

SA+AW

ABERDEEN PROVING GROUND
ABERDEEN PROVING GROUND, MARYLAND 21005
FIRING RECORD

21 November 1968

USATECOM Project No. 8-8-0210-04,
Engineer Design Test of Rifle,
Grenade, M7A3 for the M16A1 Rifle
(Safety Certification) (U)

Firing Record No.: S-46588
Dates of Test: 12 August to 8
October 1968
Authority: AMSMU-RE-M, Tele-
type 07-0685, 11
July 1968

Destroy in accordance with AR 380-5

Related Firing Record: S-46549

W. O. No. 331-702-70

nas

(U) ITEMS UNDER TEST

- Grenade, hand, riot, CS, M7A3.
- Adapter, grenade projection, M2A1.
- Cartridge, grenade, 5.56-mm, XM195.
- Rifle, M16A1, serial No. 808105, with maximum size flash suppressor (outside diameter).
- Rifle, M16A1, serial No. 820848, with minimum size flash suppressor (outside diameter).

(U) SUPPORTING FACILITIES AND MATERIALS

- Stand, rifle, for grenade firings.
- Temperature-controlled storage cabinets.

(U) DETAILS OF TEST

Initial firing attempts were made with the M16A1 rifle in a fixed rest and elevated to 32° above the horizontal (Figure 1 of Inclosure 3). Thirty grenades were fired from each of two weapons (one assembled with

THIS MATERIAL CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF ESPIONAGE LAWS, TITLE 18, U.S.C. SECTIONS 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

GROUP 4
DOWNGRADED AT 3 YEAR INTERVALS
DECLASSIFIED AFTER 12 YEARS
DOD DIR 5200.10

CLASSIFIED BY _____

SUBJECT TO GENERAL DECLASSIFICATION SCHEDULE OF EO 11652.

DECLASSIFIED ON 31 Dec 74

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FR No. S-46588

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a maximum diameter flash suppressor, the other with a minimum diameter flash suppressor) in this manner. Following this, 20 grenades were fired from each weapon by a rifleman in the kneeling position with the rifle butt resting on hard-packed gravel.

Grenades, grenade adapters, and grenade cartridges were conditioned to +125°F for a minimum period of 4 hours prior to firing. One of each item was removed from the conditioning cabinet and fired immediately from the rifle. The rifle was not temperature-conditioned for these firings.

Upon completion of all grenade firings (50 from each weapon) and without cleaning the rifles, 20 rounds of M193 ball cartridges were fired from each weapon.

(U) ROUND-BY-ROUND DATA

Round-by-round data are contained in Inclosure 2.

(C) SUMMARY OF RESULTS (U)

Suppressor measurements are shown in Table I. Measurements were made starting with the ring on the suppressor farthest away from the threaded portion. A micrometer was used to determine the largest outside measurements on each suppressor.

Table I (C). Suppressor Measurements Before and After Firing (U)

	Outside Diameter, in.			
	Suppressor Ring No.			
	1	2	3	4
Maximum Diameter Suppressor				
Before firing	0.8648	0.8652	0.8646	0.8640
After firing	.8641	.8632	.8637	.8637
Minimum Diameter Suppressor				
Before firing	0.8605	0.8600	0.8602	0.8600
After firing	.8605	.8600	.8602	.8600

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Grenade impact ranges are summarized in Table II.

Table II (C). Grenade Impact Range (U)

	<u>Test Stand Firings</u>		<u>Rifleman, Kneeling^a</u>
Rifle No.: 808105 (fitted with the largest diameter flash suppressor).			
Rounds	30	^b 29	20
Maximum range, yd	161	161	138
Minimum range, yd	75	112	97
Average range, yd	126	128	117
Rifle No.: 820848 (fitted with the smallest diameter flash suppressor).			
Rounds	30		20
Maximum range, yd	134		129
Minimum range, yd	96		76
Average range, yd	117		107

^aWith butt of rifle against hard-packed gravel.

^bExclusive of one grenade range (75 yards), when the stabilizer boom and fin (Figures 2 and 3 of Inclosure 3) remained on the rifle after firing. The three-prong grenade adapter disk separated from the boom and was launched with the grenade.

Grenades launched from the test stand were with the rifle elevated to 32° above the horizontal. Those fired by a kneeling rifleman were with the rifle maintained relatively close to 32°.

Of the 100 grenades fired, 39 M2A1 adapters separated prior to impact. Separations occurred at the estimated peak of trajectory.

The stocks of both rifles cracked when fired from the test stand. The stock assembled to the rifle with the largest diameter flash suppressor began to crack after the first grenade was launched (Figures 4, 5, 6, and 7 of Inclosure 3); the launcher assembled with the smaller diameter flash suppressor cracked after the 15th grenade was launched.

New stocks were fitted to both rifles prior to the firings by the rifleman. The stock assembled to the rifle with the maximum size flash suppressor showed no evidence of cracking until the 15th round was fired. The other did not crack during the firings of 20 rounds from the kneeling position; however, the stock was slightly bulged near the butt plate.

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The XM195 cartridge functioned without incident throughout all the firings.

Of the 100 grenades launched 6 failed to function.

Following all grenade firings, and without cleaning the weapons, 20 M193 ball cartridges were fired from each weapon. All rounds fired normally without incident.

(U) OBSERVATIONS AND REMARKS

The retaining ring for the ejection port cover pin of both M16A1 rifles was vibrated off during the grenade launchings. The port cover pin slid rearward and fell free of the assembly.

A safety recommendation was submitted concerning employment of the M7A3 grenade with the M16A1 rifle (Inclosure 1).

This is the final report on this task.

SUBMITTED:

Frank Hines Jr / For
FRANCIS G. KILLEEN
Test Director

REVIEWED:

S. A. Doilney
S. A. DOILNEY
Chief, Small Arms and
Aircraft Weapons Branch

FOR THE COMMANDER:

Claude E. Brown
CLAUDE E. BROWN
Chief, Infantry and Aircraft
Weapons Division
Materiel Test Directorate

4 Incls

1. Authority
2. Round-by-Round Data
3. Photographs
4. Distribution List

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Firing Record No. S-46588

AUTHORITY (U)

RTTCZYUW RUEOEKB0719 1931737-CCCC-RUEBEAA.

ACTION: D&PS - 2cc's
INFO.CY: COMPT - 1cc

ZNY CCCCC

F 111455Z JUL 68

Incoming APG
Comm Ctr Nr

FM CGUSAMUCOM DOVER NJ

28261

TO RUEOPUA/COFA PHILA PA

RUCIRFA/CGUSAAPSA JOLIET ILL

REPRODUCTION PROHIBITED
EXCEPT BY ADJUTANT
OFFICE APG

RUEBEAA/CGUSATECOM ABERDEEN MD

INFO RUCIRRA/CGUSAWECOM ROCKIS ILL

RUEBBNA/CGUSAMC WASHDC

RUEBBFA/COEA EDGEWOOD MD

RUEBEAA/COUSAD&PS ABERDEEN MD

BT

C O N F I D E N T I A L AMSMU-RE-M 07-0685 FOR SMUFA-B2000

SMUAP-Q AMSTE-BC INFO AMCPM-RS AMCPM-SP-RS

SMUEA-STEAP-DPS FROM USAMUCOM SGD MOLLEN

SUBJ: SAFETY CERTIFICATION OF RIFLE GRENADE FOR THE M16 RIFLE (U)

TO USAMUCOM SAME SUBJECT COPIES OF WHICH WERE PROVIDED ALL

ADDRESSEES. REQUEST ACTIONS BE TAKEN AS FOLLOWS BY AGENCIES LISTED

TO EXPEDITE REQUIRED TESTING AND REPORTING

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DECLASSIFIED AFTER 12 YEARS
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Inclosure 1, page 1

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Firing Record No. S-46588

PAGE 2 RUEOEKB0719 C O N F I D E N T I A L

A. FRANKFORD ARSENAL

(1) PROVIDE FUND CITATION TO APG COMPTROLLER IN AMOUNT OF \$8000 FOR CONDUCT OF TESTS.

(2) PROMPTLY AUTHORIZE USE OF XM195 5.56 MM GRENADE CARTRIDGES ON HAND AT APG FOR TEST OF M7A3 CS GRENADE AND M2A1 ADAPTER.

B. USAAPSA

(1) EXPEDITE SHIPMENT OF 100 EACH M7A3 CS GRENADES AND M2A1 ADAPTERS TO USAD&PS APG

(2) ADVISE FA AND USATECOM OF DATE OF ARRIVAL AT APG

C. USATECOM

(1) UPON RECEIPT OF FUND CITATION AND TEST HARDWARE INITIATE TEST TO PROVIDE SAFETY CERTIFICATION OF M7A3 CS GRENADE AND M2A1 ADAPTER WITH M16A1 RIFLE AND XM195 5.56MM GRENADE CARTRIDGE

(2) PROVIDE RESULTS BY TELETYPE TO DA USAR V AND ADDRESSEES OF THIS MESSAGE

(3) ADVISE FA IF ESTIMATED TESTING COSTS EXCEED \$8000

2. (U) ESTIMATED DATE OF ARRIVAL OF TEST HARDWARE AT APG IS 15 JUL 68. PREVIOUSLY USATECOM PROVIDED VERBAL ESTIMATE OF TWO WEEKS FOR ACTUAL FIRING AND TWO WEEKS FOR DATA ANALYSIS AND REPORTING. REQUEST USATECOM PROVIDE DA USARV AND ADDRESSEES OF THIS MESSAGE ESTIMATED DATE FOR TELETYPE REPORT OF RESULTS

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Firing Record No. S-46588

PAGE 3 RUEOEKB0719 C O N F I D E N T I A L

3. (U) ANY QUESTIONS OF PRIORITY OF THIS TEST VERSUS OTHER M16 RIFLE TESTS OR OF RIFLES TO BE USED IN THIS TEST SHOULD BE REFERRED BY TELEPHONE TO PM-RIFLES FOR DECISION

4. (U) THIS IS A MATTER OF HIGH PRIORITY

GP4

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Firing Record No. S-46588

PTTUZYUW RUEOPUA0014 1911744-UUUU--RUEBEAA.

ZNR UUUUU

DATED: 9 JULY 68

R 091700Z JUL 68

ACTION: TECOM

FM COFA PHILA PA

INFO: D&PS

ISD

SAFETY

TMD

TO RUCIRFA/CG USAAPSA JOLIET ILL

INFO RUEBBNA/CG USAMC WASH D C

RUEBEAA/CG USATECOM APG MD

RUEBBFA/CO EDGEWOOD ARSENAL MD

BT

UNCLAS FOR SMUAP-Q, MR. POTTER INFO COPY FOR AMCPM-RS COLONEL

ISAACS, USAMC: AMSTE-BC, MR. CRIDER, USATECOM: SMUEA-MR. S. HASSON

EDGEWOOD ARSENAL FROM SMUFA M9000 TT5690 MR. CRANKS SGD LTC JOHNSON.

SUBJ: SAFETY CERTIFICATION OF RIFLE GRENADE FOR
THE M16 RIFLE.

1. SHIP-100 (EACH) M7A3 CS GRENADE; STOCK NUMBER

1330-965-0802-6963.

2. SHIP-100 (EACH) M2A1 ADAPTER, GRENADE, PROJECTION,

CHEMICAL; STOCK NUMBER 1330-6801.

3. SHIP TO: COMMANDING GENERAL

USATECOM

DEVELOPMENT AND PROOF SERVICES

ATTN: MR. WHITE-STEAP-DS

ABERDEEN PROVING GROUND, MD

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Firing Record No. S-46588

PAGE 2 RUEOPUA0014 1911744-UUUU--RUEBEAA.

4. ITEMS ARE FOR SAFETY CERTIFICATION TEST.

5. PRIORITY IS SEA-02.

6. USE GA FUNDING.

BT

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Firing Record No. S-46588

PTTUZYUW RUEOPUA0035 1982106-UUUU-RUEBEAA.

ZNR UUUUU

DATE: 17 JULY 68

P 162105Z JUL 68

ACTION: D&PS

FM COFA PHILA PA

INFO: ISD
SAFETY
COMPT

TO RUEBEAA/CG USATECOM ABERDEEN MD

INFO RUEOEKB/CG USAMUCOM DOVER NJ

RUCIRRA/CG USAWECOM ROCK ISLAND ILL

RUEBEAA/CO USAD&PS ABERDEEN MD

BT

UNCLAS FOR AMSTE-BC INFO, AMSMU-RE-M, AMCPM-RS, AMCPM-SP-RS, SMUEA,
STEAP-DPS FROM SMUFA B2000 TT 5903 SGD JOHNSON

SUBJ: SAFETY CERTIFICATION OF RIFLE GRENADE FOR THE M16 RIFLE (U).

1. REF IS MADE TO CONFIDENTIAL TT AMSMU-RE-M 07-0685, PARAS A (1) AND (2).
2. APG IS AUTHORIZED TO UTILIZE LOT LC12000 CTG GRENADE: 5.56MM, XM195 CURRENTLY ON HAND THAT INSTALLATION FOR SUBJECT CERTIFICATION TEST.
3. FUNDS HAVE BEEN ALLOCATED AND FORWARDED TO YOUR INSTALLATION.

BT

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Firing Record No. S-46588

MrKilleen/ps/895-3350-4634

STEAP-MT-TI

5 SEP 1968

SUBJECT: Safety Evaluation of M7A3 Grenade Using M16A1 Rifle,
USATECOM Project No. 8-8-0210-04 (U)

Commanding General
U.S. Army Test and Evaluation Command
ATTN: AMSTE-BG

1. (U) References:

a. SUMFA-B2000 teletype 5690, dated 17 July 1968, Subject: Safety Certification of Rifle, Grenade, for the M16 Rifle.

b. AMSMU-RE-M teletype 07-0685, dated 1 July 1968, Subject: Safety Certification of Rifle, Grenade, for the M16 Rifle.

2. (C) During the period of 6 through 20 August 1968 100 M7A3 CS hand grenades were fired from the M16A1 rifle, using the XM195 grenade cartridge and the M2A1 grenade projection adapter. The grenades (with adapters) and grenade cartridges were conditioned to +125°F prior to firing. Two rifles were used during the test, rifle No. 808105 with a flash suppressor 0.8652 inch in diameter and rifle No. 820848 with a flash suppressor 0.8605 inch in diameter. The rifles were fired from a rigid test stand, at an elevation of 32 degrees, to impact the grenades at a distance of 120 yards. Thirty rounds were fired from each rifle in this manner. The rifle with the maximum diameter flash suppressor developed cracks along the stock in firing the first grenade. The stock on the rifle with the minimum diameter flash suppressor did not crack until 15 grenades were fired. Following the firings from the test stand, the cracked stocks were replaced with new ones, and 20 additional grenades were fired from each rifle by a rifleman in the kneeling position, with the butt plate resting on hard packed gravel. The weapon elevation was maintained at approximately 32 degrees. After firing 15 grenades the stock of the rifle with the maximum size flash suppressor cracked, and after firing 20 grenades a piece separated from the stock (the stock was judged to be serviceable). The rifle with the minimum size flash suppressor did not crack during these firings.

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Firing Record No. S-46588

5 SEP 1968

STEAP-MT-TI

SUBJECT: Safety Evaluation of M7A3 Grenade Using M16A1 Rifle,
USATECOM Project No. 8-8-0210-04 (U)

3. (C) Ranges for the two weapons varied. The oversized suppressor produced an average range of 128 yards when fired from the test stand, and 117 yards when fired from the kneeling position; under comparable conditions the minimum diameter flash suppressor produced ranges of 117 yards and 107 yards, respectively.

4. (C) With the exception of one grenade adapter fired from the rifle with the maximum diameter flash suppressor, all the grenades were launched without incident. The exception involved launching of a grenade but retention of the stabilizer tube and fin on the flash suppressor of the rifle; the grenade and clamping disk of the adapter were launched and impacted 75 yards from the gun position. During flight most of the grenades exhibited a tendency to yaw, and 39 of the adapters separated from the grenades at the peak of the trajectory. Also, the snap ring that retains the dust cover pin was lost from both rifles during firing.

5. (C) Recommend that the M7A3 CS grenade, with the M2A1 projection adapter, be considered safe for firing from the M16A1 rifle employing the XM195 grenade cartridge, providing the following precautions are exercised:

a. Firing procedures comply with the safety precautions prescribed in par 19 through 25 of FM 23-30, Grenades and Pyrotechnics and par 2-8 of TM9-1330-200, Grenades, Hand and Rifle.

b. Firing of the M7A3 grenade from a rifle not be accomplished with the butt of the rifle held against the shoulder or any other part of the body.

FOR THE COMMANDER:

/t/ R. P. WITT
Associate Director
Materiel Test Directorate
(Formerly Development and
Proof Services)

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(C) ROUND-BY-ROUND DATA (U)

Ammunition Components (Temperature-Conditioned to +125°F):

Grenade, hand, riot, CS, M7A3, lot FDL-1-11.
Cartridge, grenade, 5.56-mm, XM195, lot LC-12000.
Adapter, grenade projection, M2A1, lots ARX-1-17 and -1-18.

<u>Round No.</u>	<u>Range, yd</u>	<u>Round No.</u>	<u>Range, yd</u>
Rifle No.: 808105 (with maximum diameter flash suppressor).			

Fired from Test Stand

1	120	16	127
2	117	17	120
3	123	18	128
4	120	19	131
5	123	20	128
6	120	21	126
7	134	22	121
8	126	23	119
9	124	24	152
10	133	25	140
11	120	26	161
12	126	27	136
13	112	28	75
14	124	29	139
15	119	30	147

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<u>Round No.</u>	<u>Range, yd</u>	<u>Round No.</u>	<u>Range, yd</u>
Fired by a Kneeling Rifleman ^a			
31	138	41	118
32	128	42	111
33	123	43	103
34	130	44	108
35	124	45	106
36	135	46	117
37	106	47	122
38	119	48	105
39	122	49	126
40	104	50	97

^aButt of rifle resting on hard-packed gravel.

Notes: All but two grenades (rounds 21 and 47) exhibited evidence of yawing or tumbling in flight.

Forty-three of the adapters were a tight fit on the flash suppressor. There appeared to be no effect on the range projected.

Twenty-four adapters separated from the grenades in flight. Separations appeared to occur at the peak of trajectory, and had no apparent affect on the impact range. Both the maximum range and minimum projected ranges exhibited this separation. The rifle stock showed evidence of cracking after firing the first round.

A new stock was assembled prior to firings conducted by a kneeling rifleman. Stock first showed evidence of cracking after the 15th round was fired in this manner.

Following the firing of the 50 grenades, 20 rounds of M193 ball ammunition were fired through the weapon without incident.

Three grenades failed to function.

On round 28 the stabilizer tube and the fin remained on the flash suppressor of the rifle. The three-pronged clamping disk and grenade were launched.

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<u>Round No.</u>	<u>Range, yd</u>	<u>Round No.</u>	<u>Range, yd</u>
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Rifle No.: 820848 (with minimum diameter flash suppressor).

Fired from Test Stand

1	114	16	115
2	118	17	118
3	108	18	111
4	122	19	123
5	122	20	123
6	110	21	96
7	120	22	126
8	115	23	124
9	117	24	130
10	105	25	119
11	134	26	119
12	132	27	103
13	133	28	110
14	108	29	125
15	105	30	118

Fired by a Kneeling Rifleman^a

31	110	41	101
32	113	42	104
33	127	43	103
34	117	44	97
35	118	45	106
36	129	46	76
37	112	47	104
38	121	48	116
39	108	49	100
40	104	50	81

^a Butt of rifle resting on hard-packed gravel.

Notes: All but five grenades (rounds 11, 22, 30, 36, and 45) exhibited evidence of yawing or tumbling in flight. One adapter (round 9) was a tight fit on the flash suppressor. Fifteen adapters separated from the grenades in flight. No apparent affect on ranges projected; for the minimum range projected the adapter remained assembled to impact. The rifle stock showed evidence of cracking after firing the 15th round.

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Firing Record No. S-46588

A new stock was assembled prior to the firings conducted by a kneeling rifleman. The stock showed no evidence of cracking after firing 20 rounds.

Following the firing of the 50 grenades, 20 rounds of M193 ball ammunition were fired through the weapon without incident. Three grenades failed to function.

(U) PHOTOGRAPHS

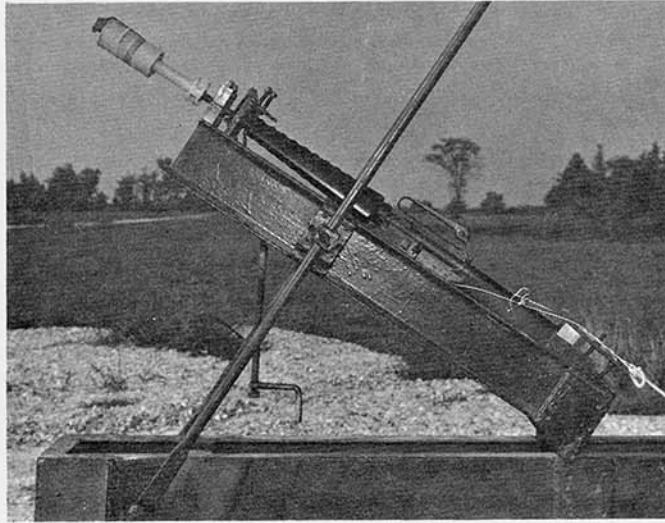


Figure 1 (U): Rifle, M16A1 with Grenade and Attachment Mounted on Test Stand (U).



Figure 2 (U): Stabilizer That Remained on Rifle Fitted with Maximum Size Flash Suppressor. Grenade and Base Impacted 75 Yards Forward of the Gun Position (U).

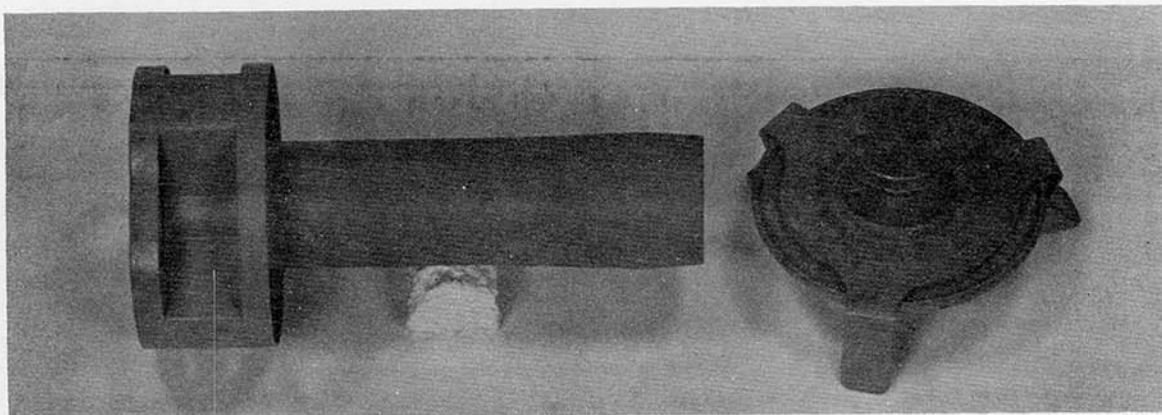


Figure 3 (U): Stabilizer That Remained on Suppressor after Firing, and Base That Was Recovered 75 Yards Forward of the Gun Position, with Grenade Still Attached, but Removed for Photograph (U).

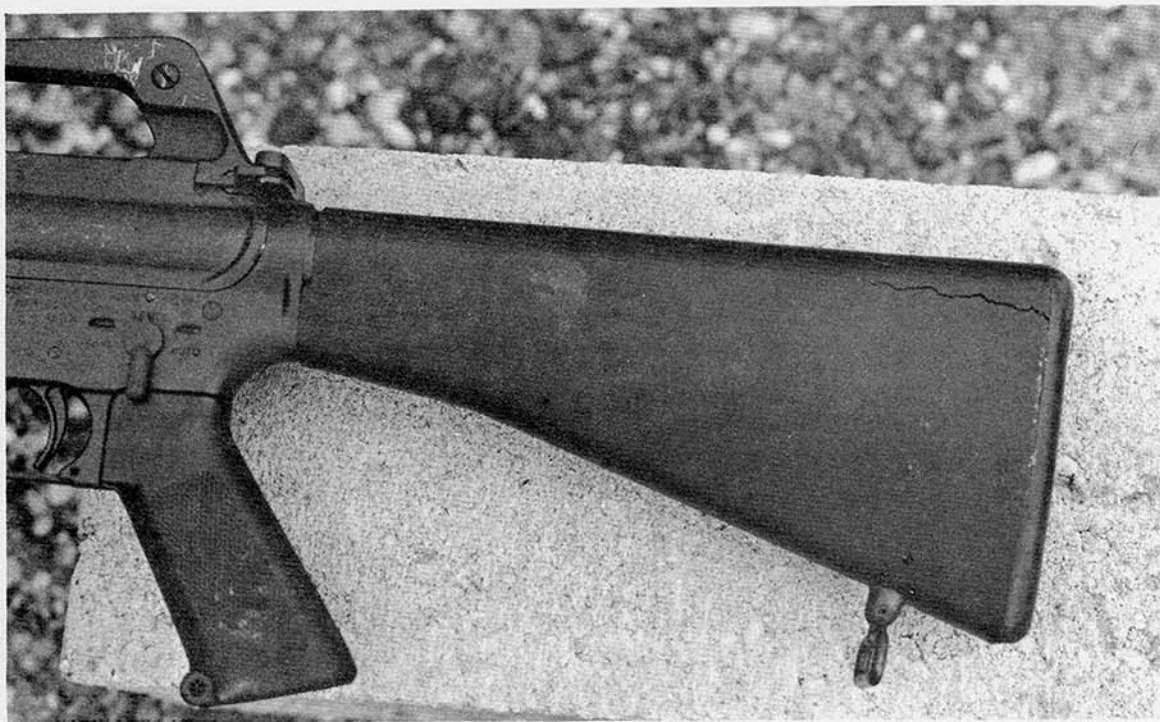


Figure 4 (U): Side of Rifle Stock Fitted with Maximum Size Flash Suppressor after Firing Ten Rounds from the Test Stand (U).

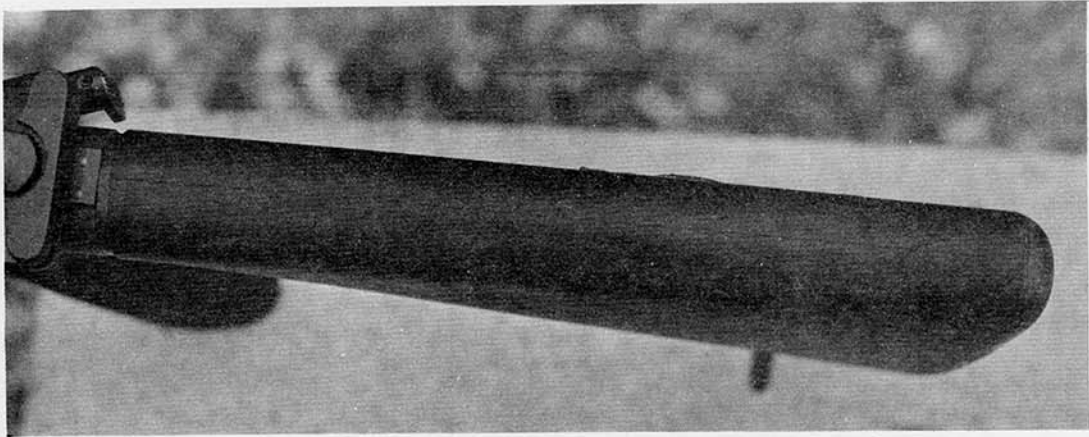


Figure 5 (U): Top of Rifle Fitted with Maximum Flash Suppressor after Firing Ten Rounds from the Test Stand (U).



Figure 6 (U): Right Side of Stock on the Rifle Fitted with Maximum Flash Suppressor upon Completion of Test Stand Firings (30 Rounds) (U).



Figure 7 (U): Top and Left Side of Stock on Rifle Fitted with Maximum Flash Suppressor upon Completion of Test Stand Firings (30 Rounds) (U).



Figure 8 (U): Left Side of Stock on Rifle Fitted with the Maximum Flash Suppressor upon Completion of Firings from the Kneeling Position (U).



Figure 9 (U): Close-Up of the Stock on Rifle Fitted with Maximum Flash Suppressor (Same As Figure 8) (U).

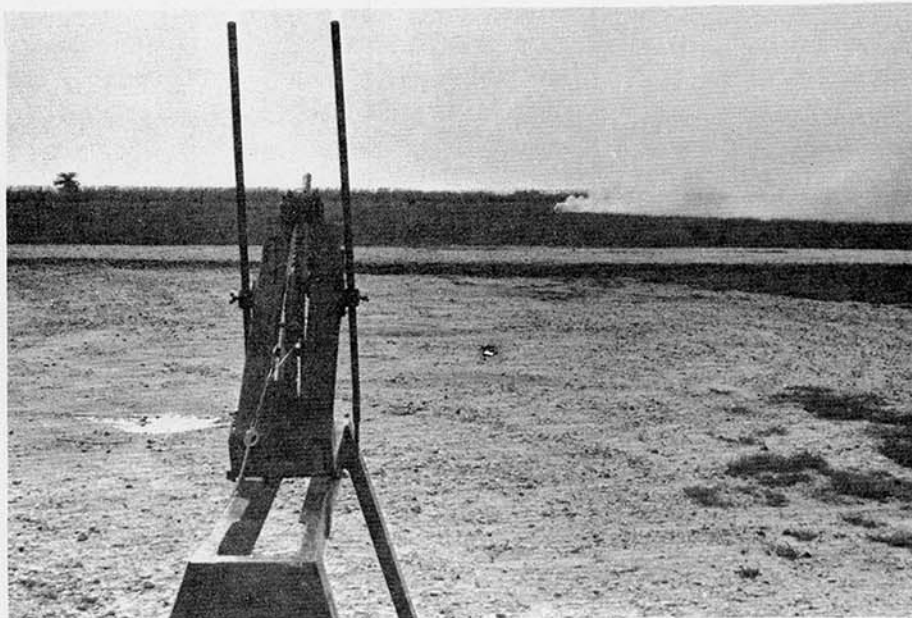


Figure 10 (U): Grenade That Was Launched after Separation from the Stabilizer. Stabilizer Remained on the Flash Suppressor of the Rifle (U).

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