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INFANTRY AND AIRCRAFT WEAPONS DIVISION

NOX

REPORT ON

A TEST OF RIFLE, CALIBER 7.62-MM, AR-10

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NOVEMBER 1960

Aberdeen Proving Ground
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MARYLAND

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A TEST OF RIFLE, CALIBER 7.62-MM, AR-10

Report No. DPS-101

Dates of Test: 30 August to 20 October 1960

ABSTRACT

Three rifles were subjected to the light automatic rifle test, and two rifles were subjected to additional accuracy tests. The AR-10 rifle weighs 10.11 pounds when fully loaded with the flash hider - grenade launcher assembled, and is 41.2 inches long, over all. The rifles tested were chambered for the 7.62-mm NATO round. The average mean radius for 10-round targets fired from a bench rest at 100 yards was 1.0 inch. The average number of shots fired semiautomatically in one minute was 57.7, and the average number of hits on the "E" target at 100 yards was 49.0. When fired automatically the average number of rounds fired was 97.3, and the average number of hits was 21.0. With the rifle held normally the average malfunction rate was 0.22 per hundred rounds. The average velocity loss in firing 6000 rounds was 29 feet per second. The average mean radius for 10-shot bench-rest targets fired at 100 yards before the endurance test was 1.0 inch and after the test it was 1.2 inches. No part was broken in any rifle during the endurance test. About normal functioning was obtained in the unlubricated, extreme-cold and dust tests. In the mud test the performance varied from 5 rounds fired with 13 stoppages to 40 rounds fired with 1 stoppage. Cartridge case failures, caused by excessive chamber pressure arising from water in the bore, resulted in damage to two rifles in the rain test.[1] The damaged parts were replaced, and the rifles completed the test. A cook-off occurred after firing 220 rounds in 1 minute 9 seconds, but no cook-off resulted after firing 200 rounds in 56 seconds.

[1]Possibly due to a faulty test fixture, see remarks under results of rain test, pages 24 and 25.

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CONTENTS

	PAGE
INTRODUCTION	3
DESCRIPTION OF MATERIAL	3
DETAILS OF TEST	12
OBSERVERS	28
APPENDIX A: DIRECTIVE LETTER	A-1
APPENDIX B: TEST DATA	B-1
APPENDIX C: DISTRIBUTION	C-1

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1. INTRODUCTION

The AR-10 rifle was designed and developed by Code D and it is being manufactured by Code B. Six AR-10 rifles were submitted for test. It was requested in letter 00/60-UO 3601 (Appendix A), that three rifles be selected at random and subjected to the light automatic rifle test.

2. DESCRIPTION OF MATERIEL

2.1 Rifle, Caliber 7.62-mm, AR-10

The AR-10 rifle (Figures 1 through 5) is a gas-operated rifle equipped with a 20-round detachable magazine. It is chambered for the caliber 7.62-mm NATO round. A plastic stock, in line with the bore to minimize rotation of the rifle about the shoulder during firing, is used in conjunction with a high line of sight and a separate grip. The stock is equipped with a rubber butt. A two-piece plastic handguard is used in conjunction with a two-piece liner for convenient disassembly and rapid dissipation of heat. Sling swivels and a carrying handle are provided. A lever, on the left side above the grip provides a trigger safety, and semiautomatic and automatic fire. A bolt catch is provided to retain the bolt to the rear after the last round has been fired. A charging handle is provided. The trigger guard is hinged to permit the trigger to be operated while wearing mittens. A cover is provided to close the ejection port in the receiver. A combination flash hider - grenade launcher also serves as a support for a bayonet. A fixed-post front sight and an adjustable-aperture rear sight (Figure 5) are provided. Additional accessories include bayonet, bipod, grenade-launching sight and a telescopic sight.

The bolt locks in a barrel extension, which is permanently assembled to the barrel, by means of seven locking lugs. This design permits the use of a lightweight receiver to house the operating parts. The bolt carrier is a massive part which has a cam cut to accommodate a pin assembled in the bolt for rotating the bolt through 22 degrees for locking and unlocking.

Gas passes through a 0.116-inch diameter port in the barrel located 13.5 inches forward of the bolt face (when in the locked position), and it is directed through a tube having an inside diameter of 0.134 inch, to the operating parts. The gas enters the bolt carrier through a tube which fits over the gas tube and which is machined to form a guide to prevent rotation of the carrier. The gas applies a force to the bolt and carrier. The carrier moves to the rear 0.32 inch before unlocking of the bolt is completed. Holes in the right side of the carrier permit the gas to escape when the bolt has unlocked from the extension. The carrier and bolt then travel to the rear together.

A regulator governs the amount of gas which is permitted to enter the gas tube. The regulator, a screw equipped with a spring-loaded detent for retaining the screw in adjustment, is threaded to the gas tube and extends through the front of the front sight.

Use is made of the stock to house a large action spring which operates in a direct line with the carrier.

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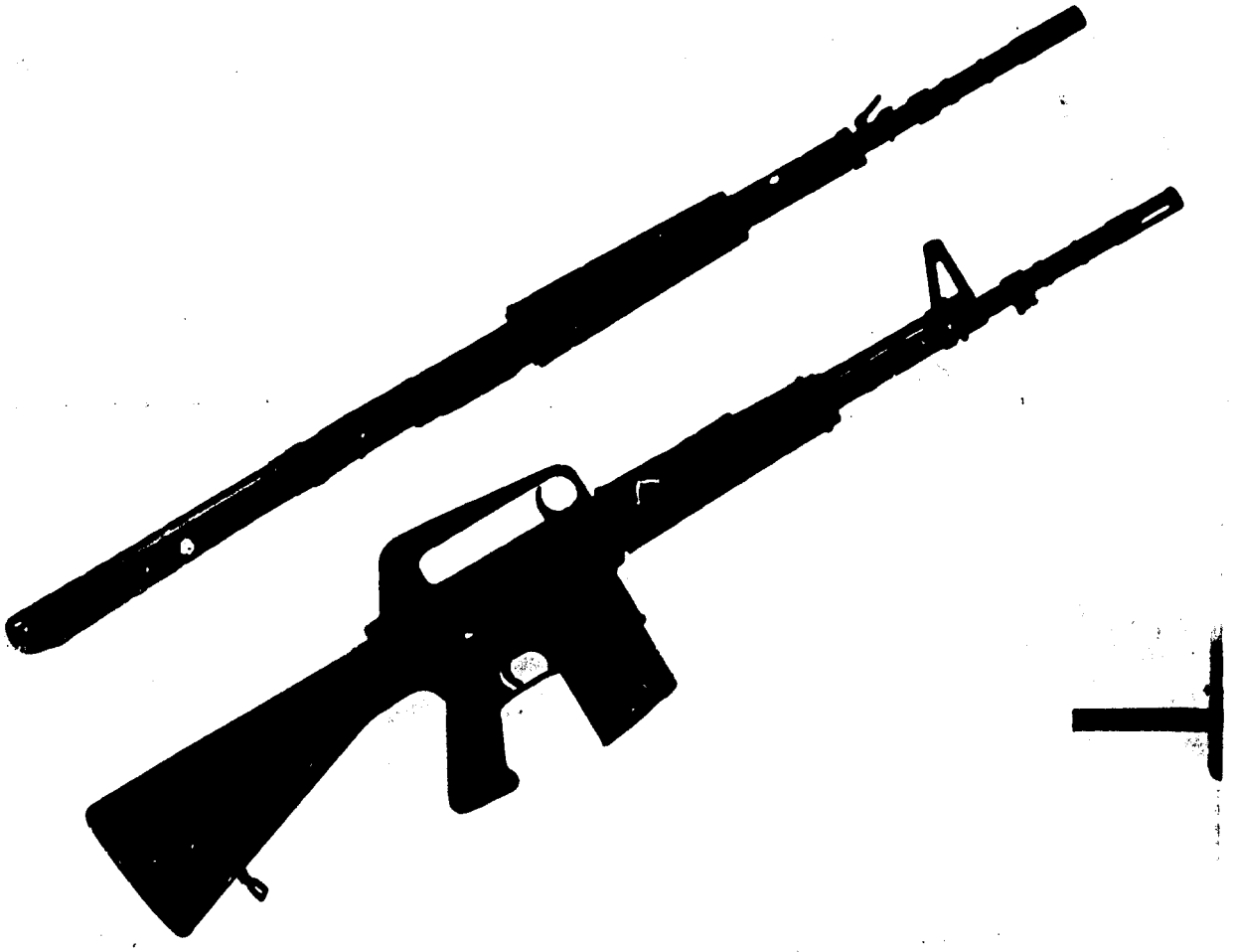

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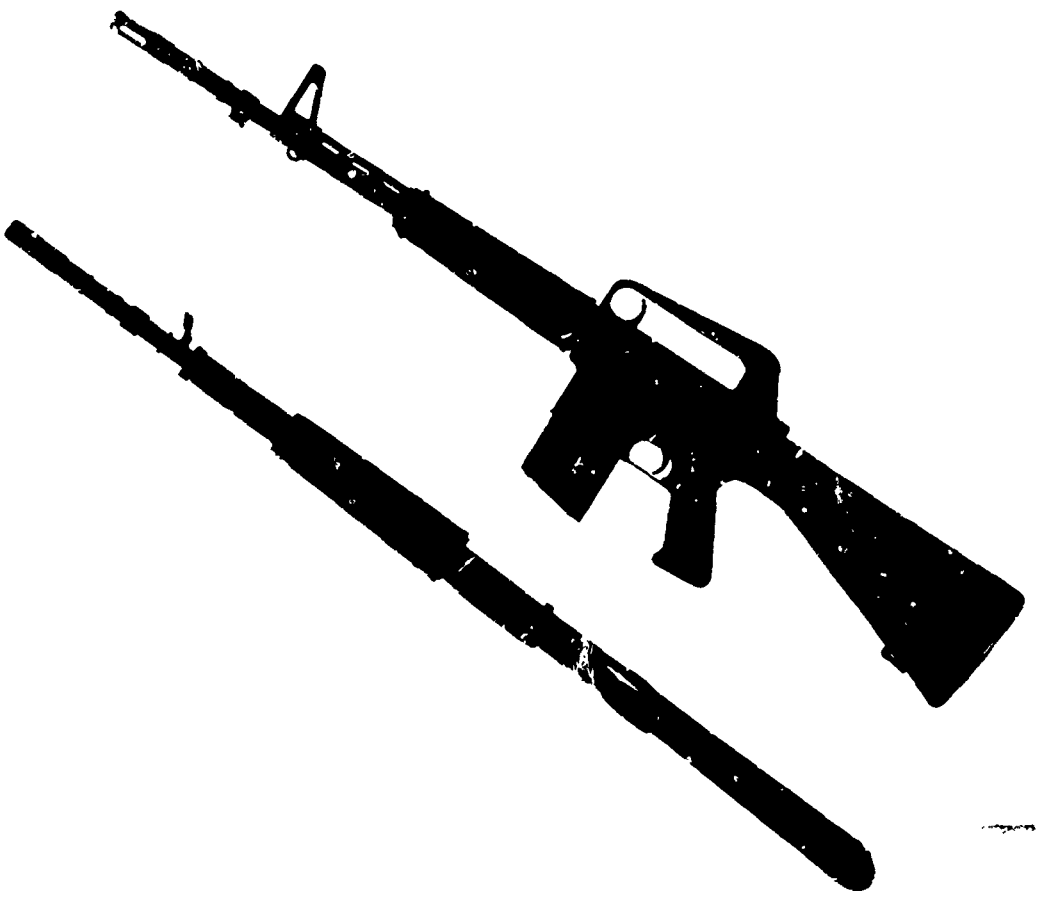
Project TS1-2/265. Rifle, Caliber 7.62mm, AR-10, Figure 1. Top and right side views.



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Project TS1-2/265. Rifle, Caliber 7.62mm, AR-10, Figure 2. Left side and bottom views.

A firing pin, which retains the cam pin in assembly, is retained in the carrier by a pin. A limited movement of the firing pin is permitted. This serves as a safety feature to prevent contact of the pin with the round only when the bolt is in the locked position.

A spring-loaded ejector is positioned in the bolt face. The extractor is reinforced with a rib.

The receiver is in two parts to permit convenient removal of the operating parts. The upper receiver is secured to the barrel assembly by means of a nut, and it houses the bolt and carrier assemblies. The upper receiver is designed to provide a carrying handle which also serves as a base for a rear sight and a telescopic sight. Two lugs on the bottom of the upper receiver permit assembly of the lower receiver by means of pins. The lower receiver houses the firing mechanism, provides a support for the magazine, and serves as a base for the grip and stock. The action spring operates in a tube threaded to the rear of the lower receiver. The stock is retained in assembly by a screw through the butt to the tube.

The operating parts can be disassembled with a round, or other suitable tool, by pushing out the rear pin. This permits the lower receiver to rotate away from the upper receiver. The carrier and bolt can then be withdrawn to the rear. The action spring and buffer assembly can be removed from the tube by depressing a spring-loaded plunger. The upper and lower receivers can be separated by pushing out the front pin.

The firing mechanism uses a hammer which is rotated to the cocked position by the carrier and which is energized by either a coil or a torsion spring. The rifle shown in Figure 4 used a torsion spring, but all rifles used in firing tests were equipped with a coil spring used in conjunction with a modified hammer, a guide, and a connector. The forward movement of the hammer is controlled in semiautomatic fire by the trigger and sear, and in automatic fire by the automatic sear, sear and trigger. A trigger safety is provided which also serves as a change lever for the type of fire desired. When the lever is rotated to the rearward position (SAFE) there is insufficient movement of the trigger to permit the sear to disengage the hammer. When the lever is rotated to the downward position (SEMI) the trigger is permitted to rotate sufficiently to force the sear out of engagement with the hammer. The hammer is then free to rotate forward and contact the firing pin. The sear has an elongated hole to accommodate the trigger pin, and it is forced forward and upward on the pin by a spring assembled in the rear of the trigger. This permits the sear to engage in a notch in the lower rear of the hammer when the hammer is rotated to its rear position. Should the trigger be at the rear when the hammer is rotated to the rear, the sear will engage in the hammer notch and, because the hammer spring has a higher rate than the sear spring, the sear will be forced to the rear. The rear end of the sear engages on a shoulder on the trigger and this prevents the disengagement of the sear from the hammer. When the trigger is rotated to its forward position the sear disengages the shoulder on the trigger, and it is forced to its rearward limit of travel. The rear of the sear then rests on top of the trigger, and it can be disengaged from the hammer by rotating the trigger to the rear. When the lever is rotated to its forward position (AUTO) the trigger is permitted a sufficient movement to prevent the sear from engaging in the hammer notch. The bottom of the automatic sear is also permitted to rotate forward to engage a notch on the top rear of the hammer. The bolt carrier contacts the automatic sear on its forward movement and rotates it out of engagement with the hammer.

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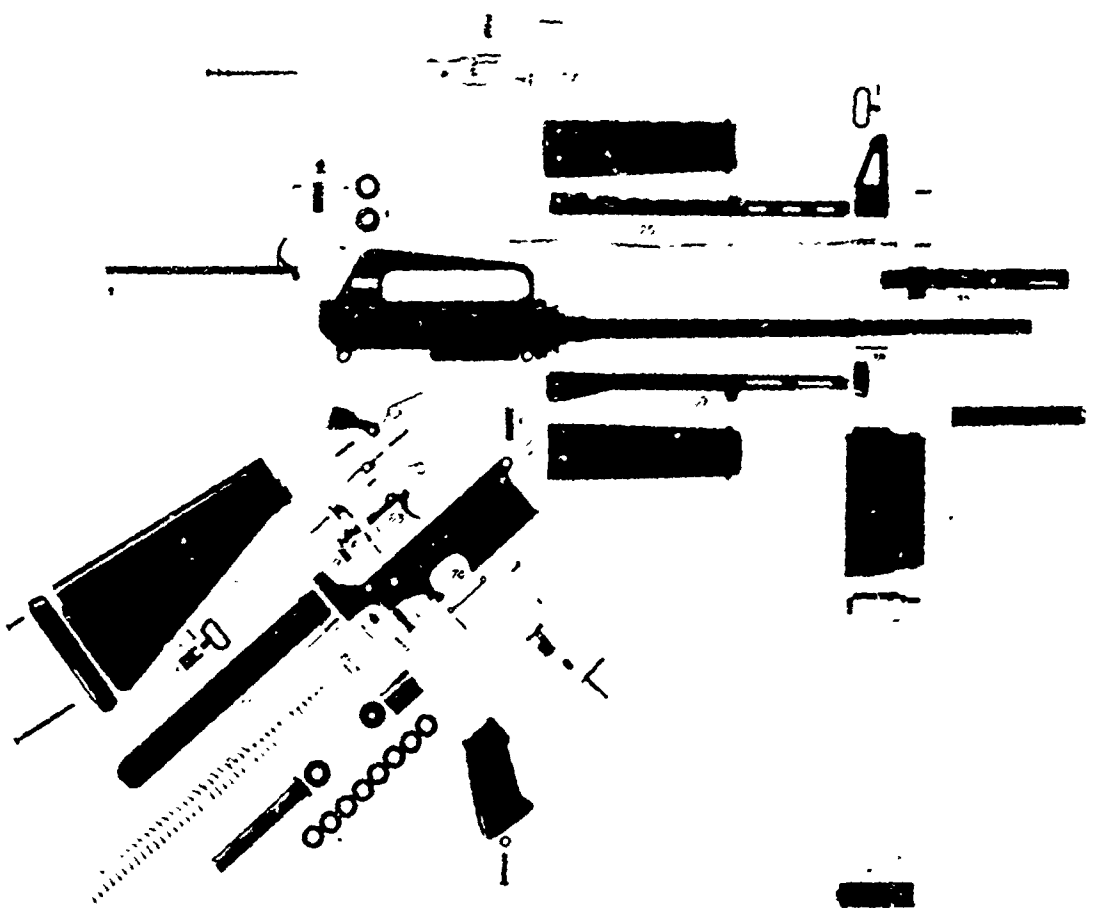
Project TS1-2/265. Rifle, Caliber 7.62mm, AR-10, Figure 3. Rifle field stripped.



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S18-001-2724-1005-59-4P/ORD-60 30 August 1960

Project TS1-2/265. Rifle, Caliber 7.62mm, AR-10, Figure 4. Rifle disassembled.

The hammer will go forward unless the trigger is released to permit the sear to engage in the hammer notch.

The ejection port cover is spring-loaded so that it is held against the receiver during firing. A catch holds it in the closed position over the port. The catch is disengaged automatically by a cam on the carrier when the operating parts move to the rear.

The barrel has a diameter of 0.69 inch at a point forward of the enlarged chamber section and a minimum diameter of 0.62 inch (excluding the short cylindrical section at the muzzle). The front sight, which also serves as a support for the gas tube, is retained on the barrel by a taper pin. The front sight blade has a width of 0.086 inch and it is protected by guards.

The rear sight aperture fits in a dovetail on an elevation screw to permit a zero windage adjustment. The aperture is held in the dovetail by a clamping action which is obtained by tightening a screw which passes through the top of the elevation screw. The aiming aperture has a diameter of 0.067 inch. The rear sight is equipped with an elevation spool which is graduated in 100-meter increments from 2 to 6. A nut, which operates on the elevation screw, has 24 holes in its circumference to provide click adjustments. Each click moves the rear sight aperture 0.0066 inch. This represents an adjustment of 1.15 inches on the target at 100 yards. The rear sight aperture has a total elevation movement of 0.15 inch.

The magazine is retained in the lower receiver by a catch which engages the magazine on the left side. A catch is operated by a button on the right side of the receiver. The magazine can be disengaged without removal of the hand from the grip (right-handed shooter). When the magazine is empty the follower forces the catch up to engage the bolt and retain it at the rear. The bolt may be disengaged from the catch when the magazine has been removed or replaced with one containing rounds by depressing the portion of the catch which extends outside the receiver on the left side or by retracting the charging handle and then releasing it.

The handguards are of moulded plastic. Six 1/2-inch-diameter holes are provided along the top of the handguards, and six 1/4-inch-diameter holes are provided around the rear of the hand guards. The front of the handguards fit in a flange on the liners, and the rear fits into a ring threaded to the barrel nut. The handguard liners are positioned at the front by a ring, retained in position between a shoulder on the barrel and the front sight, and at the rear by the barrel nut and the handguards. The liners are positioned away from the barrel and elongated holes are provided at the front of the liners, in addition to those to match the holes in the handguards, for free circulation of air.

The bayonet for the AR-10 rifle has an over-all length of 12.1 inches and a blade length of 7.5 inches. The weight of the bayonet is 0.62 pound. The scabbard has a length of 13.1 inches and a weight of 0.32 pound.

The manufacturer's representative showed a gas regulator having a design different from the one used in this test. The regulator provided three positions, and it was more convenient to adjust than the one used in this test.

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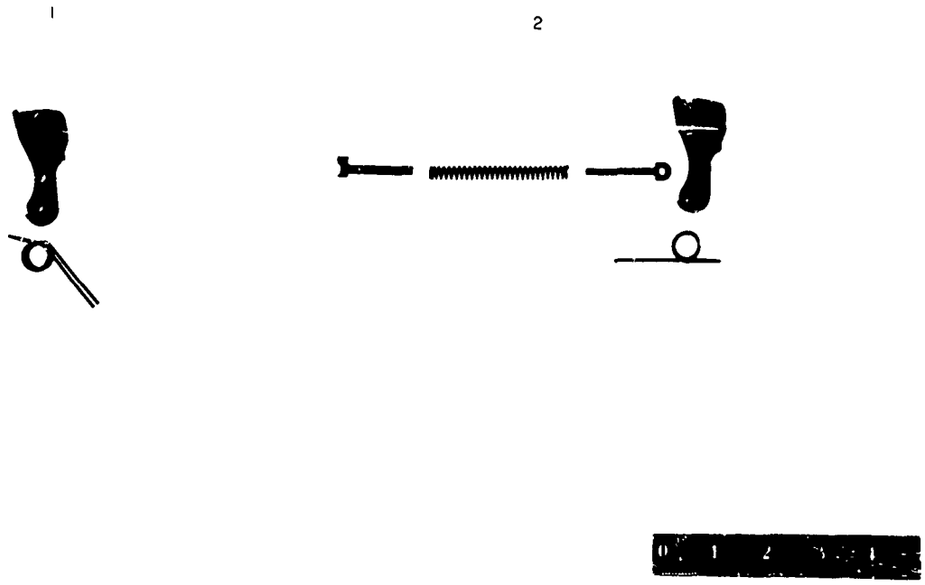

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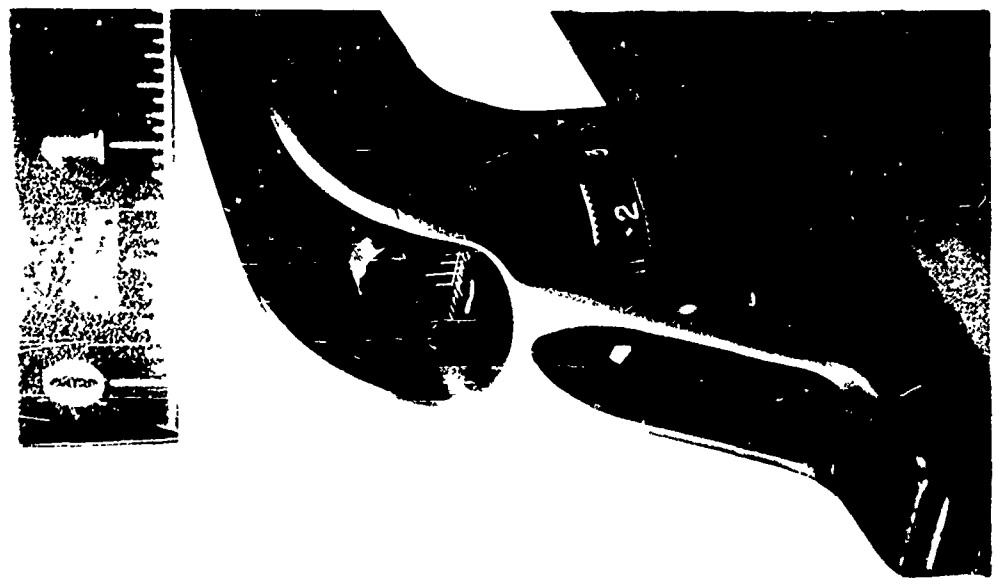
S18-001-2878-1005-59-8P/ORD-60 21 September 1960

Project TS1-2/265. Rifle, Caliber 7.62mm, AR-10, Figure 4a.

Original (1) and modified (2) hammer assemblies. The modified hammer was used in test.



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S18-001-2725-1005-59-7P/ORD-60 30 August 1960

Project TS1-2/265. Rifle, Caliber 7.62mm, AR-10, Figure 5. Front and rear sights.

2.2 Cartridge, Ball, Caliber .30, T104E1, Lot FA-14

In its acceptance test this round gave an average velocity of 2748 feet per second at 78 feet, an average pressure of 45,500 pounds per square inch, and average accuracy of 4.85 inches mean radius at 600 yards. The average weight of the round was 364.4 grains.

2.3 Lubricant

The lubricant used in all phases of the test where lubricant was used, except the rain and extreme-cold phases, was PL-Special Lubricating Oil General Purpose Preservative, MIL-L-644B. PD 500 oil was used in the extreme-cold phase. Lubriplate was used in the rain test.

3. DETAILS OF TEST

Three rifles were subjected to the light automatic rifle test and two additional rifles were subjected to additional accuracy tests. The procedure for the light automatic rifle test follows.

STANDARD LIGHT AUTOMATIC RIFLE TEST

TEST I

EXAMINATION:

a. The rifle will be disassembled and an examination made of all parts.

b. The number and names of all parts and the types of springs will be recorded.

c. The weight of the complete rifle, component parts and accessories will be recorded.

d. The length of the rifle and other pertinent dimensions will be recorded. Dimensions recorded will include barrel length, sight radius, line of sight above bore, and stock dimensions.

e. The average trigger pull will be determined.

f. The rifle will be photographed in various conditions of disassembly.

TEST II

DISASSEMBLY AND ASSEMBLY

The time and the number and type of tools required for each of the following operations will be recorded:

a. To disassemble the rifle completely.

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b. To assemble the rifle after complete disassembly.

c. To dismount the operating parts and magazine mechanism (field strip).

d. To assemble the operating parts and magazine mechanism.

TEST III

ACCURACY

a. Four ten-round targets will be fired at a range of 100 yards from a machine rest or from a bench rest by an expert rifleman.

b. A test will be conducted to investigate the accuracy that can be obtained when the rifle is fired under various conditions similar to those encountered in combat. Three riflemen will each fire the following course at 100 yards with the test rifle:

(1) With sights properly adjusted and with a fouled bore, one 10-round target will be fired from a bench rest.

(2) The rifle will be disassembled (field stripped), cleaned, oiled, and reassembled.

(3) Starting with a cold and oiled bore, one 10-round target will be fired from a bench rest.

(4) One 10-round target will be fired from the prone position using a sling.

(5) One hundred rounds will be fired as rapidly as possible.

(6) Immediately after firing the 100 rounds, one 10-round target will be fired from a bench rest.

(7) Another 10-round target will be fired immediately from the prone position using a sling.

c. Three riflemen will each fire ten three-round bursts at a range of 25 yards from the standing position. The course will be repeated from the prone position. A suitable control rifle may be used.

d. Three individuals will fire as many aimed shots as possible in a one-minute period with each semiautomatic and automatic fire. The course will be fired three times per individual and the hits recorded on the "E" * target at 100 yards.

e. Six individuals will fire a standard qualification course with the rifle.

*Silhouette target representing a figure about the height of a man in a kneeling position (Ref. FM23-5).

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TEST IV

ENDURANCE

The rifle will be fired 6000 rounds for endurance, firing alternately 100 rounds semiautomatically and 100 rounds automatically. The rifle will be cooled after each 100 rounds. The entire mechanism may be disassembled, cleaned and oiled after each 600 rounds. All malfunctions, breakages and replacement of parts will be recorded. The instrumental velocity will be measured on 20 rounds, before and after the endurance test. Accuracy will be checked before and after the test. In the endurance test 100 rounds will be fired semiautomatically and 100 rounds will be fired automatically under each of the following conditions:

a. With the rifle held loosely in the hands.

b. With the rifle held right side up.

c. With the rifle held left side up.

d. With the rifle held loosely in the hands at an elevation of 80 degrees

e. With the rifle held in a normal manner at an elevation of 80 degrees.

f. With the rifle held loosely in the hands at a depression of 80 degrees

g. With the rifle held in a normal manner at a depression of 80 degrees.

TEST V

FLASH

The cumulative flash from 20 rounds fired semiautomatically in a completely dark range will be recorded photographically by means of 4 x 5-inch camera using a lens opening of f 2.5 and a film having a Weston rating of 100. The camera will be placed at a right angle to the muzzle at a distance of 4.5 feet.

TEST VI

UNLUBRICATED

The rifle will be cleaned in solvent and left in an unlubricated condition One hundred rounds will then be fired alternating between semiautomatic and automatic fire.

TEST VII

EXTREME COLD

The rifle will be cleaned, lightly oiled, and placed with a loaded magazine in a cold room maintained at -65°F, for a 12-hour period prior to firing.

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After this period an attempt will be made to fire 20 rounds (or the capacity of the magazine) semiautomatically. If satisfactory functioning is obtained, a similar number of rounds will be fired automatically after an additional two hours.

TEST VIII

DUST

The rifle will be cleaned and lightly oiled. It will be fully loaded and the safety will be placed in the "ON" position. The rifle will then be placed in the dust box and exposed to the dust for one minute top side up and for one minute upside down. The dust mixture, which is made by mixing nine pounds of Grade 0 Albany sand with one pound of clean silica core sand which passed 100 per cent through a 30 mesh sieve, 80 per cent through a 50 mesh, and 3.4 per cent through a 100 mesh, will be poured at a rate of five pounds per minute through the pourhole while the blower is turned at a handle speed of 60 revolutions per minute. The shooter will attempt to clean the rifle by wiping with his bare hands and by blowing sharply on the congested areas of the action. An attempt will be made to fire 20 rounds (or the capacity of the magazine).

TEST IX

MUD

The rifle will be cleaned, lightly oiled, and the muzzle taped to exclude the mud from the bore. The rifle will be immersed completely in the mud for a period of 15 seconds. The mud mixture is made in the proportion of ten pounds of red clay and two pounds of clean river sand with eight quarts of water. The sand is approximately the same grading as that used in the dust test. The shooter will remove the tape from the muzzle and attempt to clean the rifle by wiping with the bare hands and by blowing on the congested areas of the action. An attempt will be made to fire 20 rounds (or the capacity of the magazine).

TEST X

RAIN

The rifle will be cleaned, lubricated and subjected to spray which is directed over the entire rifle by means of a 1/2-inch pipe having 0.059-inch holes spaced 1/2-inch apart. The pipe will be positioned three feet above the rifle. The following procedure will be used:

a. The rifle, in a horizontal position, will be exposed to the spray for five minutes with the bolt retracted and for five minutes with the bolt closed. The rifle will be loaded when the bolt is closed. After this time the gun will be fired 100 rounds semiautomatically.

b. The procedure in "a" will be repeated, except that the gun will be fired automatically.

c. The procedure in "a" will be repeated, except that the rifle will be exposed to the spray with muzzle up. The rifle will be fired 100 rounds semiautomatically in a horizontal position. Before firing, the muzzle of the rifle will be depressed to permit water accumulating in the bore to run out.

d. The procedure in "c" will be repeated except that the gun will be fired automatically.

e. The procedure in "c" will be repeated except that the rifle will be exposed to the spray with muzzle down.

f. The procedure in "e" will be repeated.

TEST XI

COOK-OFF

The rifle will be subjected to a test to determine the minimum number of rounds which may be fired before sufficient heating of the chamber occurs to result in a premature explosion of the cartridge. The firing will be conducted as rapidly as possible employing preloaded magazines. An attempt will be made to bracket the cook-off point in number of rounds fired.

Complete test data are attached as Appendix B. There follows a summary of results.

TEST I (EXAMINATION)

NOMENCLATURE LIST

The names of the parts correspond to the numbers in Figure 4, as follows:

1. Pin, firing
2. Bolt Carrier Assembly composed of:
   - Carrier, Bolt
   - Key, Bolt Carrier
   - Screw, Socket Head Cap (2)
   - Pin, Socket Screw Lock (2)
3. Bolt Assembly composed of:
   - Bolt
   - Ring, Bolt Seal (3)
4. Pin, Firing Pin Retaining
5. Pin, Cam
6. Spring, Ejector
7. Pin, Roll
8. Ejector, Bolt
9. Extractor
10. Spring, Extractor
11. Pin, Extractor

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12. Handguard, L.H.
13. Pin, Roll
14. Swivel, Sling
15. Aperture, Rear Sight
16. Screw, Aperture Clamp
17. Screw, Rear Sight Elevation
18. Screw, Rear Sight Lock
19. Rear Sight Elevation Spool Assembly composed of:
    Spool, Rear Sight Elevation
    Pin, Sight Spool Stop
20. Spring, Rear Sight Ring
21. Nut, Rear Sight
22. Detent, Rear Sight
23. Spring, Rear Sight
24. Pin, Roll
25. Liner, Handguard Upper
26. Sight, Front
27. Pin, Taper
28. Tube, Gas
29. Regulator, Gas
30. Pin, Taper
31. Pin, Cotter
32. Flash Hider - Grenade Launcher Assembly composed of:
    Flash Hider - Grenade Launcher
    Ring, Grenade Detent
33. Pin, Roll
34. Handle, Charging
35. Detent, Charging Handle
36. Spring, Charging Handle Detent
37. Barrel and Receiver Assembly composed of:
    Barrel
    Cover, Dust
    Extension, Barrel
    Latch, Cover
    Nut, Barrel
    Pin, Cover
    Pin, Indexing
    Pin, Roll
    Receiver, Upper
    Ring, Handguard Locking
    Spring, Cover
    Spring, Cover Latch
    Stop, Sight Spool Pin
38. Key
39. Liner, Handguard Lower
40. Ring, Handguard Front Locating
41. Handguard, R.H.
42. Screw, Short Recoil Pad
43. Pad, Recoil
44. Screw, Long Butt
45. Block, Rear Sling Swivel
46. Pin, Roll
47. Swivel, Sling
48. Stock

49. Hammer Assembly composed of:
    Hammer
    Retainer, Hammer Pin
50. Spring, Hammer
51. Pin, Hammer
52. Pin, Trigger
53. Sear
54. Spring, Trigger
55. Pin, Automatic Sear
56. Automatic Sear Assembly composed of:
    Bushing, Automatic Sear
    Sear, Automatic
    Spring, Automatic Sear
57. Spring, Sear
58. Plunger, Sear
59. Safety
60. Plunger, Safety Detent
61. Spring, Safety Detent
62. Pin, Roll
63. Trigger
64. Pin, Hinge*
65. Pin, Roll
66. Extension, Receiver
67. Pin, Roll
68. Spring, Takedown Pin
69. Plunger, Takedown Pin
70. Pin, Roll
71. Pin, Buffer Retaining
72. Spring, Buffer Retaining
73. Pin, Takedown
74. Receiver, Lower
75. Pin, Roll
76. Guard, Trigger
77. Plunger, Trigger Guard
78. Pin, Roll
79. Pin, Bolt Catch
80. Spring, Trigger Guard
81. Pin, Roll
82. Plunger, Bolt Catch
83. Catch, Bolt
84. Spring, Bolt Catch
85. Button, Magazine Catch
86. Catch, Magazine
87. Spring, Magazine Catch
88. Spring, Action
89. Pin, Roll
90. Guide, Action Spring
91. Pin, Roll
92. Ring, Buffer Locking
93. Guide, Buffer Discs
94. Buffer
95 to 102. Disc, Buffer

*An assembly not designed for disassembly

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103. Grip, Pistol
104. Lock, Washer
105. Screw
106. Box Magazine, Assembly composed of:
    Box
    Retainer, Magazine Floor Plate
    Rivets (3)
107. Follower, Magazine
108. Spring, Magazine
109. Plate, Magazine Floor

Before the start of the firing the original hammer and hammer spring were replaced with a trigger pin retaining spring, a hammer spring, a hammer spring guide, a connector, and a modified hammer. The trigger pin retaining spring is a modification of the original hammer spring. The original and replacement parts are illustrated in Figure 4a.

WEIGHTS AND MEASUREMENTS

Weights and measurements are averages for rifles numbers 4219, 4412 and 4534.

Weights are given in pounds and measurements in inches.

WEIGHTS

Rifle without magazine or sling (with flash hider - grenade launcher)	8.80
Empty magazine	0.27
One round of ammunition	0.0513
Magazine capacity (rounds)	20*
Rifle with loaded magazine	10.11
Recoiling parts	1.64**
Stock	0.76
Hand guards and liners	0.61
Flash hider - grenade launcher	0.43
Trigger pull (average of 5 trials for each rifle)	10.4

MEASUREMENTS

Over-all length with flash hider - grenade launcher	41.2
Over-all length without flash hider - grenade launcher	39.5

*21 rounds can be inserted, but the magazine was loaded with a maximum of 20 in this test.
**Includes bolt assembly, bolt carrier assembly, buffer assembly and action spring.

MEASUREMENTS (Contd)

Barrel length (face of bolt to muzzle)	20.0
Sight radius	20.5
Line of sight above bore	2.7
Butt to trigger	14.1
Pitch from line of bore	6° **
Line of sight to forward end of comb	2.0
Barrel: Rifling	
One turn in	12
Number of grooves	4
Number of parts	141***
Number of coil springs	14
Number of flat-type springs	2
Number of torsion springs	4

TEST II (DISASSEMBLY AND ASSEMBLY)

The time given is the average required for two trials by each of three individuals.

Number of tools required to disassemble rifle: 7.
Time required to disassemble rifle: 9 minutes, 56 seconds.
Number of tools required to assemble rifle after disassembly: 6.
Time required to assemble rifle after disassembly: 22 minutes, 40 seconds.
Number of tools required to dismount operating parts and magazine: *
Time required to dismount operating parts and magazine: 7 seconds.
Number of tools required to assemble operating parts and magazine: None.
Time required to assemble operating parts and magazine: 5 seconds.

TEST III (ACCURACY)

Legend:
MR - Mean Radius
MVD - Mean Vertical Deviation
MHD - Mean Horizontal Deviation
EVD - Extreme Vertical Deviation
EHD - Extreme Horizontal Deviation
ES - Extreme Spread
CI - Center of Impact

*No tool is required, but it was found convenient to use a tool to start the takedown pin.
**Angle between a normal to the line of bore and a line extending across butt.
***Rifle with modified hammer, coil hammer spring, hammer spring guide, and connector.

Bench-Rest Accuracy

The averages for four ten-shot targets fired from a bench rest at a range of 100 yards are given in inches.

Rifle No.	MR	MVD	MHD	EVD	EHD	ES
4219	1.2	0.8	0.8	3.1	2.7	3.4
4412	0.8	0.6	0.6	2.4	2.2	2.9
4534	1.0	0.7	0.6	2.7	1.9	3.0
Average	1.0	0.7	0.7	2.7	2.3	3.1

Combat Accuracy

The averages for five targets, each fired under a different condition at a range of 100 yards, for each rifle are given in inches.

Rifle No.	Mean From Normal C.I.	MR	ES	Extreme Shot to Normal C.I.
4219	2.6	1.3	4.1	4.1
4412	2.2	1.1	3.5	4.0
4534	2.5	1.3	4.3	4.4
Average	2.4	1.2	4.0	4.2

Automatic Accuracy

The averages for ten three-round bursts by each of three shooters at a range of 25 yards are given in inches.

Firing Position	Mean for Shots Fired Automatically*	30-Shot Target			
		Mean From Aiming Point	EV	EH	ES
Prone	57.2	37.5	85.0	27.7	87.7
Standing	114.4	74.3	162.6	83.7	181.2

Rate of Aimed Fire

The average number of shots fired and number of hits obtained on the "E" target at a range of 100 yards in one minute (three trials by each of three riflemen) are given below. Firing was from the prone position.

Type Fire	No. Shots Fired	No. Bursts	No. Hits Obtained
Semiautomatic	57.7	-	49.0
Automatic	97.3	25	21.0

*The first shot in each burst is considered a semiautomatically-fired shot.

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In the rate-of-aimed-fire test the shooter attempted to fire 4 bursts per magazine in the automatic-fire phase.

An asbestos glove was worn by the shooter in the combat-accuracy and rate-of-aimed-fire tests because there was a tendency for the shooter's hand to slip forward on the liner during firing. The liner was uncomfortable to handle after extended firing.

The sling was used in the combat-accuracy and rate-of-aimed-fire tests. It was found difficult to hold the AR-10 in position because the front sling swivel is located on the side and this tends to twist the rifle during firing.

Test phase III, e was not conducted because the error of the individual is a large factor in the scores produced, and therefore data generated in this phase are of little value unless a control weapon is used.

TEST IV (ENDURANCE)

	Rifle Number		
	4219	4412	4534
Number of broken or damaged parts replaced during firing cycles	0	0	0
Number of broken or damaged parts replaced between firing cycles	0	0	0
Malfunctions Per Hundred Rounds			
Rifle held loosely in hands	1.5*	0	0
Rifle held right side up	4.0*	1.5*	0
Rifle held left side up	0.5*	0	0
Rifle held at an elevation of 80°	1.5**	1.0**	2**
Rifle held at a depression of 80°	0	0.25*	0
Rifle held normally	0.24	0.13	0.28
Average velocity loss in firing 5000 (feet per second)	27	54	6
Average accuracy before test (MR at 100 yards)	1.2	0.8	1.0
Average accuracy after test (MR at 100 yards)	1.2	1.3	1.2

Two types of malfunctions occurred in the endurance test, a failure of the bolt to lock fully on the first round from the magazine, and a failure to eject. The AR-10 rifle does not have a provision for charging the rifle manually and should there be sufficient drag on the operating parts, as sometimes occurs on the first round from a magazine, the bolt carrier will not cam the bolt to the fully locked position. The frequency of this malfunction is dependent somewhat upon the gunner. The gunner can release the operating parts by depressing the bolt catch or by retracting and releasing the charging handle. Should the gunner fail to release the charging handle freely after retracting it, some of the energy of the operating parts will

*All malfunctions were failures of the bolt to lock fully on the first round from the magazine.
**All stoppages were failures to eject.

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be lost. A slightly greater compression of the operating spring is obtained by retracting the charging handle fully than when the bolt is engaged by its catch, but when the charging handle is used to load the rifle the handle must be carried forward with the operating parts. A method of loading the first round was demonstrated by Mr. Deibel (representing the weapon manufacturer) which reduces the possibility of this malfunction. When the bolt is released from its rear position the rifle is moved sharply to the rear thus increasing the inertial force of the operating parts.

The failures to eject were caused by improper rearward travel of the operating parts. The force applied to the operating parts can be controlled by means of the gas regulator. When firing rifle number 4219 with the rifle held normally a total of 9 failures to eject occurred in firing 1400 rounds. The gas regulator was adjusted, and only two malfunctions, failures of the bolt to lock fully on the first round from the magazine, occurred in firing 3000 rounds.

TEST V (FLASH)

Test V was not conducted

TEST VI (UNLUBRICATED)

A total of 100 rounds were fired in each rifle (50 rounds semiautomatically and 50 rounds automatically) after the rifle had been cleaned in solvent and left in an unlubricated condition.

Rifle Number	Malfunction	Remarks
4219	1	One failure to feed.
4412	0	
4534	0	

TEST VII (EXTREME COLD)

Twenty rounds were fired semiautomatically in each rifle after an exposure of 10 hours to a temperature of -65°F and 20 rounds were fired automatically after an additional exposure of 2 hours.

Rifle Number	Malfunction	Remarks
4219	1	One failure of bolt to close fully on first round from magazine
4412	0	
4534	1	One failure of bolt to close fully on first round from magazine.

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TEST VIII (DUST TEST)

No malfunctions occurred in firing 10 rounds semiautomatically and 10 rounds automatically from each rifle after exposure to the dust.

TEST IX (MUD)

Rifle No.	No. Rds Fired	Type Fire	No. Malfunctions	Remarks
4219	4	Semiautomatic	12	
4219	1	Single Shot	1	The gunner could not retract the charging handle after this stoppage (a failure to eject).
4412	10	Semiautomatic	12	
4412	2	Automatic	4	The gunner could not retract the charging handle after the last failure to eject.
4534	12	Semiautomatic	0	
4534	8	Automatic	0	
4534	10	Semiautomatic	0	At the request of a representative an additional 20 rounds were loaded in a magazine, not subjected to the mud, and fired.
4534	10	Automatic	1	

Rifles numbers 4219 and 4412 were fired by an ARG gunner and gun number 4534 was fired by Mr. Deibel.

TEST X (RAIN)

Each rifle was fired 200 rounds alternating between semiautomatic and automatic fire.

Rifle No.	No. Malfunctions	Remarks
4219	15	On the first round after exposure of the rifle to the spray with muzzle up a stoppage occurred on which the case ruptured and damaged the rifle. The magazine, extractor and firing pin were damaged. These parts, as well as the extractor pin and the ejector pin, were replaced.
4412	35	A stoppage occurred on the first round in the second cycle on which the case ruptured and damaged the rifle. The extractor and magazine were damaged. These parts were replaced.
4534	6	A stoppage occurred on the first round in the second cycle on which the case was deformed, but the rifle was not damaged.

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The rain test facility was inspected after the test was completed, and it was found that the AR-10 rifle was elevated slightly when positioned in the firing slide. The flash hider has three equally-spaced slots. The part is oriented in such a manner that one slot is at the top. This permits the drops of water to pass through the top slot and impact on the bottom of the hider. The drops had sufficient impact to splash some water into the bore. With the bore at a slight elevation it is expected that a considerable amount of water would accumulate in the bore during a 10-minute exposure period. Extremely high chamber pressure was developed when the rifle was fired under this condition. Figure 6 shows three deformed rounds which caused stoppages and a normal round. Only an exceptionally strong mechanism could withstand this excessive pressure with no damage to major components.

It is probable that the gunner did not allow sufficient time to permit the water to drain from the bore of rifle number 4219 after it was exposed to the spray with muzzle up.

It was difficult to retract the operating parts after the case ruptures, and considerable time was lost before the rifle was returned to the test. For this reason it is probable that the test was more severe than normal. The performance obtained with rifle number 4534, which was exposed to the spray a normal length of time, is expected to be representative for this rifle.

The effect of the adjustment of the gas regulator was demonstrated in this test phase. In the last cycle rifle number 4412 gave 32 malfunctions in firing 40 rounds. The gas regulator was then opened two clicks. No malfunctions occurred in firing the following 60 rounds.

TEST XI (COOK-OFF)

Rifle No.	No. of Rds Fired	[a]Time for Firing	Results
4219	260	1 min 33 sec	A cook-off occurred in 37 sec.
4219	200	56 sec	No cook-off occurred.
4412	220	1 min 9 sec	A cook-off occurred in 1 min 57 sec.

[a]Time from firing first round to chambering of cook-off round.

SPECIAL ACCURACY TESTS

A 10-shot target was fired from each of two rifles both with and without the bayonet from a bench rest at a range of 100 yards. The average mean radius without bayonet was 1.15 inches and with the bayonet it was 0.8 inch.

ABERDEEN PROVING GROUND

S18-001-3104-1005-59-8T/ORD-60 11 October 1960

Project TS1-2/265. Test of Rifle, 7.62mm, AR-10.

Cartridge case casualties which resulted when firing the AR-10 Rifles in the rain test. Left to Right: Casualty No. 1, from Rifle 4219, occurred on the first round after exposing the rifle to the spray with the muzzle up. A failure to extract resulted. The extractor and firing pin were bent. Casualty No. 2, from Rifle No. 4412, occurred on the first round after exposing the rifle to the spray with the rifle in a horizontal position. A failure to extract occurred. The extractor was bent. Casualty No. 3, from Rifle No. 4534, occurred on the first round after exposing the rifle to the spray with the rifle in a horizontal position. A failure to eject occurred. No parts were damaged. No. 4 is a normal case from a round fired in the rain test.

The average difference in center of impact of the groups fired with and without the bayonet was 0.5 inch.

Two 10-shot groups were fired from a rifle both with and without the flash hider-grenade launcher assembled from a bench rest at a range of 100 yards. The average mean radius with flash hider-grenade launcher was 1.05 inch and that without was 1.35. The average difference in center of impact of the groups fired with and without the flash hider-grenade launcher was 3.9 inches.

SUBMITTED:

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APPROVED:

H. A. Noble
H. A. NOBLE
Assistant Deputy Director
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Development and Proof Services

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OBSERVERS

Date	Name	Representing
19 to 21 Sept 1960	Mr. W. B. Butler	Code A
19 Sept to 10 Oct 1960	Mr. W. L. Deibel	Code B
19 Sept to 1 Oct 1960	Mr. A. J. Gunther	Code A
19 Sept 1960	Mr. R. N. McDonald	Code C
19 to 21 Sept 1960	Mr. G. H. Rockerfeller	Code C
19 to 21 Sept 1960	Mr. E. M. Stoner	Code D
22 to 26 Sept 1960	Mr. G. A. Gustafson	Elgin Air Force Base, Florida
23 to 27 Sept 1960	Mr. W. B. Butler	Code A
23 to 26 Sept 1960	Mr. G. H. Rockerfeller	Code C
23 to 26 Sept 1960	Mr. E. M. Stoner	Code D
26 Sept 1960	Mr. R. N. McDonald	Code C
28 Sept to 10 Oct 1960	Mr. E. M. Stoner	Code D
29 Sept 1960	S/Sgt R. L. Farris	Lackland Air Force Base, Texas
29 Sept to 1 Oct 1960	Lt. R. G. Gorey	Lackland Air Force Base, Texas
1 to 8 Oct 1960	S/Sgt R. L. Farris	Lackland Air Force Base, Texas
3 to 8 Oct 1960	Mr. W. B. Butler	Code A
4 Oct 1960	Mr. R. N. McDonald	Code C
6 to 10 Oct 1960	Mr. A. J. Gunther	Code A
6 Oct 1960	Mr. G. H. Rockerfeller	Code C
7 and 8 Oct 1960	Lt. R. G. Gorey	Lackland Air Force Base, Texas
7 Oct 1960	Lt. Col. J. F. Landers	CONARC Liaison Office

APPENDICES

	PAGE
A, DIRECTIVE LETTER	A-1
B, TEST DATA	B-1
C, DISTRIBUTION	C-1

APPENDIX A

Directive Letter 00/60-Uo 3601

[illegible]/[illegible]/53025

ORDTS 23 June 1960

SUBJECT: Test of Fairchild AR-10 7.62-mm Rifle

TO: Commanding General
Aberdeen Proving Ground, Md
Attn: D&PS

1. Six Fairchild AR-10 7.62-mm Rifles, together with accessories, equipment, and descriptive literature will be shipped in the near future to the Proving Ground, Attention: D&PS (Mr. L. F. Moore). It is requested that three of the six rifles be selected at random and subjected to the appropriate standard engineering test. Adequacy of the accessories and equipment should be assessed.

2. The test report will cover the Fairchild materiel only and will be classified "For Official Use Only."

3. Costs are chargeable to FY61 funds, to be supplied under Project TS2-2015.

4. It is requested that this office be advised when the above mentioned materiel has been received at the Proving Ground, and of the date established for initiation of the test. A representative of the Fairchild Engine and Airplane Corporation will be present to observe portions of the test.

FOR THE CHIEF OF ORDNANCE:

Copy furnished:
ORDOW-TS
(Mr. Gordon Gnam)

S. L. HALL
Col, Ord Corps
Assistant

APPENDIX B

Test Data

DISASSEMBLY AND ASSEMBLY TEST

Dates of Test:

Time and tools required to disassemble rifle as illustrated in photograph S18-001-2724-1005-59-4P/ORD-60.

Tools required:
1. Punch, 0.055-inch
2. Punch, 0.075-inch
3. Punch, 0.106-inch
4. Screwdriver, 1/4-inch blade
5. Screwdriver, 1/10-inch blade
6. Pliers
7. Hammer, 1/4-pound brass

Trial No.	Individual Crowther	Individual Eller	Individual Hendricks	Average
1	10 min 55 sec	9 min 15 sec	9 min 25 sec	9 min 52 sec
2	10 min 57 sec	8 min 56 sec	10 min 5 sec	9 min 59 sec
Average	10 min 56 sec	9 min 6 sec	9 min 45 sec	9 min 56 sec

Time and tools required to assemble rifles after disassembly:

Tools required:
1. Punch, 0.055-inch
2. Punch, 0.075-inch
3. Punch, 0.106-inch
4. Screwdriver, 1/4-inch blade
5. Screwdriver, 1/10-inch blade
6. Hammer, 1/4-pound brass

Trial No.	Individual Crowther	Individual Eller	Individual Hendricks	Average
1	21 min 44 sec	21 min 23 sec	25 min 11 sec	22 min 46 sec
2	24 min 44 sec	22 min 44 sec	20 min 16 sec	22 min 35 sec
Average	23 min 14 sec	22 min 4 sec	22 min 44 sec	22 min 40 sec

Time and tools required to dismount magazine and operating parts as illustrated in photograph S18-001-2726-1005-59-5P/ORD-60.

Tools required: 1. No tool is required but it was found convenient to use a tool to start the takedown pin.

Trial No.	Individual Crowther	Individual Eller	Individual Hendricks	Average
1	9 sec	6 sec	7 sec	7 sec
2	8 sec	6 sec	6 sec	7 sec
Average	8 sec	6 sec	6 sec	7 sec

Time and tools required to assemble magazine and operating parts.

Tools required: None

Trial No.	Individual Crowther	Individual Eller	Individual Hendricks	Average
1	6 sec	6 sec	6 sec	6 sec
2	5 sec	4 sec	4 sec	4 sec
Average	6 sec	5 sec	5 sec	5 sec

The following parts were damaged in the disassembly test:

The trigger guard was damaged at the point of contact with the roll pin which retains the plunger in assembly.

The long butt screw was broken.

The takedown pin spring was deformed.

The rear sight elevation screw was damaged at the point of contact with the roll pin which prevents its rotation.

FUNCTION REPORTS

Legend

A = Automatic.
S = Semiautomatic.
FF = Failure to feed.
FJ = Failure to eject.
FX = Failure to extract.
SS = Single shot.
BLE = Bolt carrier lacked energy to lock bolt (other than first round).
FBC = Failure of bolt to lock fully on first round from magazine.
FBR = Failure of bolt to remain at rear after firing last round.
FFR = Failure to fire.
FTF = Failure of trigger to go forward.
SAT = Satisfactory.

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks

Rifle, Caliber 7.62-mm, Number 4219
Cartridge, Ball, Caliber .30, T104E1, Lot FA14

The rifle was inspected, and the weights and measurements were recorded.

ACCURACY TESTS

100-Yard Bench-Rest Accuracy Test

21 September 1960

The rifle was field stripped and lubricated.

0930	8	8	S	2-FJ	Fired by Mr. Stoner to adjust the gas regulator.
0935	18	26	A	SAT	Fired by Mr. Stoner to assure proper gas regulator adjustment.
0956	5	31	S	SAT	Sighting shots.
1007 to 1025	40	71	S	SAT	Fired by Davis from a bench-rest.

100-Yard Combat-Accuracy Test

1412	10	81	S	SAT	Fired by Davis from a bench-rest.
1448	10	91	S	SAT	Fired by Davis from a bench-rest.
1454	10	101	S	SAT	Fired by Davis from prone position with sling and asbestos glove.
1506	100	201	A	SAT	Fired by Hendricks.
1567	10	211	S	SAT	Fired by Davis from a bench-rest.

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
1509	10	221	S	SAT	Fired by Davis from prone position with sling and asbestos glove.
22 September 1960					
		25-Yard Automatic-Accuracy Test			
0840	3	224	S	SAT	Fouling shots.
1424	3	227	A	SAT	Sighting shots.
1426 to 1500	30	257	A	SAT	Fired by Davis from standing position.
23 September 1960					
0850	3	260	S	SAT	Fouling shots.
1122 to 1135	30	290	A	SAT	Fired by Davis from prone position with sling.
		100-Yard Rate-of Aimed-Fire Test			
1500 to 1501	40	330	S	1-FBC	Fired by Davis from prone position with sling and asbestos glove.
26 September 1960					
0915 to 0916	99	429	A	1-FBC	Fired by Davis from prone position with sling and asbestos glove.
1030 to 1031	74	503	S	SAT	Fired by Davis from prone position with sling and asbestos glove.
1130 to 1131	104	607	A	SAT	Fired by Davis from prone position with sling and asbestos glove.
1335 to 1336	60	667	S	SAT	Fired by Davis from prone position with sling and asbestos glove.
1430 to 1431	99	766	A	1-FBC	Fired by Davis from prone position with sling and asbestos glove.

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
				ENDURANCE TEST	
				Velocity Test	
27 September 1960					
The rifle was disassembled, cleaned and lubricated.					
1129	3	769	S	SAT	Fouling shots.
1131 to 1135	20	789	S	SAT	
				Function Test	
1445	100	889	S	SAT	
1528	100	989	A	SAT	Cyclic rate 710 rounds per minute.
28 September 1960					
Fired with the rifle held loosely in the hands.					
0930	100	1089	S	2-FBC	
1014	100	1189	A	1-FBC	
Fired with the rifle held right side up.					
1043	100	1289	S	5-FBC	
1135	100	1389	A	3-FBC	One magazine was replaced at request of representative.
The rifle was disassembled, cleaned and lubricated. The gas tube was out of alignment. It was bent back to its original shape.					
Fired with the rifle held left side up.					
1349	100	1489	S	SAT	
1437	100	1589	A	1-FBC	
29 September 1960					
Fired with the rifle held loosely at a depression of 80°.					
0910	100	1689	S	SAT	The front sight taper pin loosened. It was tightened.
0957	100	1789	A	SAT	

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
Fired with the rifle held normally at a depression of 80°.					
1047	100	1889	S	SAT	
1125	100	1989	A	SAT	
The rifle was disassembled, cleaned and lubricated. Fired with the rifle held loosely at an elevation of 80°.					
1335	100	2089	S	SAT	One large leak in primer joint.
1412	100	2189	A	SAT	
Fired with the rifle held normally at an elevation of 80°.					
1437	100	2289	S	5-FJ	
1503	100	2389	A	1-FJ	
Fired with the rifle held normally.					
1518	100	2489	S	1-FJ	
1539	100	2589	A	SAT	
30 September 1960					
The rifle was disassembled, cleaned and lubricated.					
1006	100	2689	S	SAT	
1049	100	2789	A	SAT	
1124	100	2889	S	SAT	
1240	100	2989	A	1-FJ	
1322	100	3089	S	SAT	
1349	100	3189	A	SAT	
The rifle was disassembled, cleaned and lubricated.					
1425	100	3289	S	4-FJ	
1451	100	3389	A	SAT	
1520	100	3489	S	2-FJ	
1534	100	3589	A	SAT	
1 October 1960					
0910	100	3689	S	SAT	
0930	100	3789	A	1-FJ	

The rifle was disassembled, cleaned and lubricated.
The gas regulator was turned down 1 click in an effort to eliminate failures to eject.

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
1015	100	3889	S	SAT	
1050	100	3989	A	SAT	
1110	100	4089	S	SAT	
1139	100	4189	A	SAT	
1252	100	4289	S	SAT	
1312	100	4389	A	SAT	

The rifle was disassembled, cleaned and lubricated.

1345	100	4489	S	SAT	
1406	100	4589	A	SAT	
1430	100	4689	S	SAT	
1451	100	4789	A	SAT	
1509	100	4889	S	SAT	
1527	100	4989	A	SAT	

The rifle was disassembled, cleaned and lubricated.

3 October 1960

0907	100	5089	S	SAT	

Fired with the rifle held normally at an elevation of 80°.

0954	100	5189	A	SAT	
1014	100	5289	S	SAT	
1034	100	5389	A	SAT	
1052	100	5489	S	SAT	

Fired with the rifle held normally.

1121	100	5589	A	SAT	

The rifle was disassembled, cleaned and lubricated.

1338	100	5689	S	SAT	
1413	100	5789	A	SAT	
1439	100	5889	S	SAT	
1500	100	5989	A	SAT	
1525	100	6089	S	SAT	
1546	100	6189	A	SAT	

4 October 1960

The rifle was disassembled, cleaned and lubricated.

1052	100	6289	S	SAT	

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
1121	100	6389	A	SAT	
1149	100	6489	S	SAT	
1244	100	6589	A	2-FBC	
1316	100	6689	S	SAT	
1340	100	6789	A	SAT	Cyclic rate 654 rounds per minute.

The rifle was disassembled, cleaned and lubricated.

100-Yard Bench-Rest Accuracy Test

1512	3	6792	S	SAT	Fouling shots.
1513 to 1525	40	6832	S	SAT	Fired by Davis from a bench-rest.

5 October 1960

The rifle was disassembled and inspected.

It was observed that the lands were worn to the approximate depth of grooves for two inches forward of origin of rifling.

Fouling on lands through central part of bore.

Velocity Test

1048	3	6835	SS	SAT	Fouling shots.
1049 to 1104	20	6855	SS	SAT	

EXTREME-COLD TEST

The rifle was disassembled, cleaned, lubricated and subjected to a temperature of -65°F for a 12-hour period.

6 October 1960

0940	20	6875	S	SAT	
1050	20	6895	A	1-FBC	The charging handle was difficult to operate when wearing arctic mittens.

UNLUBRICATED TEST

The rifle was disassembled, cleaned in solvent, and left in an unlubricated condition.

1313	50	6945	S	1-FF
1315	50	6995	A	SAT

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
				DUST TEST	
The rifle was disassembled, cleaned and lubricated.					
1509	10	7005	S	SAT	
1510	10	7015	A	SAT	
				MUD TEST	
7 October 1960					
The rifle was disassembled, cleaned and lubricated.					
0948 to 0956	4	7019	S	2-FF 2-FTF 3-FJ 5-BLE	The butt was forced against the ground sharply on several occasions while applying a force to the charging handle in order to retract the operating parts. A round ejected from the magazine on one occasion when the magazine was inserted in the rifle.
0957	1	7020	SS	1-FJ	
The operating parts could not be retracted after the failure to eject by the gunner (Crowther). The rifle was disassembled, cleaned and lubricated with Lubriplate.					
				RAIN TEST	
8 October 1960					
The rifle was subjected to the spray in a horizontal position.					
0938 to 0942	100	7120	S	SAT	
0952 to 0956	28	7148	A	7-FF	
The rifle was removed from the spray and inspected. The gas tube was bent to align properly with the bolt carrier key. The gas regulator was opened 1 click.					
1005	3	7151	S	SAT	
The rifle was again subjected to the spray in a horizontal position.					

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
1021 to 1022	72	7223	A	SAT	

[a]The rifle was subjected to the spray with muzzle up. The rifle was fired in a horizontal position.

1038	1	7224	S	1-FBC 1-FX	The bolt failed to lock fully on the first round from a magazine while the rifle was suspended in a vertical position.

The rifle was removed from the spray and inspected.

The case was deformed at the rear and it was ruptured under the extractor. A piece of brass was forced under the extractor. The extractor and firing pin were bent and the magazine disassembled. The rifle was disassembled and the extractor, firing pin, extractor pin, and roll pin (ejector pin) were replaced.

The rifle was again subjected to the spray.

1121 to 1146	99	7323	S	1-FF	The last round in a magazine ejected from the magazine and the bolt stopped on the magazine box.
1157 to 1159	99	7422	A	1-FBC 1-FF 1-FOR	The bolt failed to lock fully on the first round from a magazine while the rifle was suspended in a vertical position. The last round ejected from a magazine and it was not observed until the cases were inspected. This round was fired in the next cycle. The failure to feed was similar to the one which occurred in the previous cycle.

The rifle was subjected to the spray with muzzle down. It was fired in a horizontal position.

[a]The gunner was instructed to depress the muzzle before firing to permit water accumulating in the bore to run out. The gunner stated that he depressed the muzzle briefly but observed no water running out.

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
1211 to 1215	101	7523	S	SAT	
1225 to 1227	100	7623	A	1-FF 1-FBR	The bolt engaged the magazine box on the last round in one magazine.

The rifle was disassembled, cleaned and lubricated.

10 October 1960

COOK-OFF TEST

Weather for this test: Temperature 58 to 62°F. Density 1.016 to 1.006. Wind NE, 0 to 3 mph.

0928	260	7883	A	SAT	Time from firing first round to loading of cook-off round 1 min 33 sec. A cook-off occurred in 37 sec.

After waiting several minutes the rifle could not be handled comfortably by the handguard or forward part of receiver.

The rifle was cooled to ambient temperature at 1010 hrs.

1020	200	8083	A	SAT	Time from firing first round to loading of cook-off round 56 sec. No cook-off occurred.

After waiting 5 min the rifle was uncomfortable to handle by the handguard.

Rifle, Caliber 7.62-mm, AR-10 Number 4263
Cartridge, Ball, Caliber .30, T104E1, Lot FA14

SPECIAL TESTS

100-Yard Bench-Rest Accuracy Test

6 October 1960

1440	4	4	S	SAT	Sighting shots.
1442 to 1447	10	14	S	SAT	Fired by Perrin from a bench-rest.
1450 to 1455	10	24	S	SAT	Fired by Perrin from a bench-rest with bayonet attached.

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
7 October 1960					
1124	4	28	S	SAT	Sighting shots.
1125 to 1135	20	48	S	SAT	Fired by Perrin from a bench-rest with the flash suppressor attached.
1150 to 1155	20	68	S	SAT	Fired by Perrin from a bench-rest with the flash suppressor removed.

Rifle, Caliber 7.62-mm, AR-10, Number 4412
Cartridge, Ball, Caliber .30, T104E1, Lot FA14

The rifle was inspected, and the weights and measurements were recorded.

ACCURACY TESTS

100-Yard Bench-Rest Accuracy Test

21 September 1960

The rifle was field stripped and lubricated.

0935	8	8	S	SAT	Fired by Mr. Stoner to adjust gas regulator.
0938	13	21	A	SAT	Fired by Mr. Stoner to assure proper gas regulator adjustment.
1111	8	29	S	SAT	Sighting shots.
1125 to 1144	40	69	S	SAT	Fired by Perrin from a bench rest.

22 September 1960

100-Yard Combat-Accuracy Test

0840	3	72	S	SAT	Fouling shots.
0915	10	82	S	SAT	Fired by Perrin from a bench-rest.
0958	10	92	S	SAT	Fired by Perrin from a bench-rest.
1002	10	102	S	SAT	Fired by Perrin from prone position with sling and asbestos glove.
1015	97	199	A	3-FBC	Fired by Davis. On 2 of the malfunctions the extractor did not engage the rim of the case and therefore the cartridge did not eject when the handle was retracted.

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
1016	10	209	S	SAT	Fired by Perrin from a bench-rest.
1018	10	219	S	SAT	Fired by Perrin from prone position with sling and asbestos glove.
		25-Yard Automatic-Accuracy Test			
1550 to 1608	30	249	A	SAT	Fired by Perrin from standing position.
23 September 1960					
0852	3	252	S	SAT	Fouling shots.
1522 to 1537	30	282	A	SAT	Fired by Perrin from prone position with sling.
		100-Yard Rate-of-Aimed-Fire Test			
1525 to 1526	50	332	S	1-FBC	Fired by Perrin from prone position with sling and asbestos glove.
26 September 1960					
0942 to 0943	80	412	A	SAT	Fired by Perrin from prone position with sling and asbestos glove.
1055 to 1056	60	472	S	2-FBC	Fired by Perrin from prone position with sling and asbestos glove.
1153 to 1154	77	549	A	2-FBC	Fired by Perrin from prone position with sling and asbestos glove. On both malfunctions the extractor did not engage the rim of the case and, therefore, the round did not eject when the handle was retracted. A second round was forced from the magazine against the chambered round. It was necessary to disengage the magazine to remove the rounds.
1350 to 1351	60	609	S	1-FBC	Fired by Perrin from prone position with sling and asbestos glove.
1450 to 1451	93	702	A	1-FBC	Fired by Perrin from prone position with sling and asbestos glove.

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks

ENDURANCE TEST

Velocity Test

27 September 1960

The rifle was disassembled, cleaned and lubricated.

1250	3	705	SS	SAT	Fouling shots.
1252 to 1256	20	725	SS	SAT	

Function Test

1453	100	825	S	SAT	
1536	100	925	A	SAT	Cyclic rate 712 rounds per minute.

28 September 1960

Fired with the rifle held loosely in the hands.

0946	100	1025	S	SAT	
1023	100	1125	A	SAT	

Fired with the rifle held right side up.

1107	100	1225	S	SAT	
1147	100	1325	A	3-FBC	One magazine was replaced at request of representative.

The rifle was disassembled, cleaned and lubricated.
Fired with the rifle held left side up.

1410	100	1425	S	SAT	
1452	100	1525	A	SAT	

29 September 1960

Fired with the rifle held loosely at a depression of 80°.

0926	100	1625	S	1-FBC	The front sight taper pin loosened. It was tightened.
1009	100	1725	A	SAT	

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
Fired with the rifle held normally at a depression of 80°.					
1102	100	1825	S	SAT	
1132	100	1925	A	SAT	
The rifle was disassembled, cleaned and lubricated. Fired with the rifle held loosely at an elevation of 80°.					
1346	100	2025	S	SAT	
1420	100	2125	A	SAT	
Fired with the rifle held normally at an elevation of 80°.					
1448	100	2225	S	SAT	
1505	100	2325	A	2-FJ	
Fired with the rifle held normally.					
1528	100	2425	S	SAT	
1542	100	2525	A	SAT	
30 September 1960					
The rifle was disassembled, cleaned and lubricated.					
1033	100	2625	S	SAT	
1055	100	2725	A	SAT	
1130	100	2825	S	1-FJ	
1250	100	2925	A	SAT	
1331	100	3025	S	SAT	
1356	100	3125	A	SAT	
The rifle was disassembled, cleaned and lubricated.					
1440	100	3225	S	SAT	
1507	100	3325	A	SAT	
1532	100	3425	S	SAT	
1 October 1960					
0856	100	3525	A	SAT	
0912	100	3625	S	SAT	
0925	100	3725	A	2-FJ	
The rifle was disassembled, cleaned and lubricated.					

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
The gas regulator was turned down 1 click in an effort to eliminate failures to eject.					
1040	100	3825	S	SAT	
1100	100	3925	A	SAT	
1130	100	4025	S	SAT	
1156	100	4125	A	SAT	
1258	100	4225	S	SAT	
1319	100	4325	A	SAT	
The rifle was disassembled, cleaned and lubricated.					
1353	100	4425	S	SAT	
1415	100	4525	A	SAT	
1443	100	4625	S	SAT	The lip was bent on one magazine. The magazine was replaced.
1506	100	4725	A	1-FBC	
1525	100	4825	S	SAT	
1546	100	4925	A	SAT	
3 October 1960					
The rifle was disassembled, cleaned and lubricated.					
0927	100	5025	S	SAT	
Fired with the rifle held normally at an elevation of 80°.					
0956	100	5125	A	1-FJ	
1018	100	5225	S	SAT	
1040	100	5325	A	SAT	
1100	100	5425	S	SAT	
Fired with the rifle held normally.					
1132	100	5525	A	SAT	
The rifle was disassembled, cleaned and lubricated.					
1354	100	5625	S	SAT	
1420	100	5725	A	SAT	
1444	100	5825	S	SAT	
1507	100	5925	A	SAT	
1531	100	6025	S	SAT	
1550	100	6125	A	SAT	

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
4 October 1960					
The rifle was disassembled, cleaned and lubricated.					
1017	100	6225	S	SAT	
1100	100	6325	A	1-FBC	
1129	100	6425	S	SAT	
1145	100	6525	A	SAT	
1245	100	6625	S	SAT	
1308	100	6725	A	SAT	Cyclic rate 667 rounds per minute.
The rifle was disassembled, cleaned and lubricated.					
		100-Yard Bench-Rest Accuracy Test			
1408	3	6728	S	SAT	Fouling shots.
1410 to 1426	40	6768	S	SAT	Fired by Perrin from a bench-rest.
5 October 1960					
The rifle was disassembled and inspected.					
It was observed that the lands were worn to the approximate depth of grooves for two inches forward of origin of rifling. Fouling on lands through central part of bore.					
		Velocity Test			
1113	3	6771	SS	SAT	Fouling shots.
1114 to [illegible]	20	6791	SS	SAT	
		EXTREME-COLD TEST			
The rifle was disassembled, cleaned, lubricated and subjected to a temperature of -65°F for a 12-hour period.					
6 October 1960					
0946	20	6811	S	SAT	The charging handle was difficult to operate, when wearing arctic mittens.
1056	20	6831	A	SAT	
		UNLUBRICATED TEST			
The rifle was disassembled, cleaned in solvent, and left in an unlubricated condition.					

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
1359	50	6881	S	SAT	
1401	50	6931	A	SAT	

DUST TEST

The rifle was disassembled, cleaned and lubricated.

1512	10	6941	S	SAT	
1513	10	6951	A	SAT	

MUD TEST

7 October 1960

The rifle was disassembled, cleaned and lubricated.

1020 to 1025	10	6961	S	7-BLE 2-FF 3-FJ	The butt was forced against the ground sharply on several occasions while applying a force to the charging handle in order to retract the operating parts.
1025	2	6963	A	2-BLE 2-FJ	The butt was forced against the ground sharply on several occasions while applying a force to the charging handle in order to retract the operating parts.

The operating parts could not be retracted after the last failure to eject by the gunner (Crowther). However, the rifle was cleared and reloaded by Mr. Deibel.

The rifle was disassembled, cleaned and lubricated with Lubriplate.

RAIN TEST

8 October 1960

The rifle was subjected to the spray in a horizontal position.

1244 to 1247	100	7063	S	SAT
1256	1	7064	A	1-FX

The rifle was removed from the spray and inspected. The case was deformed at the rear and it ruptured under the extractor. The extractor was bent and the magazine disassembled. The rifle was disassembled and the extractor was replaced.

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
The rifle was again subjected to the spray in a horizontal position.					
1344 to 1346	99	7136	A	SAT	
The rifle was subjected to the spray with muzzle up. The muzzle was depressed before firing to let water accumulating in the bore run out. The rifle was fired in a horizontal position.					
1357 to 1400	100	7263	S	SAT	
1411 to 1413	100	7363	A	1-FBC 1-FF	The bolt failed to lock fully on the first round from a magazine while the rifle was suspended in a vertical position.
The rifle was subjected to the spray with muzzle down. The rifle was fired in a horizontal position.					
1423 to 1424	100	7463	S	SAT	
1434 to 1439	40	7503	A	29-FF 1-BLE 1-FJ 1-FBR	The gas regulator was opened two clicks after this firing.
1439	60	7563	A	SAT	

10 October 1960

The rifle was disassembled, cleaned and lubricated.

COOK-OFF TEST

Weather for this test: Temperature 62°F. Density 1.011. Wind NE, 3 mph.

0957	220	7783	A	SAT	Time from firing first round to loading of cook-off round 1 min 9 sec. A cook-off occurred in 1 min 57 sec.

The rifle was cleaned and inspected.

Rifle, Caliber 7.62-mm, AR-10, Number 4480
Cartridge, Ball, Caliber .30, T104E1, Lot FA14

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks

SPECIAL TESTS

100-Yard Bench-Rest Accuracy Test

6 October 1960

1345	3	3	S	SAT	Sighting shots.
1347 to 1352	10	13	S	SAT	Fired by Perrin from a bench-rest.
1400 to 1405	10	23	S	SAT	Fired by Perrin from a bench-rest with bayonet attached.

Rifle, Caliber 7.62-mm, AR-10, Number 4534
Cartridge, Ball, Caliber .30, T104E1, Lot FA14

The rifle was inspected, and the weights and measurements were recorded.

ACCURACY TESTS

100-Yard Bench-Rest Accuracy Test

21 September 1960

The rifle was field stripped and lubricated.

0940	3	3	S	SAT	Fired by Mr. Stoner to adjust gas regulator.
0942	18	21	A	SAT	Fired by Mr. Stoner to assure proper gas regulator adjustment.
1302	8	29	S	SAT	Sighting shots.
1312	2	31	A	SAT	The lever was unintentionally set for automatic fire.
1313 to 1328	40	71	S	SAT	Fired by Hendricks from a bench-rest.

22 September 1960

100-Yard Combat-Accuracy Test

0841	3	74	S	SAT	Fouling shots.
0943	10	84	S	SAT	Fired by Hendricks from a bench-rest.
1103	10	94	S	SAT	Fired by Hendricks from a bench-rest.
1107	10	104	S	SAT	Fired by Hendricks from prone position with sling and asbestos glove.

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
1116	100	204	A	SAT	Fired by Davis.
1117	10	214	S	SAT	Fired by Hendricks from a bench-rest.
1119	10	224	S	SAT	Fired by Hendricks from prone position with sling and asbestos glove.

25-Yard Automatic-Accuracy Test

23 September 1960

0853	3	227	S	SAT	Fouling shots.
0925 to 0950	30	257	A	SAT	Fired by Hendricks from standing position.
1409 to 1420	30	287	A	SAT	Fired by Hendricks from prone position with sling.

100-Yard Rate-of-Aim-Fire Test

1542 to 1543	51	338	S	SAT	Fired by Hendricks from prone position with sling and asbestos glove.

26 September 1960

1010 to 1011	100	438	A	SAT	Fired by Hendricks from prone position with sling and asbestos glove.
1115 to 1116	59	497	S	1-FBC	Fired by Hendricks from prone position with sling and asbestos glove.
1310 to 1311	105	602	A	2-FBC	Fired by Hendricks from prone position with sling and asbestos glove
1410 to 1411	60	662	S	SAT	Fired by Hendricks from prone position with sling and asbestos glove.
1515 to 1516	120	782	A	SAT	Fired by Hendricks from prone position with sling and asbestos glove.

ENDURANCE TEST

Velocity Test

27 September 1960

Time	No. Rds Fired	Total No. of Rds Fired on Tc	Type Fire	Function	Remarks
The rifle was disassembled, cleaned and lubricated.					
1310	3	785	S	SAT	Fouling shots.
1312 to 1316	20	805	S	SAT	
			Function Test		
1500	100	905	S	SAT	
1545	100	1005	A	SAT	Cyclic rate 673 rounds per minute.
28 September 1960					
Fired with the rifle held loosely in the hands.					
0958	100	1105	S	SAT	
1031	100	1205	A	SAT	
Fired with the rifle held right side up.					
1121	100	1305	S	SAT	
1255	100	1405	A	SAT	
The rifle was disassembled, cleaned and lubricated. Fired with the rifle held left side up.					
1425	100	1505	S	SAT	
1459	100	1605	A	SAT	
29 September 1960					
Fired with the rifle held loosely at a depression of 80°.					
0932	100	1705	S	SAT	
1020	100	1805	A	SAT	
Fired with the rifle held normally at a depression of 80°.					
1114	100	1905	S	SAT	
1143	100	2005	A	SAT	
The rifle was disassembled, cleaned and lubricated. Fired with the rifle held loosely at an elevation of 80°.					
1401	100	2105	S	SAT	

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
1430	100	2205	A	SAT	

Fired with the rifle held normally at an elevation of 80°.

1453	100	2305	S	2-FJ	
1515	100	2405	A	SAT	

Fired with the rifle held normally.

1532	100	2505	S	SAT	
1543	100	2605	A	SAT	

30 September 1960

The rifle was disassembled, cleaned and lubricated.

0955	100	2705	S	SAT	
1101	100	2805	A	SAT	
1137	100	2905	S	SAT	
1256	100	3005	A	1-FBR	
1339	100	3105	S	SAT	
1402	100	3205	A	SAT	One blown primer.

The rifle was disassembled, cleaned and lubricated.

1457	100	3305	S	SAT	
1521	100	3405	A	1-FJ	
1544	100	3505	S	SAT	

1 October 1960

0858	100	3605	A	SAT	
0923	100	3705	S	SAT	
0944	100	3805	A	1-FJ 1-FBC	

The rifle was disassembled, cleaned and lubricated.

1108	100	3905	S	SAT	
1128	100	4005	A	SAT	
1145	100	4105	S	SAT	
1247	100	4205	A	SAT	
1304	100	4305	S	SAT	
1327	100	4405	A	1-FJ	

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
The rifle was disassembled, cleaned and lubricated.					
1427	100	4505	S	SAT	
1456	100	4605	A	SAT	
1516	100	4705	S	SAT	
1537	100	4805	A	SAT	
1555	100	4905	S	SAT	
3 October 1960					
0900	100	5005	A	SAT	
The rifle was disassembled, cleaned and lubricated.					
1115	100	5105	S	1-FJ	
1142	100	5205	A	SAT	
1245	100	5305	S	SAT	
1314	100	5405	A	SAT	
1337	100	5505	S	SAT	
1405	100	5605	A	SAT	
The rifle was disassembled, cleaned and lubricated.					
1453	100	5705	S	SAT	
1514	100	5805	A	1-FJ	
1540	100	5905	S	SAT	
4 October 1960					
0944	100	6005	A	SAT	
1008	100	6105	S	SAT	
1039	100	6205	A	3-FJ	
The rifle was disassembled, cleaned and lubricated.					
1135	100	6305	S	SAT	
1252	100	6405	A	SAT	
1350	100	6505	S	1-FJ	
1433	100	6605	A	SAT	
1506	100	6705	S	2-FJ	
1557	100	6805	A	SAT	Cyclic rate 672 rounds per minute.
5 October 1960					
The rifle was disassembled, cleaned and lubricated.					

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
					100-Yard Bench-Rest Accuracy Test
0930	3	6808	S	SAT	Fouling shots. The bolt release was difficult to operate.
0931 to 0944	40	6848	S	SAT	Fired by Hendricks from a bench-rest.

The rifle was disassembled and inspected.

It was observed that the lands were worn to approximate depth of grooves for two inches forward of origin of rifling.

Fouling on lands and in grooves in central part of bore.

					Velocity Test
1132	3	6851	SS	SAT	Fouling shots.
1133 to 1136	20	6871	SS	SAT	

EXTREME-COLD TEST

The rifle was disassembled, cleaned, lubricated and subjected to a temperature of -65°F for a 12-hour period.

6 October 1960

0952	20	6891	S	1-FBC	The charging handle was difficult to operate when wearing arctic mittens.
1102	20	6911	A	SAT	

UNLUBRICATED TEST

The rifle was disassembled, cleaned in solvent and left in an unlubricated condition.

1438	50	6961	S	SAT
1440	50	7011	A	SAT

DUST TEST

The rifle was disassembled, cleaned and lubricated.

7 October 1960

0936	10	7021	S	SAT
0936	10	7031	A	SAT

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
					The rifle was disassembled, cleaned and lubricated. The gas regulator was damaged during disassembly. It was replaced.

MUD TEST

The rifle was disassembled, cleaned and lubricated.

1322	12	7043	S	SAT	
1322	8	7051	A	SAT	

At the request of a representative an additional 20 rounds were loaded in a magazine, not subjected to the mud, and fired.

1323	10	7061	S	SAT	
1324	10	7071	A	1-BLE	

All firing in the mud test with this rifle was done by Mr. Deibel.

The rifle was disassembled, cleaned and lubricated with Lubriplate.

RAIN TEST

8 October 1960

The rifle was subjected to the spray in a horizontal position.

1505 to 1510	100	7171	S	1-BLE 1-FBR	The charging handle failed to remain in its forward position during firing.
1520 to 1522	100	7271	A	1-FJ	The stoppage occurred on the first round. The case was deformed at the rear.

The rifle was subjected to the spray with muzzle up. The muzzle was depressed before firing to permit water accumulating in the bore to run out. The rifle was fired in a horizontal position.

1533 to 1537	100	7371	S	1-FZ	
1547 to 1550	100	7471	A	1-FBC 1-BLE	The bolt failed to lock fully on the first round from a magazine while the rifle was suspended in a vertical position.

Time	No. Rds Fired	Total No. of Rds Fired on Test	Type Fire	Function	Remarks
The rifle was subjected to the spray with muzzle down. It was fired in a horizontal position.					
1600 to 1602	100	7571	S	SAT	
1612 to 1614	100	7671	A	SAT	

ACCURACY TEST

DATE: 21 September 1960
RANGE: 100 yards
DIRECTION OF FIRE: S
FIRED FROM: Bench rest
RIFLE: Caliber, 7.62-mm, AR-10
CARTRIDGE: Ball, Caliber .30, T104E1, Lot FA14
TARGET: A (with 10-inch bull's-eye)

WIND: NNE to E, 4 to 10 mph
SKY CONDITION: Overcast
TEMPERATURE: 68 to 70°F

Target measurements are given in inches.

Rifleman	Target No.	Group Center From Target Center	MR	MVD	MHD	EVD	EHD	ES
D. Davis	1		1.4	0.8	1.0	3.0	3.3	3.7
AR10 No. 4219	2		1.0	0.8	0.5	2.8	1.5	2.8
	3		1.2	0.7	0.8	3.2	3.1	3.4
	4		1.1	0.7	0.7	3.3	2.8	3.8
		Average	1.2	0.8	0.8	3.1	2.7	3.4
M. Perrin	1		0.7	0.4	0.6	1.4	2.3	2.3
AR10 No. 4412	2		0.8	0.6	0.5	2.0	2.0	2.7
	3		0.9	0.6	0.6	2.8	2.7	3.2
	4		1.0	0.9	0.5	3.5	1.7	3.5
		Average	0.8	0.6	0.6	2.4	2.2	2.9
G. Hendricks	1		1.1	0.9	0.5	3.8	2.0	3.9
AR10 No. 4534	2		1.0	0.6	0.6	2.2	2.2	2.9
	3		0.9	0.6	0.6	2.3	2.0	2.3
	4		1.0	0.7	0.5	2.6	1.5	3.0
		Average	1.0	0.7	0.6	2.7	1.9	3.0
		Average for all targets	1.0	0.7	0.7	2.7	2.3	3.1

COMBAT-ACCURACY TEST

DATE: 21 and 22 September
RANGE: 100 yards
DIRECTION OF FIRE: S
RIFLE: Caliber, 7.62-mm, AR-10
CARTRIDGE: Ball, Caliber .30, T104E1, Lot FA14
TARGET: A (with 10-inch bull's-eye)

WIND: NE to ENE, 4 to 10 mph
SKY CONDITION: Broken to overcast
TEMPERATURE: 63 to 71°

All target data are given in inches.
Target number 1 = Normal bench-rest group.
Target number 2 = Bench-rest group starting with a cold and oiled bore.
Target number 3 = Normal prone group.
Target number 4 = Bench-rest group with a hot barrel.
Target number 5 = Prone group with a hot barrel.

							Group Center From Aiming Point		Measurements from Center of Group No. 1 Group Center			
Target No.	MR	MVD	MHD	EVD	EHD	ES	Vert	Hor	Vert	Hor	Mean	ES
Rifleman: D. Davis AR-10, Number 4219												
1	0.8	0.6	0.5	2.0	2.1	2.1	+1.6	-0.6			0.8	2.1
2	1.1	0.7	0.7	2.4	2.7	3.3	+2.0	+0.4	+0.4	+1.0	1.4	2.5
3	1.1	0.8	0.7	3.4	2.7	3.5	-0.4	-0.2	-2.0	+0.4	2.2	4.0
4	1.6	1.2	1.0	4.1	3.6	4.8	+0.2	-3.1	-1.4	-2.5	3.2	4.6
5	1.0	1.1	1.2	3.6	6.5	6.8	-2.0	-4.0	-3.6	-3.3	5.2	7.3
Average	1.3	0.9	0.8	3.1	3.5	4.1	+0.3	-1.5	-1.3	-0.9	2.6	4.1
Rifleman: M. Perrin AR-10, Number 4412												
1	1.0	0.7	0.5	3.1	2.6	3.6	+0.7	-0.4			1.0	3.6
2	0.9	0.7	0.4	3.1	1.2	3.1	+0.2	-0.9	-0.5	-0.5	1.1	2.8
3	1.0	0.7	0.6	2.6	2.1	2.6	-1.0	-1.1	-1.8	-0.7	2.0	3.3
4	1.2	1.0	0.9	4.2	[illegible]	4.3	-1.6	-0.1	-2.3	+0.3	2.5	4.5
5	1.3	0.8	0.9	[illegible]	3.4	4.0	-3.4	-0.7	-4.2	-0.3	4.3	5.7
Average	1.1	0.8	0.6	3.2	2.2	3.5	-1.0	-0.6	-1.8	-0.2	2.2	4.0
Rifleman: G. Hendricks AR-10, Number 4534												
1	1.0	0.9	0.4	3.5	1.5	3.5	+2.4	-2.0			1.0	3.5
2	1.1	0.8	0.7	2.8	2.5	3.4	+3.5	-1.7	+1.1	+0.3	1.5	2.5
3	1.3	1.0	0.7	3.4	3.3	3.8	+1.3	-4.0	-1.1	-2.0	2.6	3.6
4	1.7	0.9	1.1	3.8	6.4	6.4	+0.9	-4.4	-1.5	-2.4	3.2	6.4
5	1.5	1.1	0.8	3.8	3.6	4.2	-1.1	-4.0	-3.5	-2.0	4.2	6.2
Average	1.3	0.9	0.7	3.5	3.5	4.3	+1.4	-3.2	-1.0	-1.2	2.5	4.4
Average for all targets	1.2	0.9	0.7	3.3	3.1	4.0	+0.2	-1.7	-1.4	-0.8	2.4	4.2

AUTOMATIC ACCURACY TEST

DATE: 23 September 1960 RANGE: 25 yards

RIFLE: Caliber, 7.62-mm, AR-10, Number 4534

CARTRIDGE: Ball, Caliber .30, T104E1, Lot FA14

FIRING POSITION: Standing RIFLEMAN: G. Hendricks

Fired in three-round bursts. Measurements are given in inches.

Burst No.	Distance from Aiming Point to First Shot		Distance from Aiming Point to Second Shot		Distance from Aiming Point to Third Shot	
	Vert	Hor	Vert	Hor	Vert	Hor
1	-0.5	-0.2	+59.7	+20.9	+143.9	+61.9
2	-2.4	-0.6	+64.2	+29.0	+148.5	+77.5
3	-2.0	0.0	+52.4	+33.6	+118.4	+68.3
4	-2.2	-1.1	+50.2	+24.8	+122.1	+56.6
5[a]	-1.7	-0.8	+48.0	+14.2	+113.3	+ 5.1
6	-2.5	-1.2	+62.0	+32.1	+144.7	+94.8
7	-2.0	-1.0	+65.4	+30.5	+137.1	+83.6
8	-2.0	-1.0	+50.9	+33.6	+123.0	+76.9
9	-3.1	-1.6	+49.6	+33.4	+138.9	+82.1
10	-2.1	-1.3	+49.3	+36.4	+120.7	+73.1
Average	-2.05	-0.88	+55.17	+28.85	+131.06	+67.99

30-shot group	Mean From Aiming Point	EV	EH	ES
	71.6	151.6	96.4	177.8

Mean for shots fired automatically (from center of impact of first shot in each burst)

108.7

[a]At end of burst toe of rifle was resting on top of shooter's shoulder.

AUTOMATIC ACCURACY TEST

DATE: 22 September 1960 RANGE: 25 yards

RIFLE: Caliber, 7.62-mm, AR-10, Number 4219

CARTRIDGE: Ball, Caliber .30, T104E1, Lot F414

FIRING POSITION: Standing RIFLEMAN: D. Davis

Fired in three-round bursts. Measurements are given in inches.

Burst No.	Distance from Aiming Point to First Shot		Distance from Aiming Point to Second Shot		Distance from Aiming Point to Third Shot	
	Vert	Hor	Vert	Hor	Vert	Hor
1	-3.0	+1.1	+60.5	+25.1	+160.1	+75.7
2	-0.8	+0.7	+54.9	+30.2	+150.6	+78.0
3	+0.3	-0.2	+64.7	+25.2	+173.7	+74.7
4	+0.7	+0.3	+65.6	+32.7	+165.3	+88.7
5	-1.3	+2.3	+67.5	+26.1	+181.7	+79.8
6	+0.2	+0.8	+62.1	+25.6	+172.3	+76.0
7	-0.3	-0.1	+60.0	+17.3	+168.7	+74.9
8	+0.8	+1.5	+55.7	+18.1	+156.4	+70.2
9	-0.2	+1.2	+62.6	+30.6	+155.9	+80.3
10	-0.9	-0.2	+69.5	+26.2	+178.7	+79.5
Average	-0.45	+0.74	+62.31	+25.71	+166.34	+77.78

30-shot group	Mean From Aiming Point	EV	EH	ES
	84.2	184.7	88.7	201.4

Mean for shots fired automatically (from center of impact of first shot in each burst)

125.7

AUTOMATIC ACCURACY TEST

DATE: 22 September 1960 RANGE: 25 yards

RIFLE: Caliber, 7.62-cm, AR-10, Number 4412

CARTRIDGE: Ball, Caliber .30, T104E1, Lot FA14

FIRING POSITION: Standing RIFLEMAN: M. Perrin

Fired in three-round bursts. Measurements are given in inches.

Burst No.	Distance from Aiming Point to First Shot		Distance from Aiming Point to Second Shot		Distance from Aiming Point to Third Shot	
	Vert	Hor	Vert	Hor	Vert	Hor
1	-3.8	0.0	+49.2	+21.2	+148.3	+61.9
2	-2.9	-1.0	+44.8	+23.3	+134.0	+65.3
3	-1.9	-0.5	+46.7	+21.0	+127.4	+57.0
4	-3.3	-0.1	+50.9	+21.4	+140.0	+51.2
5	-3.0	-0.9	+49.6	+21.2	+142.7	+55.6
6	-2.9	0.0	+52.1	+24.3	+144.7	+60.8
7	-2.7	-0.2	+43.1	+19.8	+124.1	+46.9
8	-1.8	-1.1	+50.3	+17.2	+137.0	+54.2
9	-2.1	+0.3	+48.5	+18.3	+136.2	+48.6
10	-3.7	-0.5	+44.0	+14.0	+127.6	+39.3
Averege	-2.81	-0.40	+47.92	+20.17	+136.20	+54.08

30-shot group	Mean From Aiming Point	EV	EH	ES
	67.2	152.1	66.5	164.5

Mean for shots fired automatically (from center of impact of first shot in each burst)

109.9

AUTOMATIC ACCURACY TEST

DATE: 23 September 1960 RANGE: 25 yards

RIFLE: Caliber, 7.62-mm, AR-10, Number 4219

CARTRIDGE: Ball, Caliber .30, T104E1, Lot FA14

FIRING POSITION. Prone (without sling) RIFLEMAN: D. Davis

Fired in three-round bursts. Measurements are given in inches.

Burst No.	Distance from Aiming Point to First Shot		Distance from Aiming Point to Second Shot		Distance from Aiming Point to Third Shot	
	Vert	Hor	Vert	Hor	Vert	Hor
1	-2.2	-0.2	+41.9	-11.7	+80.0	- 1.5
2	-3.3	+0.6	+34.6	- 1.1	+73.5	- 1.0
3	-2.3	+0.5	+32.7	-10.6	+74.6	+ 3.5
4	-1.5	-1.3	+33.8	- 1.8	+69.4	+13.7
5	-1.7	-0.7	+38.8	- 7.6	+76.5	+ 8.7
6	-2.4	-0.4	+29.3	- 9.0	+78.4	+ 9.7
7	-2.2	-0.4	+38.2	-10.5	+86.1	- 2.7
8	-1.3	-0.8	+40.1	- 7.8	+82.0	+ 8.4
9	-1.4	-0.2	+37.9	- 8.1	+89.5	+15.5
10	-2.2	-0.6	+32.0	- 7.5	+73.3	+12.2
Average	-2.05	-0.35	+35.93	- 7.57	+78.33	+ 5.65

30-shot group	Mean From Aiming Point	EV	EH	ES
	39.3	92.8	27.2	94.1

Mean for shots fired automatically (from center of impact of first shot in each burst)

59.8

AUTOMATIC ACCURACY TEST

DATE: 23 September 1960 RANGE: 25 yards

RIFLE: Caliber, 7.62-mm, AR-10, Number 4412

CARTRIDGE: Ball, Caliber .30, T104E1, Lot FA14

FIRING POSITION: Prone (without sling) RIFLEMAN: M. Perrin

Fired in three-round bursts. Measurements are given in inches.

Burst No.	Distance from Aiming Point to First Shot		Distance from Aiming Point to Second Shot		Distance from Aiming Point to Third Shot	
	Vert	Hor	Vert	Hor	Vert	Hor
1	-1.5	-1.2	+57.9	+6.9	+74.9	+12.3
2	-2.2	+0.1	+50.7	+0.2	+68.1	- 5.9
3	-2.4	-0.4	+59.7	+1.4	+89.2	- 0.4
4	-2.1	-0.4	+55.6	+2.7	+88.1	- 0.2
5	-2.6	+0.1	+50.7	+4.2	+74.9	+ 1.1
6	-2.0	0.0	+53.9	-2.2	+90.9	- 4.4
7	-1.7	-0.1	+54.6	+4.8	+90.5	+11.2
8	-2.7	-0.4	+50.6	+5.6	+85.3	+ 9.7
9	-1.6	-0.2	+58.4	+6.5	+100.4	+15.8
10	-2.2	-0.5	+48.9	+5.5	+83.7	+22.9
Average	-2.10	-0.30	+54.10	+3.56	+84.60	+ 6.21

30-shot group	Mean From Aiming Point	EV	EH	ES
	47.2	103.1	28.7	104.5

Mean for shots fired automatically (from center of impact of first shot in each burst)

71.9

AUTOMATIC ACCURACY TEST

DATE: 23 September 1960 RANGE: 25 yards

RIFLE: Caliber, 7.62-mm, AR-10, Number 4534

CARTRIDGE: Ball, Caliber .30, T104E1, Lot FA14

FIRING POSITION: Prone (without sling) RIFLEMAN: G. Hendricks

Fired in three-round bursts. Measurements are given in inches.

Burst No.	Distance from Aiming Point of First Shot		Distance from Aiming Point to Second Shot		Distance from Aiming Point to Third Shot	
	Vert	Hor	Vert	Hor	Vert	Hor
1	-1.6	-0.6	+34.5	+ 7.8	+43.4	+18.5
2	-2.0	-1.1	+32.2	+ 4.3	+39.8	+19.9
3	-2.6	-1.0	+29.7	+ 6.8	+48.7	+26.0
4	-2.2	-0.7	+28.7	+10.2	+46.5	+22.8
5	-1.5	-0.5	+26.8	+ 9.5	+48.8	+24.5
6	-1.6	-0.9	+31.8	+11.3	+56.4	+24.5
7	-2.0	-0.6	+18.0	+ 6.7	+35.3	+11.7
8	-1.5	-0.8	+18.2	+ 4.9	+43.1	+15.5
9	-1.2	-0.9	+20.5	+ 8.1	+39.8	+ 9.5
10	-2.0	-0.3	+19.1	+ 8.2	+48.4	+14.8
Average	-1.82	-0.74	+25.95	+ 7.78	+45.02	+18.77

30-shot group	Mean From Aiming Point	EV	EE	ES
	26.0	59.1	27.1	64.5

Mean for shots fired automatically (from center of impact of first shot in each burst)

40.0

ACCURACY TEST

DATE: 4 and 5 October 1960
FIRED FROM: Bench rest
WIND: NNE, 0 to 4 mph
TEMPERATURE: 60 to 62°F
CARTRIDGE: Ball, Caliber .30, T104E1, Lot FA14
RIFLE: Caliber, 7.62-mm, AR-10
TARGET: "A" (with 10-inch bull's-eye)

RANGE: 100 yards
DIRECTION OF FIRE: S
SKY CONDITION: Clear to overcast

Target measurements are given in inches.

Rifleman	Target No.	MR	MVD	MHD	EVD	EHD	ES
D. Davis	1	1.5	1.1	0.9	4.0	2.8	4.9
ARIO No. 4219	2	1.2	0.9	0.5	3.8	2.6	3.9
	3	0.8	0.6	0.5	2.3	1.8	2.3
	4	1.1	0.7	0.8	3.2	2.8	3.4
	Average	1.2	0.8	0.7	3.3	2.5	3.6
M. Perrin	1	1.3	0.9	0.8	3.8	2.5	4.4
ARIO No. 4412	2	1.0	0.5	0.8	2.2	2.8	3.0
	3	1.2	0.6	1.0	2.8	3.5	3.8
	4	1.3	0.9	0.6	4.7	3.3	4.7
	Average	1.2	0.7	0.8	3.4	3.0	4.0
G. Hendricks	1	1.1	0.4	0.9	2.6	3.0	3.0
ARIO No. 4534	2	1.5	1.0	1.1	3.5	5.4	6.0
	3	0.9	0.6	0.7	1.1	2.4	2.6
	4	1.1	0.8	0.6	2.5	2.7	3.2
	Average	1.2	0.7	0.8	2.4	3.4	3.7

RATE-OF-AIMED FIRE TEST

DATES: 23 and 26 September 1960
RANGE: 100 yards
TARGET: E
WIND: NNE to NE, 3 to 5 mph
TEMPERATURE: 60 to 72°F
RIFLE: Caliber, 7.62-mm, AR-10

FIRED FROM: Prone position with sling
DIRECTION OF FIRE: S
SKY CONDITION: Scattered to overcast

An asbestos glove was worn on the hand supporting the handguard.

Number of shots fired semiautomatically and number of hits obtained in one minute.

Rifleman	Trial No.	No. of Rounds Fired	No. of Hits Obtained	No. of Malfunctions
Hendricks with rifle No. 4534	1	51	44	0
	2	59	54	1
	3	60	50	0
Average		57	49	
Davis with rifle No. 4219	1	40	36	1
	2	74	69	0
	3	60	57	0
Average		58	54	
Perrin with rifle No. 4412	1	50	45	1
	2	60	40	2
	3	60	47	1
Average		57	44	
Average for 3 shooters		57.7	49.0	

All malfunctions were failures of the bolt to lock fully on the first round from the magazine.

RATE-OF-AIMED FIRE TEST

DATES: 23 and 26 September 1960
RANGE: 100 yards
TARGET: E
WIND: N to NE, 3 to 7 mph.
TEMPERATURE: 60 to 68°F
RIFLE: Caliber, 7.62-mm, AR-10

FIRED FROM: Prone position with sling
DIRECTION OF FIRE: S
SKY CONDITION: Overcast

An asbestos glove was worn on the hand supporting the handguard.

Number of shots fired automatically and number of hits obtained in one minute.

Rifleman	Trial No.	No. of Rounds Fired	No. of Hits Obtained	No. of Malfunctions
Hendricks with rifle No. 4534	1	100	[a]30	0
	2	105	24	2
	3	120	35	0
	Average	108	30	
Davis with rifle No. 4219	1	99	28	1
	2	104	25	0
	3	99	25	1
	Average	101	26	
Perrin with rifle No. 4412	1	80	14	0
	2	77	3	2
	3	93	7	1
	Average	83	8	
Average for 3 shooters		97.3	21.0	

[a]One hit was approximately 90° keyhole.
All malfunctions were failures of the bolt to lock fully on the first round from the magazine.

ACCURACY TEST

TO DETERMINE EFFECT OF BAYONET ON RIFLE

DATE: 6 October 1960
FIRED FROM: Bench rest
WIND: SW, 9 to 10 mph.
TEMPERATURE: 71°F
CARTRIDGE: Ball, Caliber .30,T104E1,Lot FA14
RIFLE: Caliber, 7.62-mm, AR-10
RIFLEMAN: M. Perrin

RANGE: 100 yards
DIRECTION OF FIRE: S
SKY CONDITION: Overcast

Target measurements are given in inches.

Group Center From Aiming Point		MR	MVD	MHD	EVD	EHD	ES
Rifle No. 4263 with bayonet							
0.1R	0.0	0.8	0.5	0.5	2.1	2.1	2.5
Rifle No. 4263 without bayonet							
0.4R	0.0	1.2	1.0	0.5	3.3	2.6	3.4
Rifle No. 4480 with bayonet							
0.5L	2.6A	0.8	0.5	0.6	2.2	2.6	2.8
Rifle No. 4480 without bayonet							
0.0	2.0A	1.1	0.6	0.8	2.9	2.6	3.8

ACCURACY TEST

TO DETERMINE EFFECT OF SUPPRESSOR ON RIFLE

DATE: 7 October 1960
FIRED FROM: Bench rest
WIND: NNW to N, 5 to 9 mph.
TEMPERATURE: 63 to 64°F
CARTRIDGE: Ball, Caliber .30, T104E1, Lot FA14
RIFLE: Caliber, 7.62-mm, AR-10, Number 4263
RIFLEMAN: M. Perrin

RANGE: 100 yards
DIRECTION OF FIRE: S
SKY CONDITION: Clear

Target measurements are given in inches.

Group Center From Aiming Point		MR	MVD	MHD	EVD	EHD	ES
Fired with the flash hider - grenade launcher							
0.6R	2.2A	1.2	0.8	0.8	2.6	2.3	3.3
0.9R	2.1A	0.9	0.4	0.8	1.8	2.7	2.9
Average							
0.8R	2.2A	1.05	0.6	0.8	2.2	2.5	3.1
Fired without the flash hider - grenade launcher							
1.6L	5.8A	1.4	1.1	0.8	3.4	3.5	3.8
0.3L	5.6A	1.3	1.1	0.5	4.6	2.8	5.4
Average							
1.0L	5.7A	1.35	1.1	0.65	4.0	3.15	4.6

VELOCITY TESTS

Time Started: 1131
Rifle, Caliber 7.62-mm, AR-10

Time Completed: 1316

Date: 27 September 1960

Previous Rounds of Test: Rifle No. 4219 - 769
Rifle No. 4412 - 705
Rifle No. 4534 - 785

Ammunition Temperature: 70°F
Density: 0.995 to 0.998
Chronograph Type: Counter

Range Temperature: 67°F

Initiator type: Lumiline Screens

Instrumental Velocity, fps at 78 feet

Velocity

Cartridge, Ball, Caliber .30, T104E1, Lot FA14

Round Number	Rifle No. 4219	Rifle No. 4412	Rifle No. 4534
1	2625	2646	2674
2	2618	2636	2596
3	2623	2651	2621
4	2658	2720	2606
5	2640	2722	2644
6	2627	2644	2671
7	2680	2630	2603
8	2639	2661	2612
9	2651	2651	2672
10	2647	2694	2601
11	2623	2697	2647
12	2627	2667	2633
13	2615	2668	2629
14	2650	2672	2592
15	2665	2612	2614
16	2641	2664	2636
17	2664	2694	2691
18	2667	2629	2668
19	2661	2685	2588
20	2687	2674	2640
Average	2645	2666	2632
Maximum	2687	2722	2691
Minimum	2615	2612	2588
Ex. Var.	72	110	103
Mean Var.	17.6	23.4	25.7

VELOCITY TESTS

Time Started: 1049 | Time Completed: 1136 | Date: 5 October 1960

Rifle, Caliber 7.62-mm, AR-10

Previous Rounds on Test: Rifle No. 4219 - 6835
Rifle No. 4412 - 6771
Rifle No. 4534 - 6851

Ammunition Temperature: 70°F | Range Temperature: 67°F

Density: 1.010 to 1.019

Chronograph Type: Counter | Initiator type: Lumiline Screens

Instrumental Velocity, fps at 78 feet

Velocity

Cartridge, Ball, Caliber .30, T104E1, Lot FA14

Round Number	Rifle No. 4219	Rifle No. 4412	Rifle No. 4534
1	2639	2618	2585
2	2627	2648	2644
3	2606	2636	2584
4	2626	2615	2637
5	2639	2661	2641
6	2608	2603	2633
7	2641	2595	2644
8	2608	2626	2646
9	2660	2637	2667
10	2601	2634	2615
11	2612	2639	2601
12	2639	2603	2660
13	2596	2583	2664
14	2632	2621	2612
15	2640	2583	2600
16	2632	2612	2647
17	2615	2595	2591
18	2589	2541	2621
19	2591	2593	2647
20	2554	2601	2589
Average	2618	2612	2626
Maximum	2660	2661	2667
Minimum	2554	2541	2584
Ex. Var.	106	120	83
Mean Var.	19.8	21.3	21.9