle to replace the M-14 and M-15 rifles.

c. Scope.--The temperate phase tests of this project were conducted by the United States Army Infantry Board. The United States Army Arctic Test Board will conduct arctic phase tests. Separate reports of project will be submitted to United States Continental Army Command by each test agency.

2. REFERENCES.

a. Report of Project Nr 2709, Board Nr 3, CONARC, 28 Nov 55, Evaluation of M2 Carbine Modified to Fire High Velocity Caliber .22 Cartridge (C).

b. Report of Project Nr 2726, Board Nr 3, CONARC, 29 May 56, Evaluation of Light Weight Rifles.

c. Report of Project Nr 2743, US Army Inf Bd, 26 Jul 57 (subject classified SECRET).

d. Paragraph 237a(1), Combat Development Objective Guide, USCONARC, 1957.

3. DESCRIPTION OF MATERIEL.

a. Control Rifle.--M-14 rifles, hereinafter referred to as the control rifle, or M-14, are production model weapons of United States fabrication. They are new weapons and essentially the same as reported on in ref 2b.

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b. Test Rifle.

(1) AR-15 rifles, hereinafter referred to as the test rifle, or AR-15, are prototype rifles developed by the Armalite Division of Fairchild Engine and Airplane Corporation, Los Angeles, California. They fire, selectively semiautomatic-automatic, a caliber .224 lead cored round developed by Winchester-Western Division of Olin Mathieson Chemical Corporation or a caliber .222 lead cored round built to Armalite specifications by Remington Arms Corporation.

(2) The test rifle has a unique gas system. The gas to cycle the parts is transferred from the gas port, located under the front sight, to the receiver through a tube. (For further details on operation, see Test Nr 1, app I.) (Photographs are attached as app III.)

c. Control Ammunition.--Cartridge, Ball, 7.62mm, M59, Lot Nr LC 12011, hereinafter referred to as the control round or M59, is a standard item currently issued for use with United States standard 7.62mm weapons.

d. Test Ammunition.

(1) Cartridge, Ball, Cal .224, Winchester, E2, hereinafter referred to as the test ammunition or the Winchester Cal .224, is a lead cored round developed by Winchester-Western Division of Olin Mathieson Chemical Corporation. This cartridge fires a 53 grain projectile at a muzzle velocity of 3300 ft/sec.

(2) Cartridge, Ball, Cal .222 Remington, hereinafter referred to as the Remington, Caliber .222, is a lead cored round developed by Remington Arms Corporation to specifications of Armalite. This cartridge fires a 55 grain projectile at a muzzle velocity of 3275 ft/sec.

4. BACKGROUND.

a. In 1952, Ordnance began investigating High Velocity Small Caliber Cartridges for use in rifles and carbines. In 1955 this Board conducted an evaluation of a M-2 carbine modified to fire a High Velocity, Caliber .22 Cartridge (ref 2a). The resulting report of project recommended that investigation of the high velocity, small caliber principle be given a high priority and that a lightweight rifle utilizing the high velocity small caliber principle be developed. On 26 July 1957, this Board forwarded to USCONARC draft military characteristics for rifles utilizing the high velocity small caliber principle.

b. The test rifle is not proposed for Tripartite Standardization.

5. SUMMARY OF TESTS.--The AR-15 rifle was tested to determine its characteristics and compare them with those of the standard M-14 rifle.

[redacted]

a. The test and control rifles are comparable in these respects:

(1) Organizational Maintenance.

(2) Accuracy - Semiautomatic Fire.

(3) Accuracy - Automatic Fire.

(4) Accuracy - Transition Firing.

(5) Performance under Adverse Conditions.

b. The test rifle is superior to the control rifle in these respects:

(1) Lightness of weight.

(2) Ease of assembly and disassembly.

(3) Reliability under simulated combat conditions.

(4) Ease of handling.

c. The test rifle-ammunition combination is inferior to the control rifle-ammunition combination in these respects:

(1) Penetration.

(2) Flash suppression.

6. DISCUSSION.

a. The Winchester Caliber .224 round was fired from the Armalite (AR-15) rifle throughout the test program. Test Nr 9, Penetration, was repeated using Remington Cal .222 ammunition to compare its performance with that of the Winchester ammunition.

b. The test rounds meet the penetration requirements stated in the United States Army Infantry Board's Draft Military Characteristics for a Rifle of High Velocity and Small Caliber (ref 2c).

c. An analysis of Test Nr 9 (app I) shows:

(1) A significant reduction in the capability of either test round to penetrate various mediums, as compared to the control round.

(2) That the projectiles of the test rounds are considerably deflected when fired through brush. However, this is considered a minor deficiency.

(3) That the projectiles of the test rounds have a tendency to break up or disintegrate when fired into brush, sand, etc.

[redacted]

d. It is the opinion of this Board that the penetration capability of either test round would be greatly enhanced if steel cores are substituted for the currently used lead cores or if the bullet jackets are increased in thickness.

e. Firing conducted in addition to that reported in Appendix I indicates that the test rifle, using ammunition of improved penetration capability and equipped with an optical sight, would fill sniper requirements.

f. Equipping the test rifle with an integral flash suppressor should result in reduction of muzzle flash comparable to that obtained with the control rifle with its integral flash suppressor.

g. The results of Test Nr 6, Transition Firing, indicate that a marked increase in the number of hits per unit of time is possible with the test rifle.

7. CONCLUSIONS.

a. The Armalite (AR-15) Rifle is a potential replacement for the M-14 rifle.

b. The Armalite (AR-15)rifle equipped with a bipod and hinged butt plate should provide a potential replacement for the M-15 rifle.

c. The penetration capability of either test round is significantly less than that of the control round and should be improved.

8. RECOMMENDATIONS.--The United States Army Infantry Board recommends that:

a. The Armalite (AR-15) rifle be considered a potential replacement for the M-14 and M-15 rifles.

b. Development be expedited to provide a round for the Armalite (AR-15) rifle that has greater resistance to bullet disintegration and better penetration characteristics.

c. The following items be furnished for service test:

(1) Eight Armalite (AR-15) rifles modified to correct the deficiencies reported in Appendix II (three rifles to be equipped with hinged butt plate and bipod).

(2) Sufficient quantities of improved ammunition for use with the Armalite (AR-15) rifles.

Henry B. Kunzig

HENRY B. KUNZIG
Colonel, Infantry
President

Appendixes:
I Details of Test
II Deficiencies and Suggested Modifications
III Photographs

[redacted]

APPEN[redacted]

Report of Project Nr 2787 - Armalite (AR-15)

Test Nr 1, PHYSICAL CHARACTERISTICS.

1. PURPOSE.--To determine and compare the physical characteristics and the operation of the test and control rifles.

2. METHOD.

a. Test and control rifles were weighed and measured, and the resulting data was recorded. Photographs are attached as Appendix III.

b. Operation for the control rifle was determined by analysis of descriptive material furnished by the Chief of Ordnance. Operation for the test rifle was determined by physical inspection and explanation and demonstration conducted by a representative of the developer.

3. RESULTS.

a. Weights (lb):

	M-14	AR-15
Rifles (less sling, magazine and accessories)	8.34	5.32
Magazine (empty)	(0.54)	(0.19)
Magazine (loaded - 20 rds)	1.61	0.68
Magazine (loaded - 25 rds)		(0.80)
Sling (M-1)	0.31	None furnished
Accessories	None	None
Totals: w/20 rd mag	10.26	6.00
w/25 rd mag		6.12

RELATIVE BATTLE LOAD (LBS)

	M-14	AR-15
Rifle w/100 rds in five 20 rd magazines plus 120 rounds (Total - 220 rds)	22.39	
Rifle w/125 rds in five 25 rd magazines plus 95 rds (Total-220 rds)		12.20
Rifle w/125 rds in five 25 rd magazines plus 524 rounds (Total - 649 rds)		22.39

Note: Weight of bandoleers, clips, etc, are not included in the above comparison.

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CARTRIDGE:

	M-59	Winchester Cal .224	Remington Cal .222
Case	184 gr	94 gr	95.9 gr
Propellant	45 gr	25 gr	24.3 gr
Projectile	147 gr	53 gr	55.3 gr

b. Dimensions (Inches):

	M-14	AR-15
Overall length	44.19	37.50
Barrel length	22.00	20.00
Overall height	7.63	8.75
Sight radius	26.75	18.25

c. Operation.

(1) Control Rifle.--Functioning and operation of the control rifle was determined to be the same as similar rifles previously tested and reported by this Board (ref 2b).

(2) Test Rifle.

(a) The test rifle is gas operated. When the rifle is fired and the bullet passes beyond the gas port located under the front sight, gases are directed to the rear through a gas tube into a chamber formed by the bolt carrier and bolt.

(b) When the high pressure gases enter the chamber formed by the bolt carrier and bolt, the bolt is locked forward and acts as a stationary piston. The entering gases create pressure on the bolt carrier. Expansion of these gases provides the energy necessary to cause the bolt carrier to move to the rear. The cycle is then completed as in conventional rifles.

4. SPECIAL OBSERVATIONS RELATING TO THE TEST WEAPON.--Trigger pull is excessive (9 3/4 pounds, compared to 5 4/5 pounds for the M-14 rifle).

[redacted]

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Test Nr 2, EASE OF DISASSEMBLY AND ASSEMBLY.

1. PURPOSE.--To determine and compare the ease of disassembly and assembly, and difficulties of training therein for test and control rifles.

2. METHOD.

a. Using appropriate Ordnance publications and advice furnished by the developer as guides, test personnel were instructed in the proper procedures to be followed in disassembling and assembling the test and control weapons*.

b. Twelve test personnel were given four hours of preliminary training and familiarization with each type rifle. After familiarization, each individual performed three field stripping and assembly operations with each type rifle. Each operation was timed and average times computed.

c. Test and control rifles were thoroughly cleaned and properly lubricated prior to conducting time trials in this test.

d. Throughout all test firing, difficulties encountered in disassembly and assembly of test weapons were recorded.

3. RESULTS.

a. Number of parts handled by the soldier in field stripping:

M-14 - 11

AR-15 - 8

b. Time required (seconds):

	M-14	AR-15
(1) Disassembly	35.4	14.9
(2) Assembly	92.7	32.4

c. Special observations relating to the test weapon:

(1) The bolt retaining pin is difficult to grasp and remove. Enlargement of the head of the retaining pin and deeper beveling of the retaining pin seat would enable the soldier to remove the pin with less difficulty

*NOTE: No combination tool was furnished for either type weapon. A wrench is required to disassemble and assemble the control rifle. (Loosen or tighten the gas plug.) A cartridge (dummy or live) is the only aid required for disassembling or assembing the test rifle.

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(2) The outer ring of the buffer contains slots which catch on the buffer retaining spring detent (the receiver will not close).

(3) Reversibility of parts:

(a) The bolt group can be assembled with the firing pin improperly seated (weapon will not fire).

(b) The following parts are subject to reverse assembly which will cause the weapon to function improperly.

1. Semiautomatic sear.

2. Automatic sear spring.

3. Hammer.

Test Nr 3, ORGANIZATIONAL MAINTENANCE.

1. PURPOSE.--To determine whether organizational maintenance of the test rifle can be readily accomplished to review the maintenance package, to accumulate parts usage data, and to compare the data with that of the control rifle.

2. METHOD.--Throughout all tests, data was recorded which pertained to the ease of care, cleaning, and maintenance of the test and control rifles.

3. RESULTS.

a. No cleaning or maintenance package (cleaning rods, chamber cleaning tools, combination tools, etc) was received for the test or control rifles. Necessary spare parts accompanied each shipment.

b. A combination tool, chamber brush, and cleaning rod will be required for proper maintenance of the test and control rifles. No special tools are required for organizational maintenance.

c. Time required to clean the test and control rifle using improvised maintenance equipment was comparable.

d. Parts Breakage:

(1) M-14 - None.

(2) AR-15 - 2 extractor springs.

e. Special observations pertaing to the test rifle:

(1) Dirt, mud, etc, accumulating under the front hand guard cannot be completely removed (hand guard is of one piece and is not removable by soldier).

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(2) Bolt locking lugs and recesses are difficult to clean. (Provision of a satisfactory chamber cleaning tool should eliminate this problem area.)

4. ANALYSIS.--Organizational maintenance can be readily accomplished for the test and control rifles.

Test Nr 4, ACCURACY - SEMIAUTOMATIC.

1. PURPOSE.--To determine and compare the accuracy of the test and control rifles in semiautomatic fire.

2. METHOD.

a. Using a bench rest, each of four experienced riflemen fired the following with two of each type rifles.

(1) After zeroing, three 10-round groups at 300 yards ("A" target).

(2) After zeroing, three 10-round groups at 500 yards ("B" target.

b. Center of impact, maximum spread, and mean radius were computed and recorded for each shot group. The average of these measurements for each type rifle was determined.

3. RESULTS.--Average mean radius and maximum spread (inches):

	300 Yds		500 Yds	
	MR	MS	MR	MS
M-14	5.53	17.64	10.44	33.48
AR-15	6.00	18.48	9.12	27.60

4. ANALYSIS.--The test and control rifles are comparable in semiautomatic fire.

Test Nr 5, ACCURACY - AUTOMATIC FIRE.

1. PURPOSE.--To determine and compare the accuracy of the test and control rifles in automatic fire.

2. METHOD.

a. After zeroing, four experienced riflemen each fired one 100 round group (two to three round bursts) with each type rifle from a standing position at an "A" target at a range of 50 yards.

b. After zeroing, four experienced riflemen each fired one 100 round group (two to three round bursts) with each type rifle from a prone position at an "A" target at a range of 100 yards.

c. The number of hits falling within a 12 inch circle, 24 inch circle, and 36 inch circle were recorded.

d. After zeroing, four experienced riflemen each fired three 100 round groups (two to three round bursts) with each type rifle at three "E" type silhouette targets, placed side by side, at a range of 300 yards. The number of hits striking the silhouette targets were recorded. (The above exercise was conducted from a prone position with and without sandbag rest.)

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3. **RESULTS**.--The number of hits falling within a 12 inch circle, 24 inch circle, and 36 inch circle, or on other type targets, are shown below:

a. Standing (50 yards):

	DIAMETER OF CIRCLE (INCHES)			
Weapon	12	24	36	TOTAL
M-14	25	21	5	(51)
AR-15	13	24	16	(53)

b. Prone (100 yards):

	DIAMETER OF CIRCLE (INCHES)			
Weapon	12	24	36	TOTAL
M-14	17	21	10	(48)
AR-15	13	25	12	(50)

c. Prone without sandbag (300 yards):

Weapon	Nr of Hits on Three "E" Type Silhouettes
M-14	32
AR-15	28

d. Prone with sandbag (300 yards):

Weapon	Nr of Hits on Three "E" Type Silhouettes
M-14	46
AR-15	62

4. **ANALYSIS**.--The test and control rifles are comparable in automatic fire accuracy.

Test Nr 6, TRANSITION FIRING.

1. **PURPOSE**.--To determine and compare the performance of the test and control rifles under transition range firing conditions.

2. **METHOD**.

a. **Semiautomatic**.--After zeroing their rifles at a range of 300 yards, twelve average riflemen each fired one practice and three record runs of a modified transition course with each type rifle.

b. **Automatic**.--After zeroing their rifles at a range of 300 yards, twelve average riflemen each fired one practice and one record run of a modified transition course with each type rifle.

c. The modified transition range consisted of 10 targets located at ranges of 50 to 350 yards within a 25° to 40° fan. Each rifleman was allotted 1 round per target for semiautomatic fire and two rounds per target for automatic fire. All targets were exposed when the order was given to commence firing. Unhit targets were lowered 40 seconds after firing commenced.

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d. The percentage of target hits in relation to number of rounds fired by each type weapon was recorded.

3. RESULTS.

Percentage of target hits in relation to rounds fired:

Rifle	Semiautomatic	Automatic
M-14	62%	30%
AR-15	61%	31%

NOTE: In nearly all instances, the riflemen required the full 40 seconds to engage the ten targets with the M-14 rifle. Approximately 20-25 seconds were required to engage the ten targets with the AR-15.

4. ANALYSIS.--The test and control rifles are comparable in unknown distance (transition) accuracy. The AR-15 rifle, due to its lighter weight and shorter length, is easier to point and aline on subsequent targets.

Test Nr 7, SIMULATED COMBAT CONDITIONS.

1. PURPOSE.--To determine and compare the performance of the test and control rifles under simulated combat conditions.

2. METHOD.

a. A course consisting of six lanes was constructed. Obstacles of various types (barbed wire fences, ditches, shell holes, etc) were constructed in each lane so that the lanes became progressively more difficult, lane 1 being the least difficult and lane 6 being the most difficult. No minimum acceptability criterion was established since the purpose of the course was to establish relative performance and not absolute performance. Each weapon entered the course at lane 1 and proceeded through the firing points (five firing points in each lane) until 8 out of 10 rounds resulted in malfunctions (four malfunctions of 5 rounds fired at each of two successive firing points). The weapon was then removed from the course, field stripped and cleaned. In the event of breakage or stoppages that could not be corrected by the soldier negotiating the course, the weapon was removed from the course, cause of breakage or stoppage determined, and the weapon disassembled and cleaned prior to restarting in lane 1. Each weapon entered the course at lane 1 four times (three semiautomatic fire runs and one automatic fire run).

b. Malfunctions by type and number of firing points completed were determined and recorded for each type rifle.

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3. RESULTS.

a. Semiautomatic Fire.

Rifle Nr	Rds Fired	*MALFUNCTIONS EJ	X	F	NFH	SR	CE	LS	RO	% Malfunctions Per 100 Rounds Fired	Avg Nr Firing Points Completed
AR-15 0012	767	1	2	15	3	0	4	0	2	3.8	44
0013	1287	0	11	41	0	0	4	0	7	4.9	72
0016	630	0	6	54	2	0	10	0	2	11.7	36
0017	232	6	2	2	1	0	2	0	0	5.6	13
TOTAL		7	21	112	6	0	20	0	11		

Total Malfunctions: 179 (includes two instances of the hammer following the bolt home, not included above - Rifle Nr 0017)

Average Malfunctions/100 rds fired: 6.5

Average firing points completed per start: 41

Rifle Nr	Rds Fired	*MALFUNCTIONS EJ	X	F	NFH	SR	CE	LS	RO	% Malfunctions Per 100 Rounds Fired	Avg Nr Firing Points Completed
M-14 1006	148	0	2	2	8	0	0	0	0	8.1	9
1041	492	0	18	11	27	2	13	0	3	16.9	28
1147	408	9	12	1	46	0	0	0	0	17.2	23
1150	538	3	19	14	42	0	1	0	3	16.4	31
TOTAL		12	51	28	123	2	14	0	6		

Total Malfunctions: 253 (includes 17 instances of the hammer following the bolt home, not included above - Rifle Nr 1041-9; Nr 1147-2; Nr 1150-6)

Average Malfunctions/100 rds fired: 14.6

Average Nr firing points completed per start: 23

b. Automatic Fire.

Rifle Nr	Rds Fired	*MALFUNCTIONS EJ	X	F	NFH	SR	CE	LS	RO	% Malfunctions Per 100 Rounds Fired	Avg Nr Firing Points Completed
AR-15 0012	225	0	0	17	0	0	0	0	1	8.0	38
0013	136	0	0	3	0	0	0	0	1	2.9	22
0016	120	0	0	9	0	0	5	0	3	14.2	21
0017	181	0	1	18	6	0	3	0	11	21.5	31
TOTAL		0	1	47	6	0	8	0	16		

*NOTE: See Annex A to App I for definition of malfunction abbreviations.

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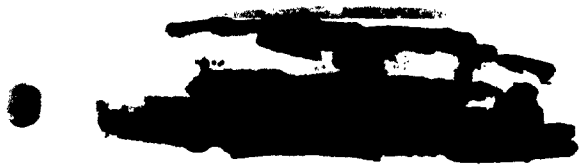

Total Malfunctions: 81 (includes three instances of the hammer following the bolt home, not included above - Rifle Nr 0017)

Average Malfunctions/100 rds fired: 12.2

Average firing points completed per start: 28

Rifle Nr	Rds Fired	*MALFUNCTIONS								% Malfunctions Per 100 Rds Fired	Avg Nr Firing Points Completed
		EJ	X	F	NFH	SR	CE	LS	RO		
M-14 1006	147	0	2	0	11	0	1	0	0	9.5	25
1041	288	0	3	1	15	0	1	0	0	6.9	49
1147	116	0	2	1	28	0	2	0	1	29.3	20
1150	200	1	3	11	6	0	1	0	1	11.5	34
TOTAL		0	10	13	60	0	5	0	2		

Total Malfunctions: 101 (includes 10 instances of the hammer following the bolt home, not included above - Rifle Nr 1041-2; Nr 1147-2; Nr 1150-6)

Average Malfunctions/100 rds fired: 13.4

Average firing points completed per start: 32

c. Specific observations pertaining to the test weapon:

(1) The safety is not positive (does not remain in the safe position when the soldier crawls under wire or over obstacles).

(2) The dust cover opens when the soldier hits the ground, breaking his fall with the butt of the rifle.

(3) The charging handle becomes very difficult to operate after the rifle has been exposed to mud or dust.

(4) The trigger sticks to the rear when particles of dirt, dust, etc, get into the trigger mechanism.

(5) The gas power was inadequate to properly cycle the operating parts after the chamber became dirty and scoured by sand and grit. (This condition ceased to exist after the gas port was opened an additional .005 inch.)

*NOTE: See Annex A to App I for definition of malfunction abbreviations.

[redacted]

(6) Dirt, mud, etc, accumulating under the front hand guard cannot be completely removed (hand guard is of one piece and is not removable by soldier).

(7) The buffer hangs to the rear of the buffer housing assembly when dirt, sand, etc, accumulates between the buffer and the buffer housing wall (insufficient clearance).

(8) The feed ramp in the receiver appears to be too steep to allow easy feeding of the rounds from the magazine (bolt partially overrides round).

4. ANALYSIS.--The test rifle is significantly more reliable under simulated combat conditions than the control rifle. The test rifle experienced an excessive number of failures to feed due primarily to the slope of the feed ramp and the binding of the buffer. The control rifle experienced an excessive number of bolts failing to go home which may be attributable to insufficient gas (gas ports measured .076 inches).

Test Nr 8, ADVERSE CONDITIONS.

1. PURPOSE.--To determine and compare the performance of the test and control weapons under adverse conditions.

2. METHOD.

a. Clean and properly lubricated test and control rifles (two of each type) were fired, at the rate indicated below for 5 days without further care and cleaning.

1st day - 40 rd per min for 5 minutes.
2d day - 15 rd per min for 30 minutes.
3-5th day - 8 rd per min for 15 minutes.

b. Prior to each exposure to the conditions discussed below, the test and control rifles (two of each type) were thoroughly cleaned, properly lubricated and fully loaded, including one round in the chamber. Spare magazines (loaded) in ammunition pouches were exposed to the same adverse conditions.

(1) The rifles were submerged in muddy water for 5 minutes then drained and fired. The rifles were then cleaned and again submerged in muddy water for 5 minutes, drained, left to dry for 24 hours and fired. (Muddy water approximated that found in shell holes, etc, on the battlefield.)

(2) The rifles were fired while exposed to an artifically generated 25-mph wind laden with dust and sand. This exercise was repeated to allow rotation of weapons and change in wind direction (left-right sides).

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(3) The rifles were fired in a light downpour of artificial rain (100 rounds).

c. Clean and properly lubricated test and control rifles (two of each type) were stored, with loaded magazines and a round in the chamber; in a cold room at -25 F for 72 hours, then transported in insulated containers to the testing range and fired (100 rounds).

d. Clean and properly lubricated test and control rifles (two of each type) were stored with loaded magazines and a round in the chamber, in a hot room at 125 F for 72 hours, then transported in insulated containers to the testing range and fired (100 rounds).

e. Clean and properly lubricated rifles (two of each type) were fired (100 rounds), stored with loaded magazine and a round in the chamber, in a cold room at -25 F for 24 hours, then transported in insulated containers to the testing range and fired (50 rounds).

3. RESULTS.

a. After 5 days without care and cleaning:

		*MALFUNCTIONS								Total Malfunctions	Total Rds Fired
Weapon		EJ	X	F	MFH	SR	CE	LS	RO		
M-14	1006									0	1010
	1041									0	1010
AR-15	0016									0	1010
	0012	2		4				1	3	10	1010

Breakages: M-14 - None.
AR-15 - 1 Extractor Spring (Rifle Nr 0012 after 3381 rds).

Per Cent Malfunctions/100 rds Fired: M-14 - 0
AR-15 - .5

b. After submersion in muddy water:

		MALFUNCTIONS								Total Malfunctions	Total Rds Fired
Weapon		EJ	X	F	MFH	SR	CE	LS	RO		
M-14	1147			6	10					16	16
	1150		1	8	5		6			20	25
AR-15	0012	5	8	3						16	17
			6	7			5			18	23

Breakages: M-14 - None
AR-15 - None

Per Cent Malfunctions/100 rds Fired: M-14 - 88.
AR-15 - 85.

*NOTE: See Annex A to Appendix I for definition of malfunction abbreviations.

[redacted]

[redacted]

c. While being exposed to artificially generated sand and dust:

Weapon		*MALFUNCTIONS EJ	X	F	NFH	SR	CE	LS	RO	Total Malfunctions	Total Rds Fired
M-14	1147		4	7	1		4			16	16
	1006	2	10	2	1		1			16	17
AR-15	0012	1	7				1			9	31
	0016		9				1			10	50

Breakages: M14 - None.
AR15 - None.
Percent Malfunctions/100 rds Fired: M14 - 97
AR15 - 23

d. Fired while being exposed to artificial rain:

Weapons		*MALFUNCTIONS EJ	X	F	NFH	SR	CE	LS	RO	Total Malfunctions	Total Rds Fired
M14	1147		2	0	1					3	100
	1150									0	100
AR15	0013									0	100
	0017									0	100

Breakages: M14 - None.
AR15 - None.
Percent Malfunctions/100 rds Fired: M14 - 1.5
AR15 - 0

e. After exposure to -25°F for 72 hours.

Weapons		*MALFUNCTIONS EJ	X	F	NFH	SR	CE	LS	RO	Total Malfunctions	Total Rds Fired
M14	1006									0	100
	1147									0	100
AR15	0012			2						2	100
	0016									0	100

Breakages: M14 - None.
AR15 - None.
Percent Malfunctions/100 rds Fired: M14 - 0
AR15 - 1

*NOTE: See Annex A to Appendix I for definition of malfunction abbreviations.

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f. After exposure to 125°F for 72 hours:

Weapon		*MALFUNCTIONS								Total Malfunctions	Total Rds Fired
		EJ	X	F	NFH	SR	CE	LS	RO		
M-14	1041									0	100
	1150		10	12	25				1	48	100
AR-15	0013			1						1	100
	0017									0	100

Breakages: M-14 - None.
AR-15 - None.

Per Cent Malfunctions/100 rds Fired: M-14 - 24.5
AR-15 - 0.5

g. Fired 100 rounds, exposed to -25°F for 24 hours, then fired:

Weapon		Malfunctions	Total Rds Fired	Breakages
M-14	1006	0	50	0
	1147	0	50	0
AR-15	0012	0	50	0
	0016	0	50	0

h. Special observations relating to the test weapon:

(1) The charging handle becomes difficult to operate after the rifle has been exposed to muddy water, sand, and dust.

(2) The trigger sticks to the rear when particles of dirt, dust, etc, gets into the trigger mechanism.

(3) The buffer hangs to the rear of the buffer housing assembly when dirt, dust, etc, accumulates between the buffer and the buffer housing wall.

*NOTE: See Annex A to Appendix I for definition of malfunction abbreviations.

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(4) Carbon builds up in the gas chamber to the rear of the bolt after firing for an extended period without care or cleaning.

4. ANALYSIS.

a. The test and control rifles are comparable in performance when:

(1) Fired for five days without care or cleaning.

(2) Exposed to rain.

(3) Exposed to temperatures of -25°F.

(4) Exposed to temperatures of 125°F. (The performance of Control Rifle Nr 1150 is not considered representative. This rifle was completely dry when removed from the hot chamber indicating improper lubrication prior to this test.)

b. The test and control rifles did not function satisfactorily when exposed to muddy water or sand and dust. (The dust cover of the test weapon aids in preventing sand, dust, etc, from entering the receiver. However, when the magazine is removed for reloading, the weapon becomes as sensitive to dust as the control weapon.)

Test Nr 9, PENETRATION.

1. PURPOSE.--To determine and compare the relative penetration effects of the ammunition used with test and control rifles.

2. METHOD.--(During the conduct of this test both Winchester Caliber .224 and Remington Caliber .222 Ammunition were fired to obtain comparative penetration characteristics of the two rounds.)

a. Five rounds of each type ammunition were fired into 10 gauge mild steel plate (SAE 1020, Rockwell hardness C-14) at ranges of 25, 100, 300, and 500 yards. Layers of 1 inch commercially dressed pine boards (actual measurement 3/4 inch), spaced at 1 inch intervals, were placed behind the steel plate. Ranges at which the steel plate and pine board were perforated were determined and recorded.

b. Ten rounds of each type ammunition were fired into layers of 1 inch commercially dressed pine boards (actual measurement 3/4 inch) spaced at 1 inch intervals, at ranges of 300, 500, 600, 700 and 800 yards. The number of boards perforated by each type ammunition at each range was recorded.

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c. Each type ammunition was fired against standard US steel helmets (with liners) at ranges of 500, 600 and 700 yards and against body armor at 500 yards. Firing was conducted until 10 fair hits (strikes more than 1 inch from the periphery of the profile of the helmet) were obtained with each type ammunition. Number of hits and perforations obtained with each type ammunition were recorded.

d. Ten rounds of each type ammunition were fired into a box constructed of 3/8 inch plywood, containing 6 inches of sand, at ranges of 20, 40, 100, and 300 yards. A witness plate, constructed of 1 inch commercially dressed pine boards, was placed 1 foot in rear of the target. Penetration effects were recorded for each range. Performance characteristics of the test and control ammunition projectiles, such as tumbling, yawing, etc, as evidenced from the witness plate, were recorded.

e. One hundred rounds of each type ammunition were fired, in ten round groups, into a fixture containing approximately 12 inches of green, freshly cut, lightly packed, brush (limbs varied from very small to approximately 3/4 inch) at ranges of 100, 300, and 500 yards. Mean radius was determined for each 10-round shot group before the projectile entered the brush. The change in mean radius and the performance characteristics of the projectiles, such as tumbling, yawing, etc, as evidenced from a witness plate placed 10 feet in rear of the brush, were recorded.

3. RESULTS.

a. Ranges at which each type ammunition perforated steel plate and pine boards are shown below:

Range (Yards)	Type Ammunition	Steel Plate Perforated	Average Nr of Pine Boards Perforated
25	M-59	Yes	8.8
	Winchester Cal .224	Yes	4.0
	Remington Cal .222	Yes	3.8
100	M-59	Yes	9.2
	Winchester Cal .224	Yes	4.0
	Remington Cal .222	Yes	3.2
300	M-59	Yes	9.8
	Winchester Cal .224	Yes	2.0
	Remington Cal .222	Yes	2.2
*450	Winchester, Cal .224	Yes	1.0
*475	Winchester Cal .224	No	0
	Remington Cal .222	Yes	2.1

*NOTE: Firing was conducted at 450 and 475 yards after it was determined that the test ammunition would not perforate the steel plate at 500 yards. The projectiles of the test ammunition were deformed and, in some instances, partially broken up after perforating the steel plate.

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Range (Yards)	Type Ammunition	Steel Plate Perforated	Average Nr of Pine Boards Perforated
500	M-59	Yes	8.6
	Winchester Cal .224	No	0
	Remington Cal .222	No	0

b. Number of pine boards perforated by each type ammunition is shown below:

Range (Yards)	Type Ammunition	Average Nr of Pine Boards Perforated
300	M-59	15.9 (+)
	Winchester Cal .224	13.4
	Remington Cal .222	8.3
500	M-59	13.2 (+)
	Winchester Cal .224	8.0
	Remington Cal .222	6.7
700	M-59	10.8
	Winchester Cal .224	3.4
	Remington Cal .222	2.4
800	M-59	11.7
	Winchester Cal .224	2.8
	Remington Cal .222	3.5

c. Ranges at which each type ammunition perforated body armor and steel helmets are shown below:

Range (Yards)	Type Ammunition	Perforation of Body Armor	Perforation of Steel Helmets w/Liner*
400	M-59	Yes	Both sides
	Winchester Cal .224	Yes	Both sides
	Remington Cal .222	Yes	Both sides
500	M-59	Yes	Both sides
	Winchester Cal .224	Yes	One side
	Remington Cal .222	Yes	One side
600	M-59	Not tested	Both sides
	Winchester Cal .224	Not tested	None
	Remington Cal .222	Not tested	One side
700	M-59	Not tested	Both sides
	Winchester Cal .224	Not tested	None
	Remington Cal .222	Not tested	None

*NOTE: The projectiles of the test ammunition were deformed after perforation of the steel helmets.

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d. Number of rounds of each type ammunition that perforated 6 inches of sand within a box constructed of 3/8 inch plywood.*

Range (Yards)	Type Ammunition	Number of Perforations
20	M-59	10
	Winchester Cal .224	0
	Remington Cal .222	0
40	M-59	10
	Winchester Cal .224	0
	Remington Cal .222	0
100	M-59	7
	Winchester Cal .224	0
	Remington Cal .222	0
300	M-59	10
	Winchester Cal .224	4
	Remington Cal .222	1

*Note: The projectiles of the test ammunition disintegrated in the sand.

e. Comparison of mean radius prior to and after projectiles passed through brush.

Range (Yards)	Type Ammunition	MEAN RADIUS (INCHES) Prior to Entering Brush	After Passing Through Brush*	(Inches)	% Change
100	M-59	1.4	4.6	+3.2	+218
	Winchester Cal .224	1.8	7.3	+5.5	+307
	Remington Cal .222	2.3	13.9	+11.6	+511
300	M-59	4.8	7.8	+3.0	+63
	Winchester Cal .224	4.7	10.7	+6.0	+128
	Remington Cal .222	10.3	17.9	+7.6	+73
500	M-59	7.8	15.1	+7.3	+94
	Winchester Cal .224	8.3	26.4	+18.1	+218
	Remington Cal .222	11.5	25.2	+13.7	+119

*Note: The projectiles of the test ammunition tumbled more than the projectiles of the control ammunition after passing through brush.

The projectiles of the test ammunition showed evidence of breaking up when deflected by heavy brush at 100 yards.

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4. ANALYSIS.

a. There is a significant reduction in the capability of either test round to penetrate various mediums, as compared to the control round.

b. The projectiles of the test rounds are excessively deflected when fired through brush.

c. The penetration characteristics of the test rounds are comparable.

d. The projectiles of the test rounds have a tendency to break up or disintegrate.

Test Nr 10, SIGHTS.

1. PURPOSE.--To determine and compare the suitability of the sight systems and the related performance of the test and control rifles.

2. METHOD.--In all tests, incidents reflecting upon the suitability of the sights were recorded as they occurred.

3. RESULTS.

a. The AR-15 rifle is equipped with "L" type sight that is adjustable - 1 click = 1 minute of angle - for deflection. The short side of the "L" is used when targets are at 300 yards or less. The long side of the "L" is used when targets are over 300 yards from the firer. The front sight is adjustable - 1 click = 1 minute of angle - for elevation. No special tool is required to adjust either sight. The sights are retained at the desired setting by a spring detent which can be depressed using the nose of a cartridge.

b. The M-14 rifle is equipped with sights similar to those found on the M-1 rifle.

c. No difficulty was experienced in adjustment or retention of either sight system. However, with the test weapon, the soldier is uncertain of his correct windage or elevation adjustment. (The front sight does not have a range index. The rear sight does not have a deflection index.)

d. Specific Observations Pertaining to the Test Weapon.--The radius of the circular mask surrounding the rear sight aperture is not sufficiently large to prevent the rear sight from fading or disappearing as the soldier focuses on the target.

4. ANALYSIS.--The test and control sight systems are comparable in performance.

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Test Nr 11, POSITION DISCLOSING EFFECTS.

1. PURPOSE.--To determine and compare for test and control rifles the visibility of muzzle flash during darkness and of the smoke during daylight.

2. METHOD.

a. Test and control rifles were fired from unconcealed non-tactical positions. Firing was conducted during daylight and repeated during darkness. Flash hiders are integral parts on the control rifles. The test rifles were not equipped with a flash hider.

b. Observers approached the weapons positions from the front at an angle of 45°. Ranges at which the smoke and flash could be detected and the weapons position identified with the unaided eye and with 6 X 30 binoculars were recorded.

3. RESULTS.--Ranges at which the smoke and flash could be detected are shown below (four rounds were fired semiautomatically and three 4-5 round burst were fired automatically at each range).

a. Daylight.--Smoke could be observed at ranges of 400 yards from the control rifle position and at 300 yards from the test rifle position with both the unaided eye and 6 X 30 binoculars

b. Darkness.

(1) Control Rifle.

(a) Semiautomatic Fire.--The control rifle could not be detected with the unaided eye when the observer was at a range of 50 yards or with 6 X 30 binoculars when the observer was at a range of 150 yards.

(b) Automatic Fire (Three 4-5 Round Bursts).--The control rifle could not be detected with the unaided eye when the observer was at a range of 100 yards, or with 6 X 30 binoculars when the observer was at a range of 200 yards.

(2) Test Rifle.--When firing, semiautomatic and automatic flash could be observed at range of 400 yards with the unaided eye (400 yards was the maximum distance from the firing position that observers could be stationed due to terrain limitations of facilities available to this Board).

4. ANALYSIS.--The control rifle firing the M-59 ammunition produces more smoke than the test rifle firing the Winchester ammunition. The test rifle produces excessive flash (see photographs attached as app III).

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Test Nr 12, COMPARISON WITH MILITARY CHARACTERISTICS.

1. PURPOSE.—To determine to what extent the test items meet current draft military characteristics.

2. METHOD.—Upon completion of testing, test data was analyzed and compared with draft military characteristics contained in Project 2743 (ref 2c).

3. RESULTS AND ANALYSIS.

* * * EXTRACT * * *

MC Requirement	Characteristics of Test Weapon
* * * * * * * * *	
a. Configuration.—The weapon shall:	
(1) Be of a size and shape usable by all personnel meeting physical requirements of the Department of the Army with the capability of being fired from the right or left shoulder in all normal firing positions.	Meets this requirement.
(2) Be capable of accepting a carrying sling in a conventional manner.	Meets this requirement.
(3) Be equipped with an easily identifiable, conveniently located, positive safety. It is desirable that the operation of the safety be inaudible.	Meets this requirement except that the safety is not positive (does not remain in the safe position when the soldier crawls under wire or over obstacles). (See Test Nr 7, app I)
(4) Have operating controls easily located and identified by touch and capable of being operated by the firer under extremes of weather.	Meets this requirement.
(5) Be relatively comfortable to carry and fire and have no projections which can readily entangle in brush, grass, or battlefield obstacles.	Meets this requirement.
(6) Be incapable of reversed assembly to the detriment of its functioning.	Does not meet this requirement. (See Test Nr 2, app I.)

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(7) Be of the minimum weight commensurate with performance requirements. It is desirable that the weapon weigh not more than 6 pounds complete w/sling and loaded with 20 rounds of ammunition. This characteristic, however, should not limit ammunition capacity to 20 rounds.	Meets this requirement to an acceptable degree. Weapon and ammunition weigh 6 pounds (sling not furnished) (see Test Nr 1, app I).
(8) Be of minimum length commensurate with performance requirements. It is desirable that the weapon be no longer than the current standard carbine (35.5 inches).	Meets this requirement to an acceptable degree. Weapon is 37.5 inches long. However, it will require a flash suppressor which will add to its length (see Test Nr 11, app I).
(9) Have simple and durable integral sights. After zeroing, it is desirable that the sight shall not require more than two range settings or indexes for firing from 0 to 500 yards with maximum mismatch not to exceed 4 inches in each range span. Fixed focus, nonadjustable optical sights should be considered.	Meets this requirement except for mismatch which was not determined. Optical sights were not furnished (see Test Nr 10, app I).
(10) Have an ammunition capacity of not less than 20 rounds.	Meets this requirement.
(11) Be capable of being readily loaded to maximum capacity in one operation and of being recharged to maximum capacity with one or more rounds from a multi-round charging device.	Meets this requirement in part Weapon design does not permit it to be recharged from a multi-round charging device.
b. Performance.	
(1) The weapon shall:	
(a) Be provided with such integral safeties as are necessary to prevent accidental firing.	Meets this requirement.
(b) Be capable of selective semiautomatic-automatic fire by an easily accessible, positive manually controlled change lever. The automatic fire feature should be capable of being rendered inoperative to the firer without impairing the semiautomatic functioning of the weapon.	Meets this requirement in part. The automatic fire feature can not be rendered inoperative.

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(c) Fire from a closed bolt. Bolt shall remain open after the last round is fired. No preliminary action, other than release of the safety and single pull of the trigger, shall be necessary to put the weapon in action when fully loaded bolt closed.	Meets this requirement.
(2) The weapon and ammunition combination shall:	
(a) Have adequate stopping and wounding power to a range of 500 yards without bullet disintegration or undue deflection by light objects, such as grass, twigs, or brush.	Stopping and wounding power appears adequate based on results of penetration tests. Projectiles disintegrate when fired into sand and deflect when fired into brush (see Test Nr 9, app I).
(b) Be capable of inflicting a fatal wound at ranges up to 500 yards on personnel protected by standard body armor and standard helmets.	Meets this requirement (see Test Nr 9, app I).
(c) When fired semiautomatically from a bench rest have horizontal and vertical errors of not more than ½ mil at all ranges up to 500 yards. (At 300 yards 90 per cent of rounds should strike within an area 15.6" x 15.6".)	Meets this requirement to an acceptable degree. Horizontal error at 300 yards is .29 mil and vertical error is .33 mil.
(d) When fired automatically in 2 to 3 round bursts from the prone position insure a hit probability of 80 per cent distributed on three "E" type silhouette targets placed side by side at a range of 300 yards.	Does not meet this requirement (see Test Nr 5, app I).
(e) Be capable of firing at a steady rate of 15 rounds a minute for an indefinite period and 40 rounds a minute for 5 minutes without danger to weapon or firer. These rates apply to both semiautomatic and automatic fire.	Meets this requirement.

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(f) Have the minimum of recoil and blast. It is desirable that the effects of recoil and blast be reduced by at least 25 per cent as compared to the M-1 and/or M-14 rifle and its ammunition.	Not fully tested (observations indicate a reduction in recoil and blast).
(g) Not produce smoke or flash discernible beyond 50 yards. A flash suppressor, if necessary, is acceptable.	Does not meet this requirement. Smoke can be seen with the naked eye at 300 yards and flash can be seen at 400 yards (test weapon not equipped with flash suppressor) (see Test Nr 11, app I).
(3) The ammunition shall be of the smallest caliber, lowest velocity, and minimum cartridge weight to achieve required hit probability and casualty producing effects to a range of 500 yards.	Meets this requirement to an acceptable degree.
c. Durability and Reliability.— The weapon shall:	
(1) Have a minimum barrel life of 5000 rounds.	Not fully tested.
(2) Have a bore and working parts which are resistant to wear, rust, and corrosion to the maximum practicable extent.	Meets this requirement to an acceptable degree. (Weapon is equipped with an all steel barrel.)
(3) Function more satisfactorily than the current standard rifle under all adverse conditions to include rain, snow, dust, mud, after submersion, and at temperature extremes from -40°F to +125°F.	Meets this requirement to an acceptable degree (see Test Nr 8, app I).
(4) Be sufficiently rugged to withstand normal usage encountered in training and combat.	Meets this requirement.
(5) Be easy to maintain under combat conditions. It is desirable that no tools be necessary for maintenance, disassembly, or assembly.	Meets this requirement.

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d. Transportability.--The weapon shall be capable of being jumped on a parachutist without disassembly or special container.	Not tested.
e. Associated Equipment.--The weapon shall have:	
(1) A light sling for carrying which is adjustable and detachable.	No sling was furnished, however, weapon is equipped with sling swivels.
(2) A cleaning, maintenance and spare parts kit.	Not tested; equipment not furnished.
(3) A small simple multiround loading and recharging device.	Does not meet this requirement. Weapon cannot be recharged except with a new magazine.
(4) A blank firing attachment or special cartridge which will provide the weapon with a blank firing capability at its semiautomatic and automatic rates of fire. (However, the fulfillment of the requirement for this item should not impede the development of the rifle itself.)	Not tested; attachments not furnished.
f. Environmental and Terrain Requirements.--The weapon shall be so designed that all operations necessary to firing may be performed by an individual wearing standard arctic handwear. In order to meet this requirement, a special kit is acceptable.	Not tested.
g. CBR and Atomic Requirements.--Not applicable.	
h. Kit Requirement.--See paragraphs e and f.	
i. Maintenance and Interchangeability Requirement.--The weapon shall:	
(1) Require a minimum of maintenance and shall be capable of firing for long periods without cleaning or lubrication.	Meets this requirement (see Test Nr 8, app I).

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(2) Be capable of being readily modified as follows to provide a suitable replacement for the current standard small arms:	
(a) To replace the submachine gun, substitute a stock group which is capable of folding or sliding forward to minimize length. Provide a compensator, if necessary.	Does not meet this requirement. Buffer and return spring are located in the stock of the test rifle.
(b) To replace the BAR and M-15 rifle, substitute a hinged butt plate. Provide a bipod and compensator, if necessary.	Not tested (hinged butt plate or bipod not furnished).

Annex A - Definition of Abbreviations

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ANNEX A TO APPENDIX I - DEFINITION OF ABBREVIATIONS

Report of Project Nr 2787 - Armalite AR-15

Listed below are definitions of abbreviations used in Appendix I to designated malfunctions:

EJ - Failure to eject — case still in receiver but not in chamber.

X - Failure to extract — case still in or partly in chamber.

F - Failure to feed but not CE, NFH, or SR.

NFH - Bolt not fully home. Round has started in chamber.

SR - Stubbed round. No part of round has entered chamber but round has started forward. May be stubbed in magazine.

CE - Chamber empty, bolt closed, round in magazine.

LS - Light strike on primer cap. Hammer down — primer cap shows firing pin dent but round did not fire.

RO - Bolt fails to remain open after last round in magazine is fired.

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APPENDIX II - DEFICIENCIES AND SUGGESTED MODIFICATIONS

Report of Project Nr 2787 - Armalite AR-15

The deficiencies listed herein are those that remain uncorrected at the completion of this project. They are listed in two categories: major deficiencies and minor deficiencies. The former are those deficiencies which must be corrected to make the item suitable for Army use. The latter are those, the correction or elimination of which will increase the efficiency or desirability of the item, but need not be corrected to make the item suitable for Army use.

	Major Deficiencies	Results	Suggested Modifications
1.	Safety is not positive (Test Nr 7, app I).	Safety may not remain in the safe position when the soldier crawls under wire or over obstacles.	Correct. (Modified model of AR-15 incorporates repositioned safety.)
2.	Rifle-ammunition combination produces flash (Test Nr 11, app I).	Reveals position of firer in combat.	Provide integral flash suppressor.
3.	Projectiles disintegrate when fired into sand (Test Nr 9, app I).	Reduced penetration.	Correct. (Thicken projectile jacket or provide steel cored projectile.)

	Minor Deficiencies	Remarks	Suggested Modifications
1.	Trigger pull is excessive (Test Nr 1, app I).	Trigger is difficult to manipulate.	Correct.
2.	Bolt retaining pin is difficult to remove during disassembly (Test Nr 2, app I).	Handwear must be removed to disassemble the bolt group. Possibility of losing part.	Enlarge head of retaining pin. Provide deeper beveling of retaining pin seat.
3.	The outer ring of the buffer contains slots which catch on the buffer retaining spring detent (Test Nr 2, app I).	Retaining spring detent must be depressed with sharp pointed tool before buffer can be properly positioned.	Remove slots.
4.	Bolt group can be assembled with firing pin improperly seated (Test Nr 2, app I).	Weapon will not fire.	Correct.

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	Minor Deficiencies	Remarks	Suggested Modification
5.	The following parts are subject to reverse assembly: a. Semiautomatic sear. b. Automatic sear spring. c. Hammer (Test Nr 2, app I)	Weapon will not function properly.	Correct.
6.	Radius of the circular mask surrounding the rear sight aperture is not sufficiently large (Test Nr 4, app I).	Rear sight tends to fade or disappear as soldier focuses on target (results in improper sight picture).	Add more mask.
7.	Projectiles deflect considerably when fired through brush (Test Nr 9, app I).	Reduces hit probability.	None.
8.	Dust cover opens when the soldier hits the ground, breaking his fall with the butt of the rifle (Test Nr 7, app I).	Dirt, dust, etc, enter mechanism.	Correct.
9.	Charging handle is difficult to operate after the rifle has been exposed to mud or dust (Test Nr 7 & 8, app I).	Difficult to recharge or reduce malfunctions.	Correct.
10.	Trigger sticks to rear when particles of dirt, dust, etc, get into trigger mechanism (Tests Nr 7 & 8, app I).	Soldier must return trigger manually prior to firing next round.	Correct.
11.	Dirt, mud, etc, accumulating under the front hand guard cannot be completely removed (Test Nr 7, app I).	Rifle cannot be properly cleaned. (Hand guard is of one piece and is not removable by soldier.)	Provide removable two piece hand guard.

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	Minor Deficiencies	Remarks	Suggested Modifications
12.	Buffer hangs to rear of the buffer housing assembly when dirt, sand, etc, accumulates between the buffer and the buffer housing wall (Tests Nr 7 & 8, app I).	Insufficient power to return bolt to battery.	Correct - provide more clearance to allow particles to move past the buffer into noncritical areas.
13.	Feed ramp in the receiver is too steep to allow easy feeding of the rounds from the magazine (Test Nr 7, app I).	Bolt partially overrides round.	Correct.
14.	Undue sensitivity to muddy water, sand, and dust (Test Nr 8, app I).	Weapon fails to function properly.	Correct.
15.	Windage or elevation index is not provided.	Soldier is uncertain of correct windage and elevation adjustments.	Provide elevation index on front sight and deflection index on rear sight.
16.	Rifle-ammunition combination produces smoke.	Reveals position of firer in combat.	Correct.
17.	Automatic fire feature is not capable of being rendered inoperative (Test Nr 12, app I).	Fails to meet requirement imposed by military characteristics.	Correct.
18.	Magazine cannot be recharged, from a multiround charging device, when affixed to rifle (Test Nr 12, app I).	Fails to meet requirement imposed by military characteristics.	None.
19.	Rifle is not capable of being readily modified to reduce length (substitution of a stock group which is capable of folding or sliding forward to minimize length) (Test Nr 12, app I).	Fails to meet requirement imposed by military characteristics.	None.

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	Minor Deficiencies	Remarks	Suggested Modifications
20.	Rifles not sufficiently accurate in automatic fire role when fired from the prone position (Test Nr 12, app I).	Fails to meet requirement imposed by military Characteristics.	Correct.

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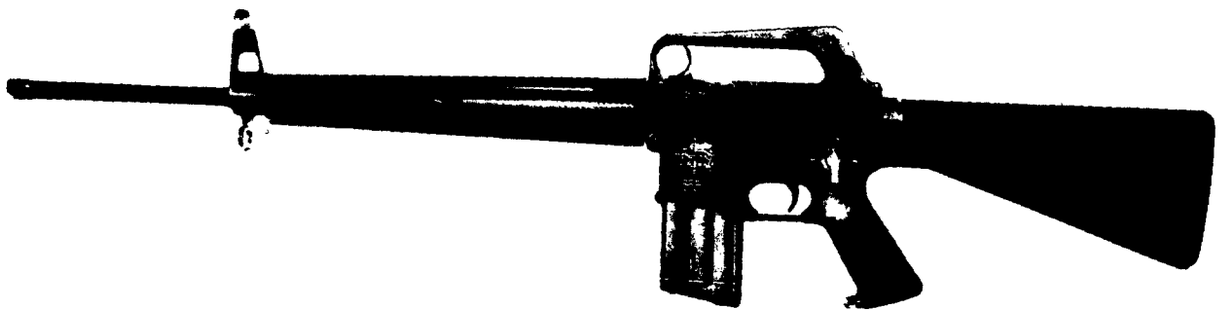
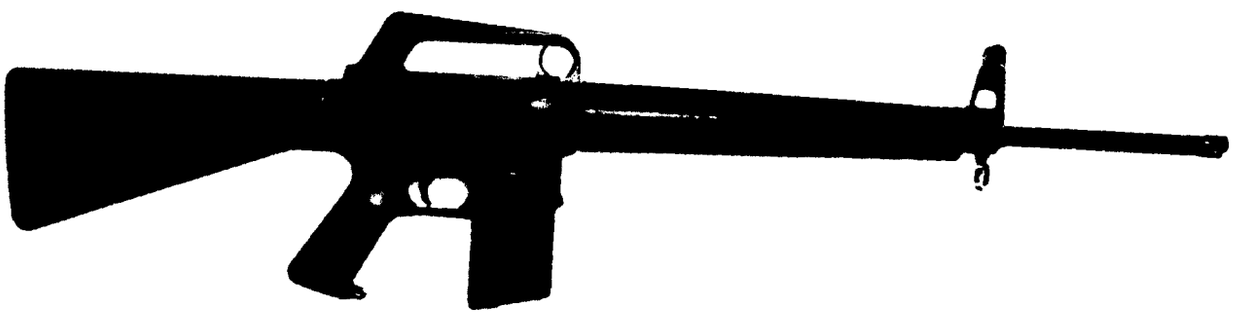




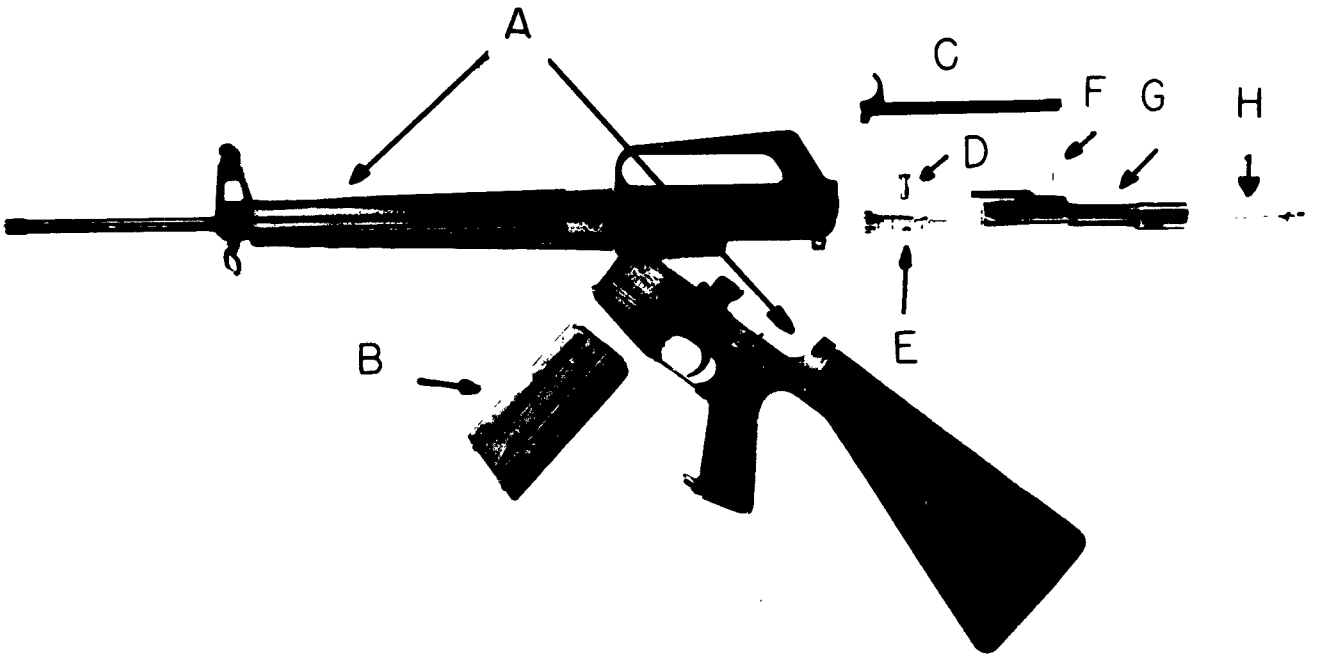
UNITED STATES ARMY INFANTRY BOARD
FORT BENNING, GEORGIA

PROJECT NR	DATE	NEGATIVE NR
2787	8 May 1958	09-166-475/AJ-58

Evaluation of High Velocity Small Caliber Rifles - Armalite (AR-15)

Top: Armalite (AR-15), Left Side View.
Bottom: Armalite (AR-15), Right Side View.

Arm III-1



UNITED STATES ARMY INFANTRY BOARD

FORT BENNING, GEORGIA

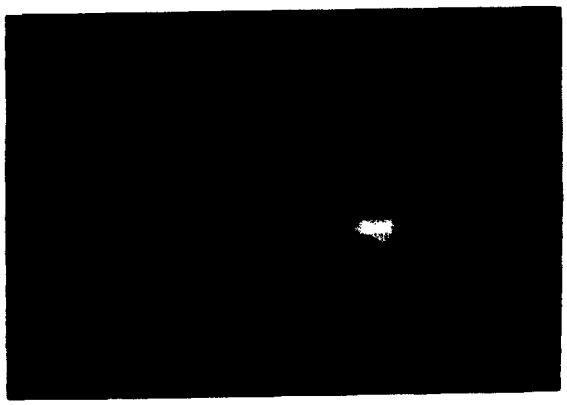
PROJECT NR	DATE	NEGATIVE NR
2787	8 May 1958	09-166-479/AJ-58

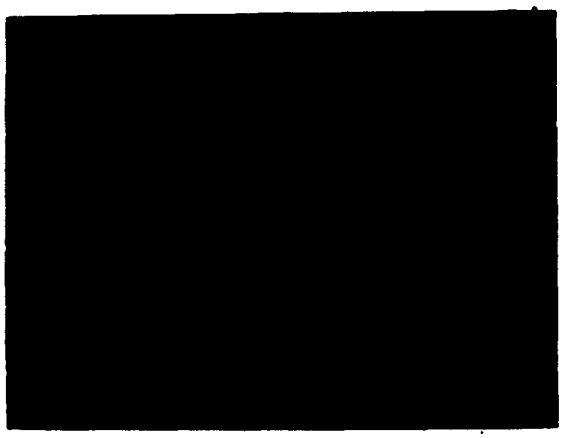
Evaluation of High Velocity Small Caliber Rifles - Armalite (AR-15)

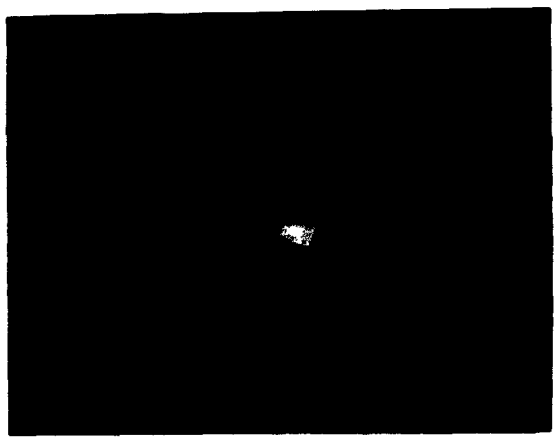
Armalite (AR-15) Disassembled (Field Strip)

a. Barrel and Receiver Group
b. Magazine
c. Charging Handle
d. Bolt Retaining Pin
e. Bolt
f. Firing Pin Retaining Pin
g. Bolt Carrier
h. Firing Pin

App III-2







UNITED STATES ARMY INFANTRY BOARD
FORT BENNING, GEORGIA

PROJECT NR	DATE	NEGATIVE NR
2787	8 May 1958	09-166-480/AJ-56

Evaluation of High Velocity Small Caliber Rifles - Armalite (AR-15)

Top: Flash - Armalite (AR-15) Firing a 5-Round Burst.
Bottom Left: Flash - Armalite (AR-15) Semiautomatic Fire.
Bottom Right: Flash - Armalite (AR-15) Firing 3-Round Burst.

This Project Executed

by

SMALL ARMS DEPARTMENT
UNITED STATES ARMY INFANTRY BOARD

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