ABERDEEN PROVING GROUND
ABERDEEN PROVING GROUND, MARYLAND 21005
FIRING RECORD

28 May 1969

USATECOM Project Nos. 8-7-0210-02 and 8-4-0210-07
Engineer Design Test for Safety Evaluation of Grenades with M16A1 Rifle and Preproduction Test of Grenade Cartridge, XM195

Firing Record No.: S-46593
Dates of Test: 10 September to 21 October 1968
Authority: Letter, USATECOM, AMSTE-BC, 26 March 1968

Related Firing Record: S-46549

W. O. No. 377-612-70 se

ITEMS UNDER TEST

Since the grenade launching phase of the Small Arms Weapon System (SAWS) test in 1965-1966, the flash suppressor of the M16A1 rifle (serves as a grenade launcher) has been redesigned and now includes an increase in the length of grenade bearing surface, 1.7 inches compared to 0.7 inch on the previous model. Additionally, a grenade retaining spring (GRS), part 62323 (Figure 2 of Inclosure 2) has been introduced. The design of the GRS permits a more positive retention of a rifle grenade or grenade adapter to the rifle when positioned for firing. Rifles were equipped with closed-end flash suppressors with the outside diameter near minimum (0.860 inch) or near maximum (0.864 inch). Grenade cartridges, XM195, lot LC-12000, commercial grenade cartridges, lot RA-1-8, and the following types of grenades were used in the testing:

Type Grenade	Lot	Quantity
Mk 1, illuminating, hand	20-C-68	21
M14, incendiary, hand	PB-4389-12	20
M30, practice, hand	PA-E-57646	20
M27, illuminating, rifle	LOW-500-1	20
M19A2, parachute, rifle	PXC-5-14	7
M64, signal ground smoke, rifle	CCG-2-7	7
AN-M8, smoke, HC, hand	2013-75-1035	20
M18, smoke, hand	1028-56-7005	20
M31, HEAT, rifle (inert-filled)	LS-35-7	20
M26A1, fragmentation, hand (with fuze, M204A2)	LS-48-5	10
M34, WP, smoke (with fuze, M206A2)	EA-1-1	20

Digitized by:
SMALLARMS OF THE WORLD
SMALLARMSOFTHEWORLD.COM

SUPPORTING FACILITIES AND MATERIALS

A recoiling rifle fixture fabricated at Aberdeen Proving Ground was mounted on a V-block assembled in a Frankford Arsenal machine rest for all grenade firing except for the hand-held firings, which involved support of the buttstock on a sandbag.
Lumiline screens and a counter chronograph were used to obtain velocity measurements.
Temperature cabinets were utilized to maintain the temperature of cartridges used for the chamber pressure test.

DETAILS OF TEST

All firing other than the velocity - pressure test, was at normal ambient temperatures. Velocities were also recorded at normal ambient temperatures for the lightest and heaviest type grenades fired (Mk 1 and M14 respectively) to provide data for calculation of recoil energy.

In order to minimize stock breakage commonly associated with launching of grenades from the M16A1 rifle, fixed-rest firings were accomplished with the rifles installed in a spring-loaded mount; firings with the weapon hand-held were conducted with the buttstock resting against a sandbag. Reference is made to Aberdeen Proving Ground Firing Record S-46549 in which it is reported that launching grenades from M16A1 rifles with stocks supported on hard surface frequently resulted in broken stocks.

The configuration of the M30 grenade closely simulates the M26A1; therefore, firing was limited to ten rounds of the M26A1. With exception of inert filling of the M31 grenade, all grenades contained standard fillers.

With an M16A1 rifle barrel modified to permit chamber pressure measurements, pressures were measured of the XM195 (lot LC-12000) and the commercial cartridges (lot RA-1-8) when launching the heaviest and lightest grenades involved in the test.

The grenade cartridges were conditioned to temperatures of -65°F, +70°F, and +155°F. Ten pressures and velocities (five with minimum and five with maximum diameter suppressors) were measured for each type cartridge using each type (weight) grenade under each temperature condition. Chamber pressure was also measured with grenade cartridges which were previously immersed in water for 24 hours, removed, placed in a basedown position, and conditioned at +70°F for approximately 12 hours.

Velocity and Chamber Pressure

Cartridge	Suppressor[a,b]	Grenade Type	Temperatures and Condition (Grenade Cartridge Only)							
			+70°F		+155°F		-65°F		Water Soaked	
			Vel[c], fps	Chamber Press., psi	Vel[c], fps	Chamber Press., psi	Vel[c], fps	Chamber Press., psi	Vel[c], fps	Chamber Press., psi
Lot RA-1-8	Minimum	Mk 1	196	28100	204	29500	189	26000	187	23500
		M14	116	29700	117	28400	113	27100	102	27300
Lot RA-1-8	Maximum	Mk 1	200	28500	206	26900	193	26600	181	24600
		M14	122	28000	118	28000	117	27400	117	27400
Lot RA-1-8	Maximum and minimum average	Mk 1	198	28300	205	28200	191	26300	189	24100
		M14	119	28800	117	28200	115	27200	110	27300
Lot LC-12000, XM195	Minimum	Mk 1	197	24000	207	24900	193	23600	197	23500
		M14	119	26000	120	26500	118	25700	117	25100
Lot LC-12000, XM195	Maximum	Mk 1	204	24500	209	25100	200	24800	202	25600
		M14	123	24400	123	24400	118	25800	120	22700
Lot LC-12000, XM195	Maximum and minimum average	Mk 1	201	24300	208	25000	196	24200	199	24500
		M14	121	25200	121	25400	118	25700	119	23900

[a]Minimum suppressor is 0.860-inch diameter.
[b]Maximum suppressor is 0.864-inch diameter.
[c]At a distance of 5.6 feet from foremost end of grenade.

SUMMARY OF RESULTS

No safety hazards were detected in firing M193 ball ammunition without cleaning the rifle, following the firing of a series of grenades.

The calculated recoil energy from firing the lightest and heaviest grenades in the test was respectively 73 and 136 foot-pounds. These values are in excess of the upper range of recoil energy (i.e., 60 foot-pounds) covered in TECP 700-700, Interim Pamphlet 20-05, 12 July 1967, and indicate that the launching of any of the types of grenades considered in these firings from the M16A1 rifle is potentially hazardous if the weapon is body-supported in regard to recoil.

After launching 37 grenades from one rifle the GRS failed to retain the grenade on the rifle when the rifle was tilted muzzle downward, and the GRS on another rifle broke after launching 72 grenades.

In assembly of grenades to M1A2 adapters, the safety lever is forced against the safety pin, thereby creating excessive resistance on the pin. The safety pin then requires such force in removal that the grenade can be pulled out of the adapter prongs. However, displacement of the grenade can be prevented by firmly grasping the grenade and retaining claws during removal of the safety pin.

The stabilizer tubes on all M19A2 and M64 rifle grenades ruptured simultaneously with launching from rifles, using both maximum and minimum diameter suppressors (Figure 1 of Inclosure 2). Fragments of the stabilizer tubes were randomly expelled in a manner to present possible hazards to the firer or persons adjacent to the weapon. The body portion of the grenades impacted far short of intended range. Several M19A2 and M64 grenades were then launched using rifles with maximum and minimum diameter suppressors, but without the GRS assembled. The grenades fitted loosely on the flash suppressor; particularly on the minimum-diameter suppressor. All of these grenades ruptured similar to those fired with the retainer spring except that the fin assembly of one M64 grenade fired from a minimum-diameter suppressor remained on the rifle after rupture of the stabilizer tube.

The average weights of grenades with adapters was 2.34 pounds for the M14 and 0.94 pound for the Mk 1.

OBSERVATIONS AND REMARKS

In this test only the M26A1, one of three models of the M26 series, was fired. According to TM 9-1330-200, page 2-4, the fuzes in the M26 series differ among models in physical detail as to shape of body and shape of the safety lever. Differences in configuration may render a particular model of grenade incompatible with the M1A2 adapter.

The M19A2 and M64 grenade types are regarded as incompatible with the M16A1 rifle/XM195 cartridge system and unsafe for use in any application involving launching the grenades from the M16A1 rifle.

Exclusive of the M19A2 and M64, and under the following provisions, any of the grenade types listed in items under test are considered safe to launch from an M16A1 rifle fitted with a closed-end flash suppressor and grenade-retainer spring (part 62323) of the type employed in these firings:

a. It is considered unsafe to launch any of the grenades from the M16A1 rifle with the rifle body-supported in any manner (i.e., variations of the hip, underarm, or shoulder position); additionally, to reduce occurrences of stock breakage, the rifle butt should not be supported against surfaces or objects offering greater resistance than approximately that of a sandbag.

b. The user adhere to appropriate provisions of TM 9-1330-200 and FM 23-30 with regard to handling, assembly of the grenades to the rifle, and procedures for launching.

It should be noted there are no precautions listed in TM 9-1330-200 to prevent inadvertent removal of the grenades from the adapter as a result of removing the safety pin.

Subtests listed in the test plan and not reported in this firing record were cancelled by US Army Test and Evaluation Command (AMSTE-BC) letter, 1 April 1969 (Inclosure 1).

This is the final report on this task.

FUTURE RELATED WORK

None known at this time.

SUBMITTED:

George Hendricks
GEORGE HENDRICKS
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

3 Incls
1. Authority
2. Photographs
3. Distribution List

Firing Record No. S-46593

AUTHORITY

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

S-14 Aug 67

AMSTE-BC

25 JUL 1967

SUBJECT: Safety Evaluation of Grenades with the M16A1 Rifle and Preproduction Test of Grenade Cartridge XM195

TO: Commanding Officer
Aberdeen Proving Ground
ATTN: STEAP-CO-P
Aberdeen Proving Ground, Md 21005

1. References:

a. Letter, CRD-CM 67-427, dated 20 Feb 67, Subject: 5.56mm Crimped Cartridge, w/2 incls, incl 1.

b. Letter, AMSTE-BC, dated 12 Jan 67, Subject: Engineer Design Test (Safety Evaluation Phase) of Rifle Grenades Fired from the M16A1 Rifle, incl 2.

c. Message, AMSTE-BC, 6335, dated 5 April 67, Subject: Reported Failure of M18A1 Rifle Grenade from 5.56mm Rifle M16A1.

d. Letter, SMUFA-U4100, dated 24 Feb 67, Subject: Cartridge, Grenade, 5.56mm, XM195, USATECOM Project No. 8-4-0210-07, incl 3.

e. Letter, AMSMU-RE-M, dated 23 June 67, Subject: Evaluation of Grenades and Signals when Fired from the M16A1 Rifle, incl 4.

f. Attendees at meeting, HQ, TECOM on 6 July 1967, incl 5.

2. In response to the guidance of reference 3, an informal meeting was held in HQ, TECOM to discuss a test program for evaluation of various grenades which are capable of being projected from the M16A1 Rifle. This evaluation was directed to satisfy an urgent requirement for signalling capabilities as soon as possible. These grenades are in addition to the M19, M22, and M23 series of signalling grenades which were released to the field by reference b. Attendees at meeting are at incl 5.

Regraded UNCLASSIFIED
When Separated from Classified Inclosure (s)

25 JUL 1967

AMSTE-BC
SUBJECT: Safety Evaluation of Grenades with the M16A1 Rifle and Preproduction Test of Grenade Cartridge XM195

3. The signals to be evaluated are as follows:

a. M26A1 Fragmentation, Hand Grenade, fired w/M1A2 Adapter.

b. MKIIIA1 Offensive, Hand Grenade, fired w/M2A1 Adapter.

c. M31 HEAT Rifle Grenade.

d. M34 WP Hand & Rifle Grenade, fired w/M2A1 Adapter.

e. M18 Smoke Hand Grenade, fired w/M2A1 Adapter.

f. AMM8 HC Hand Grenade, fired w/M2A1 Adapter.

g. M27 Illuminating Rifle Grenade.

h. M19 Parachute, Illuminating Signal, Ground.

i. M18A2 White Star Cluster, Signal, Illumination, Ground.

4. All signal and grenades with firing adapters will be provided by Picatinny Arsenal (PA). Cartridges will be provided by Frankford Arsenal (FA). Delivery of cartridges, grenades and signals is anticipated in October 1967.

5. As a concurrent test, evaluation of commercial cartridges is desired. Only 500 of these cartridges are available for a preproduction test. Suggest use of the heaviest and lightest grenades for a comparison of the commercial cartridge with the test cartridge. The commercial cartridge was used as a basis for preparation of a Technical Data Package by which the test cartridge is being procured. These tests will be conducted concurrently but reported separately.

6. It is requested that CO, APG provide the following to this HQ by 14 August 1967:

a. Prepare a separate brief test outline in letter form for both safety evaluation and the preproduction test.

b. Materiel requirements.

25 JUL 1967

AMSTE-BC
SUBJECT: Safety Evaluation of Grenades with the M16A1 Rifle and Preproduction Test of Grenade Cartridge XM195

c. Funds.

d. Time required to conduct tests subject to initiation of tests to include publication of separate reports.

7. The recommendations for safety release in letter form will be forwarded immediately upon completion of tests. Firing records are acceptable as final reports.

8. Tests should include but not necessarily be limited to the following:

a. Pressure at ambient and extreme temperature for both cartridges.

b. Adverse conditions.

c. Waterproofness.

d. Environmental.

9. During the above tests, record velocities, range malfunction of grenades, and other pertinent data. One firing evaluation may be utilized to expedite testing.

10. USATECOM Project numbers are assigned as follows:

a. 8-4-0210-07 Preproduction Test

b. 8-7-0210-02 Safety Evaluation Phase

11. Reports will be unclassified.

FOR THE COMMANDER:

Robert B Tully

ROBERT B. TULLY
LTC GS
Dir, Inf Mat Test Dir

5 Incl
as

4821

STEAP-DS-TI (25 Jul 67) 1st Ind MrAHankins/jsh/578-1500-3242
SUBJECT: Safety Evaluation of Grenades with the M16A1 Rifle and Preproduction Test of Grenade Cartridge XM195

DA, Aberdeen Proving Ground 15 AUG 1967

TO: Commanding General, U. S. Army Test and Evaluation Command,
ATTN: AMSTE-BC

1. Forwarded herewith for approval is a test plan outline covering both the safety evaluation of grenades fired from the M16A1 rifle (USATECOM Project No. 8-7-0210-02) and a preproduction test of the XM195 grenade cartridge (USATECOM Project No. 8-4-0210-07). Testing covering the two objectives has been written into a single plan to facilitate combining the two evaluations into one firing program; however, a separate report will be issued for each project.

2. An estimated 120 calendar days from date of initiation will be required for completion of the tests and publication of the reports. Recommendations regarding safety release of the items can be forwarded within 90 calendar days from start of the tests.

FOR THE COMMANDER:

R. P. Witt

R. P. WITT
Acting Technical Director
Development and Proof Services

6 Incl
wd incl 1 thru 5
6. Test Plan Outline

AMSTE-BC (25 Jul 67) 2nd Ind
SUBJECT: Safety Evaluation of Grenades with the M16A1 Rifle and Preproduction Test of Grenade Cartridge XM195

DA, Headquarters, US Army Test and Evaluation Command, Aberdeen Proving Ground, Maryland 21005 14 SEP 1967

TO: Commanding Officer, Picatinny Arsenal, ATTN: SMUPA-DC2, Dover, New Jersey 07801
Commanding Officer, Frankford Arsenal, ATTN: SMUFA-U4100, Philadelphia, Pennsylvania 19137

1. Forwarded herewith are approved test plans for your comment and/or concurrence.

2. It is intended to expand the testing of paragraph 7 beyond ten rounds to determine limitation of use relative to stock durability when backed up on harder surfaces, ground, logs, etc., notwithstanding the fact that breakage has been demonstrated in past testing.

3. For planning purposes, it is requested that this headquarters be advised of estimated delivery date for grenades and grenade cartridges.

FOR THE COMMANDER:

Goodwin Morrow

GOODWIN MORROW
Act Dir
Inf Mat Test Dir

1 Incl
nc

Copies furnished:
CG USAMC ATTN: AMCPMSO-RS
AMCPM-RS
CO APG ATTN: STEAP-DS-TI (w/o incl)

SMUPA-DC2 (25 Jul 67) 3d Ind Mr DVanderbilt/mjo/5565
SUBJECT: Safety Evaluation of Grenades with the M16A1 Rifle and Preproduction Test of Grenade Cartridge XM195

U. S. Army Picatinny Arsenal, Dover, New Jersey 07801 DEC 1 - 1967

TO: Commanding General, U. S. Army Test and Evaluation Command
Attn: AMSTE-BC, Aberdeen Proving Ground, Maryland 21005

1. This Arsenal concurs in the test plan forwarded. Comments and exceptions to certain details are noted below.

2. All grenades and pyrotechnics should be on hand at Aberdeen Proving Ground by 26 January 68. This date is controlled by the delivery of M34 WP Hand Grenades.

3. The following items should be delivered to Aberdeen Proving Ground by 15 December 67:

a. 75 M26A1 Fragmentation Hand Grenades HE loaded.
b. 250 M18 Smoke Hand Grenades (any color).
c. 250 AN M8 HC Smoke Hand Grenades.
d. 250 M27 Illuminating Rifle Grenades.
e. 250 M19 Ground Signals Parachute.
f. 500 M1A2 Grenade Projection Adapters.
g. 500 M2A1 Grenade Projection Adapters.

4. M30 Practice Grenades have the same weight and configuration as M26A1 Hand Grenades. For test purposes they should be used instead of inert loaded M26A1 Grenades. One hundred seventy-five (175) M30 Grenades should be delivered to Aberdeen Proving Ground by 15 January 68.

5. The delivery date for 250 temperature tested and certified M34 WP Hand Grenades is estimated as 26 January 68. The grenades will be procured through Edgewood Arsenal. These grenades are fired with the M1A2 Projection Adapter and not the M2A1 as listed in the test plan outline.

6. MK III A1 Offensive Hand Grenades cannot be used with available adapters and no testing should be planned.

7. M18A2 White Star Clusters are not available from field service stocks.

8. M64 Smoke Ground Signals whose configuration is similar to that of M18A2 White Star Clusters are available. Delivery of 250 should be 15 January 68.

SMUPA-DC2
SUBJECT: Safety Evaluation of Grenades with the M16A1 Rifle and Preproduction Test of Grenade Cartridge XM195

9. No procurement time is given for M31 Heat Rifle Grenades since these are available at Aberdeen according to the test plan outline.

10. Aberdeen has already received 440 Commercial Grenade Cartridges and 1100 XM195 Grenade Cartridges from Frankford Arsenal. These quantities will be adequate for testing all grenades and signals to be made available.

1 Incl
nc

J. M. LONGOBARDO
Actg Ch, Ammo Engr Lab

Copies furnished: (w/o Incl)
CG USAMC ATTN: AMCPMSO-RS
AMCPM-RS
CO APG ATTN: STEAP-DS-TI

TEST PLAN OUTLINE FOR SAFETY EVALUATION OF VARIOUS GRENADES AND SIGNALS FIRED FROM THE M16A1 RIFLE

1. General:

The signals and grenades to be evaluated are as follows:

a. M26A1 Fragmentation, Hand Grenade, fired w/M1A2 Adapter.

b. MKIIIA1 Offensive, Hand Grenade, fired w/M2A1 Adapter.

c. M31 HEAT Rifle Grenade.

d. M34 WP Hand & Rifle Grenade, fired w/M2A1 Adapter.

e. M18 Smoke Hand Grenade, fired w/M2A1 Adapter.

f. AMM8 HC Hand Grenade, fired w/M2A1 Adapter.

g. M27 Illuminating Rifle Grenade.

h. M19 Parachute, Illuminating Signal, Ground.

e. M18A2 White Star Cluster, Signal, Illumination, Ground.

Concurrent with the safety evaluation of the grenade/M16A1 rifle firings, a performance comparison is to be made between grenade cartridges being procured in accordance with a Technical Data Package (test cartridge) and an earlier cartridge from a commercial source which served as the basis for the Technical Data Package (control cartridge).

The M16A1 rifles required for test will be furnished assembled with flash suppressors (serves as grenade launcher) representing both maximum and minimum manufacturing tolerances with regard to outside diameter of the grenade-launching surface. Equal numbers of each diameter are required.

All rifles will be visually examined and critical components will be subjected to magnetic particles inspection prior to the test and after completion of each subtest. Similarly, accuracy ("zero" retention) and cyclic rate performance of the rifles, firing ball ammunition, will be checked to disclose any adverse effects from the grenade firings.

Except for firings required in paragraph 7 of the test plan outline, all firings will be conducted with rifles mounted in an appropriate rest. Support of the rifle in the rest will be contrived to minimize stock breakage, previously established as common to the firing of grenades from the M16A1 rifle.

Throughout the test, observations will be made for the safety and human factors aspects of handling, loading and firing the test grenades and signals using the M16A1 rifle.

2. Mann Barrel Firings:

a. Using an M16A1 rifle barrel modified to permit bore-pressure measurements, obtain pressures for both the test and control grenade cartridges. Samples of the heaviest and lightest type grenades among those listed in paragraph 1 will be used on the rifle in these firings and individual grenades, within each type, will be selected to provide comparable grenade weights for use with each cartridge. Prior to firing, the grenade cartridges will be conditioned to temperatures of -65°F, +70°F, and +155°F. Ten record rounds will be obtained for each cartridge using each grenade type (weight) under each temperature condition. Grenade velocity measurements will be taken simultaneously. Observation will be made for comparative bore-fouling characteristics of the two cartridges.

b. Repeat paragraph a firings at +70°F using grenade cartridges which have previously been immersed in water for a minimum period of 12 hours, removed, placed in a base-down position and conditioned at +70°F for a minimum of 6 hours prior to firing. Water and ammunition will be conditioned to equal temperature before immersion of the cartridges. Precautions against low-velocity grenades should be observed.

3. Waterproof Test (Grenades Only):

Five grenades of each type listed in paragraph 1 will be individually weighed, immersed in water for 24 hours, removed and carefully wiped dry over all exposed surfaces (including the interior of fin assemblies), and then reweighed for determination of water penetration. The water and grenades will be conditioned to equal temperature before immersion of the grenades. Firing of these grenades will not be required.

4. Salt-Water Immersion, Temperature and Humidity Storage:

a. Ten grenades of each type and 60 each of the test and control grenade cartridges, all of which must have demonstrated satisfactory resistance to water penetration in paragraphs 2b and 3, will be

immersed briefly in salt water and stored for 10 days in a high temperature-high humidity environment. The salt-water solution, temperature and humidity cycle, and firing schedule will be in accordance with TECP 700-700 Interim Pamphlet 20-20, dated 11 April 1966. Grenades or cartridges found not to be waterproof in paragraphs 2b and 3 will not be immersed in the salt water but will be subjected to the remaining conditions of this subtest. The M16A1 rifles used for the firings will not be subjected to the salt water and storage conditions. The two types of cartridges and rifles with maximum and minimum diameter flash suppressors will be used approximately equally for each type of grenade in the firings. Observations will be made for average range (visual with aid of markers) to grenade impact or function, grenade-cartridge performance, "short rounds", or any erratic performance in launching, flight or functioning of the grenades.

b. Repeat paragraph a with ten grenades of any types that failed to withstand the conditions of paragraph a, except that the grenades will be subjected to the salt-water and storage conditions while in unopened individual packaging standard to each type of grenade. Rifles and grenade cartridges will not be subjected to the salt water and storage conditions in this phase.

5. Dust Test:

The inside of the stabilizer assembly of ten grenades of each type and the corresponding mating surface of the rifle barrel and flash suppressor will be thoroughly coated with the standard dust mixture (surplus dust to be removed only by jarring or blowing on the exposed surfaces) prior to assembly of the grenade to the rifle for firing. Rifles with maximum and minimum diameter flash suppressors will be used approximately equally in the firing. Firings will be conducted with the test grenade cartridge, using the control cartridge as required. Observations as delineated in paragraph 4a will be made.

6. Temperature Tests:

Using six selected rifles, three with minimum and three with maximum diameter flash suppressors, fire each type grenade as follows:

a. With weapons and ammunition conditioned to -65°F, fire at 30° elevation ten grenades each from rifles with minimum and maximum diameter suppressors (total of 20 rounds), using the test and control grenade cartridges alternately in groups of five rounds each. Grenade velocity will be recorded. Observations as delineated in paragraph 4a will be made.

b. Repeat a with materiel conditioned to +70°F.

c. Repeat a with materiel conditioned to +155°F.

7. Recoil Energy:

a. Using the velocity data recorded in firings in paragraph 6 and grenade weight from paragraph 3, calculate recoil energy for each type grenade.

b. Based on the values determined in a and the guidance given in TECP 700-700 Interim Pamphlet 20-05, paragraph 6.2.1, dated 12 July 1967, a determination will be made as to the acceptability of each type grenade for firing from the M16A1 rifle with the rifle held at the shoulder. Those types of grenades deemed safe to fire with the weapon shoulder supported will each be fired ten rounds in that manner; types deemed unsafe to fire from the shoulder will be fired a similar number of rounds with the weapon hand held but with the butt of the rifle resting against a sandbag. The test grenade cartridges will be used. Firings will be conducted at ambient temperatures. All high-explosive type grenades fired in this exercise will contain inert HE filler. Shooter comments regarding effects of recoil will be noted.

8. Test Requirements:

a. Weapons:

(1) Twelve 5.56-mm M16A1 rifles are required. Six rifles each are to be assembled with maximum- and minimum- diameter flash suppressors.

(2) Two M16A1 rifle barrels are required for pressure firings. The barrels are to be assembled with flash suppressors but are to be furnished without gas port, front sight, and locking-lug extension.

b. Ammunition:

(1) With the exception of the M31 HEAT rifle grenade which is available at APG, 250 rounds of each grenade and signal listed in paragraph 1 of the plan will be required. Within the total of 250 rounds, 175 each of the M26A1 and MKIIIA1 grenades are to be supplied with inert HE filler and practice fuzes.

(2) The M34 WP grenades furnished for test must be accompanied by signed certification that each of the grenades has previously been subjected to a temperature of 160°F for a period of 24 hours

with no evidence of "leakers", in order to permit temperature exposure of the items as required by the test plan.

(3) A quantity of 500 rounds of the commercial grenade cartridge and 1000 rounds of the production XM195 grenade cartridge are required.

c. Funds:

Funding in the amount of $50,000 is required.

Firing Record No. S-46593

DEPARTMENT OF THE ARMY
HEADQUARTERS, U. S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

1 APR 1969

AMSTE-BC

SUBJECT: Engineer Design Test for Safety Evaluation of Hand and Rifle Grenades fired from M16A1 Rifle and Preproduction Test of Grenade Cartridge XM195, USATECOM Project No. 8-4-0210-07 and 8-7-0210-02

Commanding General
US Army Munitions Command
ATTN: AMSMU-RE-M
Dover, New Jersey 07801

1. References:

a. Letter, STEAP-MT-TI, dated 18 Oct 1968, Subject: Safety Evaluation of Grenades with M16A1 Rifle, USATECOM Project No. 8-7-0210-02 and 8-4-0210-07 with 1st Ind, AMSTE-BC, dated 28 Oct 68.

b. Letter, AMCPM-RS, dated 29 November 1968, Subject: Minutes of Conference on Grenade Launching Systems, inclosure 1.

2. In response to an operational requirement, a test program to evaluate safety and launch characteristics of various hand and rifle grenades when fired from the M16A1 Rifle was established. Reference 1a forwarded results of the test. Subsequently, pressures were measured by Mann barrel firings to establish comparative information for two lots of grenade cartridges, XM195, in accordance with the test plan. Data does not reveal any discernible difference between cartridges.

3. In November 1968, a meeting was held at PM-Rifles Office to review current and future requirements for grenade launching and munition capabilities. In view of the conclusions, abbreviated performance characteristics for the Grenade Cartridge, XM195, were to be developed by CDC for type classification procedures as Standard A. Based on this, further tests of the grenades did not appear warranted and suspension was directed by this command.

4. The following is proposed:

a. Cancel remaining subtests which consist of waterproofness, salt

1 APR 1969

AMSTE-BC
SUBJECT: Engineer Design Test for Safety Evaluation of Hand and Rifle Grenades fired from M16A1 Rifle and Preproduction Test of Grenade Cartridge XM195, USATECOM Project No. 8-4-0210-07 and 8-7-0210-02

water immersion, temperature and humidity storage, dust tests and temperature tests.

b. Publish firing record reports.

c. Upon receipt of abbreviated performance characteristics establish an engineering and service test program leading to type classification of the grenade cartridge, XM195.

5. Your concurrence and/or comment in the above proposal is requested. Your prompt attention is also requested.

FOR THE COMMANDER:

C. J. MOLLOY, Jr.
Colonel, GS
Dir, Inf Mat Test Dir

1 Incl
as

Copies furnished: (w/incl)
CO FA ATTN: SMUFA-U4100
CO PA ATTN: SMUPA-DC2
SMUPA-DC5
CO APG ATTN: STEAP-DS-TI

AMSMU-RE-M (1 Apr 69) 1st Ind
SUBJECT: Engineer Design Test for Safety Evaluation of Hand and Rifle Grenades fired from M16A1 Rifle and Preproduction Test of Grenade Cartridge XM195, USATECOM Project No. 8-4-0210-07 and 8-7-0210-02

HQ, US Army Munitions Command, Dover, New Jersey 07801 10 APR 1969

TO: Commanding General, US Army Test & Evaluation Command, ATTN: AMSTE-BC, Aberdeen Proving Ground, Maryland 21005

1. This command has been verbally advised by the Office of the Project Manager-Rifles that USACDC has decided not to develop abbreviated performance characteristics for the XM195 5.56mm Grenade Cartridge and that DA has concurred in that decision. For this reason there are no plans to conduct ET/ST nor to type classify the XM195 as Standard-A, so that the last proposal of paragraph 4, basic letter, is no longer appropriate. This command concurs in the other two proposals stated therein.

2. Since it appears likely that USARV and Eighth US Army will continue using the XM195 cartridge for the next 2-3 years, it is requested that your command conduct whatever additional tests (if any) you now consider appropriate but which were not included in the original test plan. For example, since certain types of stockpiled rifle grenades can be safely launched from M1 or M14 rifles but cannot be safely launched from the M16A1 rifle using the XM195 cartridge, it might be worthwhile to investigate the cause of this grenade - grenade cartridge - rifle incompatibility. A second possibility would be to use the forthcoming USMC/US Army tests of the MECAR 40mm rifle grenades to obtain additional performance data on the XM195 cartridge.

FOR THE COMMANDER:

John R. C. Roop

JOHN R. C. ROOP
LTC, CmlC
Act Dep Dir of Rsch, Dev & Engr

1 Incl
nc

Cy Furn:
COFA, ATTN: SMUFA-J1000
COPA, ATTN: SMUPA-DC
COAPG, ATTN: STEAP-DS-TI
AMCPM-RS (w/o Incl)

AMSTE-BC (1 Apr 69) 2d Ind
SUBJECT: Engineer Design Test for Safety Evaluation of Hand and Rifle Grenades fired from M16A1 Rifle and Preproduction Test of Grenade Cartridge XM195, USATECOM Project No. 8-4-0210-07 and 8-7-0210-02

DA, Headquarters, US Army Test and Evaluation Command, Aberdeen Proving Ground, Md 21005 9 MAY 1969

TO: Commanding Officer, Aberdeen Proving Ground, ATTN: STEAP-MT-TI

1. Based on the decision not to develop abbreviated performance characteristics for the 5.56mm, XM195, Grenade Cartridge, there is no apparent reason to conduct additional tests.

2. It is requested that subject test be terminated and a firing record published by 25 May 69. Submit critical events promptly so that the program will be removed from TSMS this month.

FOR THE COMMANDER:

C. J. MOLLOY, JR
Colonel, GS
Dir, Inf Mat Test Dir

1 Incl
nc

Copies furnished: (w/o incl)
CG USAMUCOM ATTN: AMSMU-RE-M
CO FA ATTN: SMUFA-J1000
CO PA ATTN: SMUPA-DC
PM, Rifles, WECOM

DEPARTMENT OF THE ARMY
UNITED STATES ARMY MATERIEL COMMAND
PROJECT MANAGER – RIFLES
ROCK ISLAND ARSENAL
ROCK ISLAND, ILLINOIS 61201

IN REPLY REFER TO:
AMCPM – RS

29 NOV 1968

SUBJECT: Minutes of Conference on Grenade Launching Systems

SEE DISTRIBUTION

1. A conference was held, commencing at 0830 hours 20 November 1968, concerning the U. S. Army's position on Grenade Launching Systems, at the Office of the Project Manager (Rifles), HQ USAWECOM, Rock Island Arsenal. List of attendees attached as inclosure #1.

2. The purpose of the meeting was to:

a. Review current and future requirements for grenade launching capabilities.

b. Review current munition capabilities and developmental activities.

c. Formulate a position and recommend courses of action.

3. As a result of the discussion conducted in accordance with the agenda (Incl #2) the following conclusions were reached:

a. CDC requirements for current and future grenade launching capabilities are as follows:

(1) 40 MM

(2) Tube Launched

(3) Complete family of munitions

(a) HE Dual Purpose Round

(b) Illumination/Marking/Signal Family

(c) Parachute Flare

(d) Multiple Projectile Round

(e) CS Round

29 NOV 1968

AMCPM-RS
Subject: Minutes of Conference on Grenade Launching Systems

(f) Weight - 3 lbs (Sight included)

(4) Range - 400 meters

(5) Attachable to M16A1 Rifle.

b. At present insufficient funds are available ($100,000) to develop a complete family of 40MM Ammunition.

c. Development of the complete family of 40MM Ammunition is urgently required and $450,000 of additional funds are required.

d. A complete family of ammunition can be developed, simultaneously, within two years of receipt of the funds, and procurement can be initiated in early CY 1972.

e. Rifle Grenades should be used as an interim measure until 40MM is developed.

f. The TECOM test results of MECAR Grenade System should be evaluated by the Army. If successful, consideration will be given to their use as an interim system until the 40MM family is available.

g. The current program of development of DBCATA ammunition should continue with the objective of fielding with the SPIW weapon.

4. In view of the conclusions listed above, the following tasks are to be accomplished by the agency indicated:

a. USACDC - Develop abbreviated performance characteristics for the XM195 Grenade Cartridge to be used for type classification Standard A procedures.

b. AMCPM-RS

(1) Establish recommended life of Grenade Retainer Spring.

(2) Procure a minimum of 300 Grenade Retainer Springs and send them to USARV for their information, evaluation, and stated requirement, if appropriate.

c. AMCMR-DC - Send message to USARV and Korea summarizing safety certification of Rifle Grenades.

(1) The following grenades are safety certified with or without a grenade retaining spring:

29 NOV 1968

AMCPM-RS
Subject: Minutes of Conference on Grenade Launching Systems

M19A1	WP (Rifle)
M22	Smoke (Rifle)
M23	Smoke Streamer (Rifle)
M7A3	CS (Hand)

(2) The following grenades are safe to fire from the M16A1 with the grenade retaining spring:

M27	Illuminating (Rifle)
M31	HEAI (Rifle)
M26A1	Frag w/M1A2 adapter
Mark 1	Ill w/M1A2 adapter
M34	WP w/M1A2 adapter
M30	Practice w/M1A2 adapter
AN-M14	Incendiary w/M2A1 adapter
M18	Smoke Series w/M2A1 adapter
AN-M8HC	Smoke w/M2A1 adapter

d. AMCPM-SA and CDCIA - Will cooperate and coordinate in the preparation of a QMR for 40MM WP Round.

e. USACDC - Will complete & forward QMR for complete family of 40MM Signal ammunition to DA NLT 1 January 1969.

f. MUCOM - Will prepare justification for additional funding requirements for $450,000 and forward through AMC to DA, ATTN: LTC Stottle. Funding requirements should arrive at DA to coincide with submission of QMR.

2 Incl
as

ALVIN C. ISAACS
Colonel, OrdC
Project Manager, Rifles

DISTRIBUTION:
DA ACSFOR ATTN: FOR-DS-CAS LTC Stottle
DA DSCLOG ATTN: ADCSLOG(P7B) M16 COL Cumbie
CG USACDC ATTN: CDCMR-W MAJ Riscassi
CG USCONARC ATTN: ATIT-RD-MD Mr. Harrison
CG USAMC ATTN: AMCRD-WI Mr. Cosgrove, AMCMR-D Mr. Vowter
CG USAMUCOM ATTN: AMSMU-RE-M Mr. Spaulding
CG USATECOM ATTN: AMSTE-BC Mr. Crider
CG USAWECOM ATTN: AMSWE-IMC CPT Redican, AMSWE-RES Mr. Packard
CO USACDCIA ATTN: LTC Ball
CO USACDCCAG ATTN: CAG-M
CO USAIS ATTN: AJIIS-W Mr. Roberts

GRENADE LAUNCHING SYSTEMS

20 November 1968

ORGANIZATION	NAME
AMCPM-RS	Major Wood
AMCPM-RS	John Gehbauer
AMCPM-RS	Jim Gallaugher
DA - DCSLOG(P&B) M16	LTC W. H. Creed
AMCMR-DC	R. Vawter
AMCPM-SA	L. T. Chaskes
AMSWE-LMC	CAPT. T. E. Redican
AMSWE-RES-R	C. Prischman
AMSWE-RES-R	C. F. Packard
HQ USACDL	MAJ. Underwood
HQ USACDC IA	MAJ Lucker
MUCOM	S. Spaulding
TECOM	C. Crider
AMCPM-RS	LTC West
DA - DCSLOG	Mr. Burkoskie
DA - ACSFOR	LTC Stottle

AGENDA

1.	Opening Remarks	PM-RS	0800
	a. Admin Announcement		
	b. Meeting Objectives		
2.	Discussion of USER Requirements	CDC	0810
	a. Current		
	b. Future		
3.	Current Munitions/Activities	MUCOM	0900
	a. Rifle Grenades		
	b. 40 MM		
	(1) Standard		
	(2) DBCATA		
4.	Discussion of MECAR Grenade System	CONARC	1000
5.	Stated Requirements	PM-RS	1300
	a. Program		
	b. Funding for Program		
6.	Conclusion/Recommendations		1500

PHOTOGRAPHS

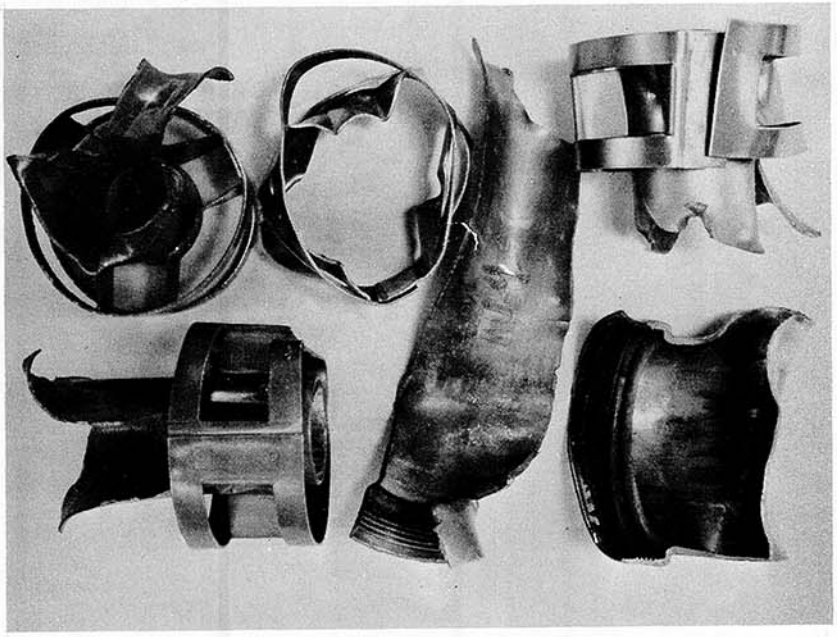

Figure 1: Ruptured Stabilizer Tubes from M19A2 and M64 Rifle Grenades.

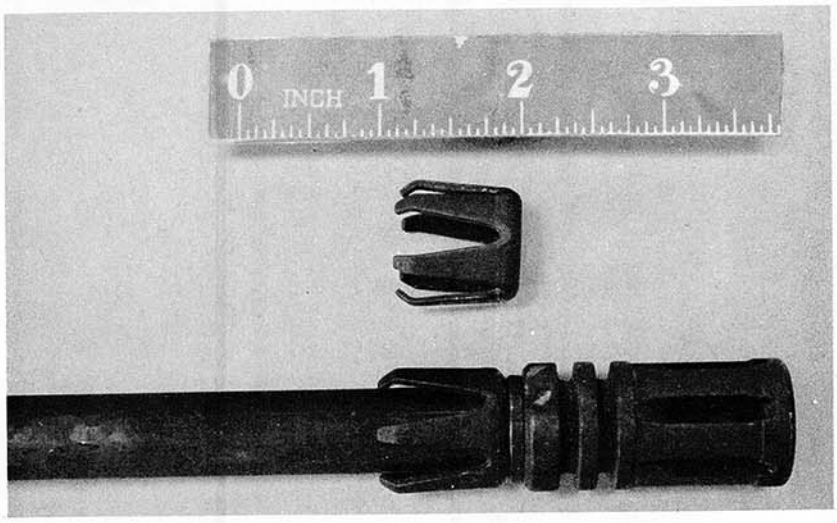

Figure 2: TOP: Grenade Retaining Spring (GRS). BOTTOM: GRS Assembled on M16A1 Rifle.

Inclosure 2

DISTRIBUTION LIST

Addressee	No. Copies
Commanding General US Army Test and Evaluation Command Aberdeen Proving Ground, Maryland 21005 ATTN: AMSTE-BC	1
Commanding General US Army Materiel Command Washington, D. C. 20315 ATTN: AMCPM-RS AMCPMSO-RS	5 5
Commanding General US Army Munitions Command Dover, New Jersey 07801 ATTN: AMSMU-RS	5
Commanding Officer Picatinny Arsenal Dover, New Jersey 07801	
Commanding Officer Frankford Arsenal Philadelphia, Pennsylvania 19137 ATTN: SMUFA-J9100	5
Commanding Officer Jefferson Proving Ground Madison, Indiana 47251	1
Commanding Officer Yuma Proving Ground Yuma, Arizona 85364	1
Commanding Officer US Army Arctic Test Center APO Seattle, Washington 98733	1
Technical Library Aberdeen Proving Ground Aberdeen Proving Ground, Maryland 21005	Master 1 Reference