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REPORT ON

DEVELOPMENT OF CARTRIDGE, HEAT, 105-MM, T384, FOR 105-MM GUN, T254 (U)

Fourth Report on Ordnance Project No. TW-419

(D.A. Project No. 5W04-03-089)

(Picatinny Arsenal TPRS TE-212 and TE-213 (C))

J. C. SLEEPER, JR.

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OCTOBER 1959

ORDNANCE CORPS U.S.A.

Aberdeen Proving Ground
Maryland

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DEVELOPMENT AND PROOF SERVICES
ABERDEEN PROVING GROUND
MARYLAND

AUTHORITY: ORDBB-TE5 Mr JCSleeper,Jr/evh/45136

DEVELOPMENT OF CARTRIDGE, HEAT, 105-MM, T384, FOR 105-MM GUN, T254 (U)

Fourth Report on Ordnance Project No. TW-419

Dates of Test: 8 to 25 June 1959

ABSTRACT (C)

Firings were conducted to determine if the present wiring system, and other components, are suitable to withstand high acceleration forces.

Fifteen T384, HEAT shell (Lot PA-E-29162) were fired for fuze-functioning effect. Ten of these shell were fired for ground impact and five were fired through a $\frac{1}{4}$-inch plywood bursting screen prior to ground impact. Thirteen of these shell were recovered and their fuzes (Lot PA-E-29173) disassembled and examined. All fuzes of Lot PA-E-29173 failed to function and were considered unsatisfactory.

Fifteen T384E1, HEAT shell (Lots PA-E-29254 and 29255) were fired for fuze-functioning effect on ground impact. Five shell were recovered and their fuzes (Lot PA-E-29261) disassembled and examined. All fuzes of Lot PA-E-29261 functioned (except for one which had a broken fuze wire prior to firing) and were considered satisfactory.

It was noted throughout these firings that the present obturator yields very good obturation and pressure-velocity uniformity, but damages the fins too severely to be used effectively. However, when the obturator is removed, the pressure-velocity dispersion increases but the range dispersion improves because of the elimination of the fin damage.

Considerable erosion was noted on the shell body around the crimping groove and band seat and also on the leading edge and surface of the fin pads.

It is recommended that a lighter, more efficient obturator be fabricated that will break up sufficiently to prevent fin damage, and that the fins be designed to withstand the forces encountered in the T384 shell-obturator system. The erosion of the shell body and fins should be eliminated by improving obturation. The fuzes from Lot PA-E-29261 are considered satisfactory for use in future testing.

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1. INTRODUCTION

(C) Picatinny Arsenal was given the assignment of developing a HEAT round for the 105-mm, T254E2 gun, and work was initiated in February 1958, at which time the first design, similar to the successful 90-mm, T300 model, was prepared. Due to the urgency attached to completing the development, a second design (the T384E1), similar to the 120-mm, T153 model, was prepared. Two different obturators were to be investigated; one being a slip-type nylon band and the other a rubber obturator assembled to a flat-based surface of the shell.

(C) The requirement for the 105-mm HEAT round is that it be fired at a muzzle velocity of 4000 fps at a working pressure below 50,000 psi. At this velocity, an accuracy of 0.17 mil horizontal and vertical is desired at both 1000- and 2000-yard ranges. Penetration should be 7 inches of armor plate at 60° obliquity.

(C) The British 105-mm, brass cartridge case will be modified for rear propellant loading and used with this shell. It was necessary to use the case-over-band design for this shell, which required the case to be necked down behind the band in order to obtain crimping surface. The T384 design used one crimping groove whereas the E1 design will have two.

(C) Tests were conducted at Aberdeen Proving Ground from the T254 gun, in March and April 1959, firing both the T384 and T384E1 (Type I and II) design to establish the propellent charge. Since the T384 round weighed 23 lb (which is 1.5 lb heavier than the actual round), a charge of 11 lb 12 oz of 0.0574-inch web, MP, M17 propellant, Lot RAD-38300, was used. The T384E1 design, which weighed 22 lb, simulating the actual flight round, was loaded with 12 lb of the same propellant. A velocity of 3900 fps was established at a working pressure of approximately 50,000 psi at ambient temperatures. In addition to the establishment of a charge, spin level was determined for both designs. The T384 round gave a muzzle spin between 17 and 20 rps, whereas the T384E1 design ranged between 25 and 30 rps.

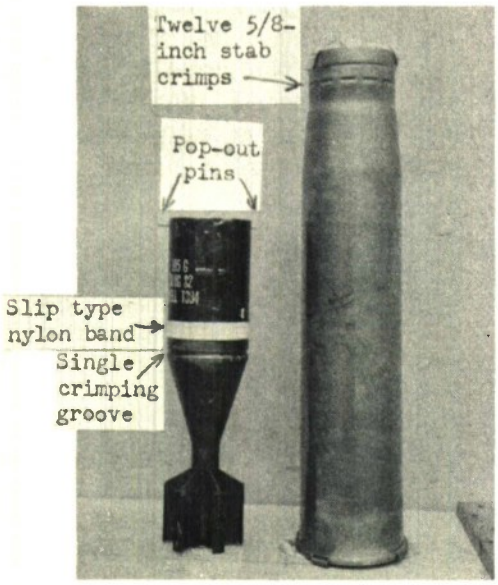
(U) This report covers all firings conducted under Test Program Requests No. TE-212 and 213 which cover tests to determine whether the present wiring system, and other components, are suitable to withstand high acceleration forces.

2. (C) DESCRIPTION OF MATERIEL

2.1 Cartridge, HEAT, 105-mm, T384, Slug

The 105-mm, T384 cartridge (Figure 1) is assembled as a complete round and consists of the following components: body slug with pop-out pin assembly, fin and fin adapter or boom, obturating band, tracer, 105-mm

modified British cartridge case with base-loading plug, percussion-electric primer, and propellant. The slug body is solid with a cylindrical hole drilled concentrically through the longitudinal axis of the slug.



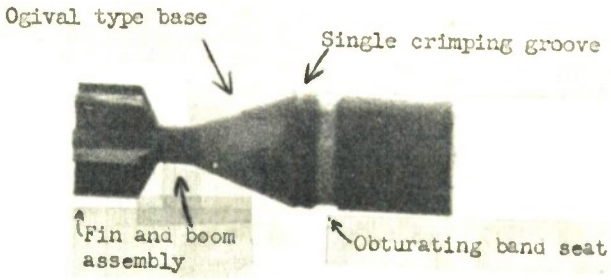


Figure 1. Left: 105-mm, T384, Slug, and the 105-mm Modified British Cartridge Case. Right: The T384 Slug in Flight Approximately 130 Feet from Muzzle.

The body of the projectile is a conventional, cylindrical, blunt-nosed slug with a boat-tailed base incorporating a fin-boom assembly. As-fired weight is approximately 23 pounds. The slug is crimped in the case by twelve 5/8-inch stab crimps in a single crimping groove. The case is a case-over-band design permitting the slug to extend no further into the case than the obturating band and band seat in the neck of the case will allow. In flight the obturator breaks up and is discarded as the projectile leaves the muzzle. The propellant is loaded by means of a loading plug at the base of the case. The tracer is installed at the base of the fin and boom assembly. Pop-out pins are installed in the front of the slug at 90° angles from the line of flight and 180° apart for the purpose of securing spin data.

2.2 Cartridge, HEAT, 105-mm, T384

The T384 HEAT shell has basically the same configuration as the T384

slug except that it incorporates a spiked nose in place of the cylindrical hole and the shell and spike are hollow, containing an inert filler. The T384 shell weighs approximately 21.5 lb (or 1.5 lb less than the slug weight). Figure 2 shows the T384 shell after recovery from the 9600-yard recovery field.

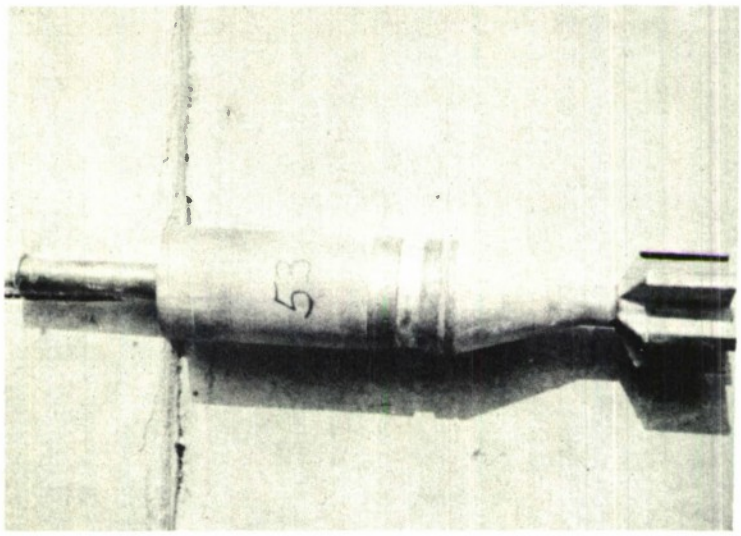
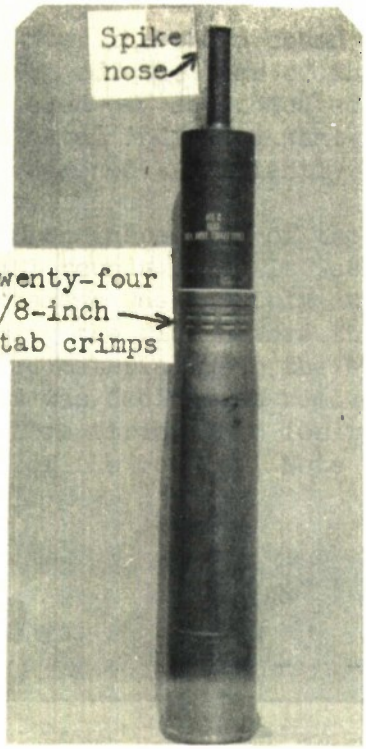


Figure 2. T384 Shell After Recovery.

2.3 Cartridge, HEAT, T384E1, Type I and II

The T384E1 shell is basically the same as the T384 shell except that the base of the projectile is a flat, step-down design (square) and the projectile is crimped in the case by twenty-four 5/8-inch stab crimps in a double crimping groove. The weight of the projectiles is approximately the same and the only difference between the Type I and Type II shell is in the rubber obturator. Figure 3 shows the Type I projectile crimped in the case and rubber obturators removed from these shell prior to firing. Figure 4 shows the Type II projectile and case after bullet-pull operation and three rubber obturators removed from these shell prior to firing. The rubber obturator for the Type II projectile is slightly larger than the obturator for the Type I.



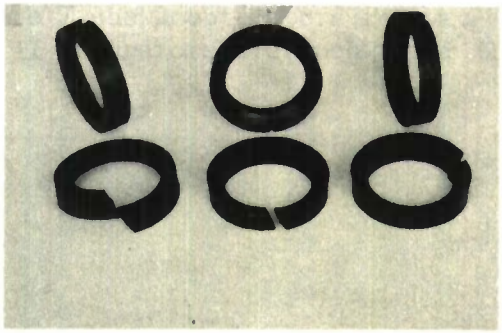
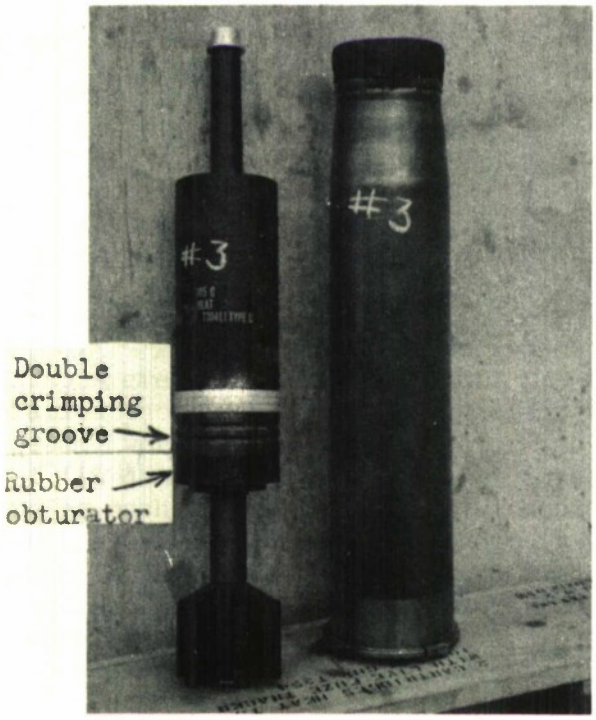


Figure 3. Type I Projectile Crimped in Case (Left), and Rubber Obturators.



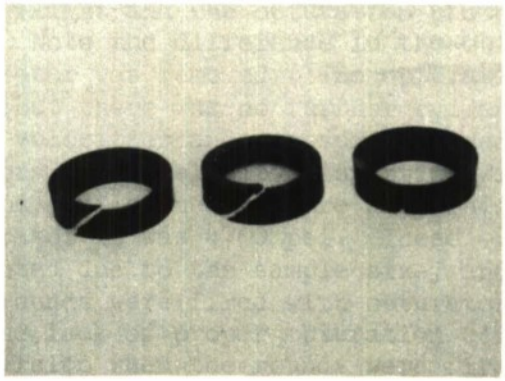


Figure 4. Type II Projectile and Case (Left), and Rubber Obturator.
(Note: One side of the obturator is flat and the other is concave. The concave side faces the rear of the projectile or the fin assembly.)

3. DETAILS OF TEST

3.1 (U) Procedures

Forty complete rounds (assembled and crimped) were shipped from Picatinny Arsenal to Aberdeen Proving Ground to be fired and recovered to determine if the present wiring system, and other components, are suitable to withstand high acceleration. Two Test Program Requests were sent to cover these firings. The first firing consisted of twenty T384 inert-loaded shell with live fuze and the second ten each of the T384E1 Type I and Type II inert-loaded shell with live fuze detonator and lead.

The twenty T384 rounds were delivered to Magazine 700 (HE shed) for for final checks on the wiring, at which time two medium pressure (M3) copper crusher gages were placed in each cartridge case.

The British 105-mm gun and tube were assembled, with a 90-mm concentric recoil mechanism, in the 155-mm gun motor carriage and emplaced at the railway range firing position. A complete star-gaging was effected prior to assembly at Building 525 and also after firing. The gun was elevated to the desired position, the velocity coils put in place and measured, and the camera mounted in position to record obturation. Since difficulty was encountered in obtaining velocities with the velocity coils on the former test, sky screens were also set up to record the velocities in the event the coils again failed to give satisfactory results. Range observers and demolitions men were stationed in bombproofs at the 9600-yard recovery field to observe the impacts, stake the rounds, and assist in recovering them. All equipment was checked and the ammunition was brought to the site. Figure 5 shows setup prior to firing.

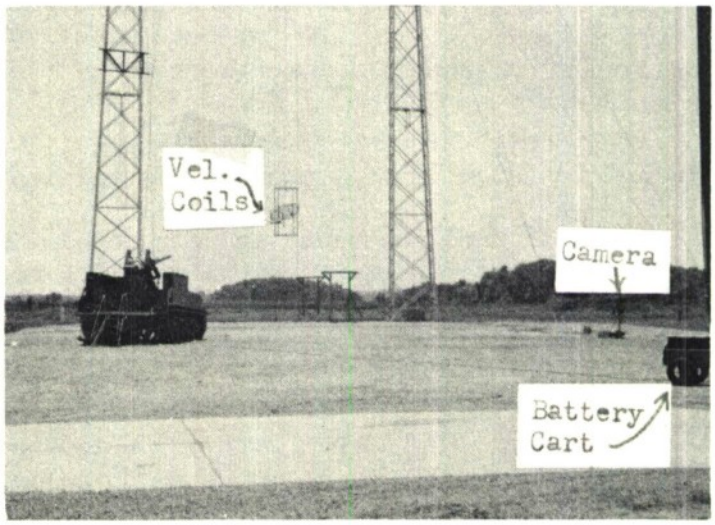


Figure 5. Setup Prior to Firing.

(C) On 8 June 1959 five rounds were fired. The first two rounds were T384 slugs that were available from a former test; they were used as conditioning and spotting rounds. Three test rounds were then fired and an effort was made to recover them immediately. One round fell short but the other two were recovered and inspected. The results were not gratifying but it was decided to fire seven more rounds the following morning and recover as many of the projectiles as possible. Two conditioning rounds were fired followed by the seven test rounds and all projectiles were recovered. Inspection showed fuze failure but it was decided to fire five more rounds the following day (10 June) through a plywood bursting screen placed on the last coil, and recover and inspect the projectiles before making the final decision. The fuzes did not function and the program was discontinued. Photographs of these recovered projectiles are inclosed in Appendix D (D-2 and D-3). Obturation photographs are inclosed in Appendix D-4 through D-16. The remaining five rounds under TPR TE-212 were disassembled, the fuzes removed and destroyed, and the rounds minus propellant returned to Picatinny Arsenal for further inspection.

(C) On 22 June 1959 the firings under TPR TE-213 were commenced using the same setup as before except that in addition a smear camera was placed approximately 30 feet from the muzzle to record the projectile in flight. The sky screens were eliminated because the velocities were recorded satisfactorily by the coils on the last firings. Only four rounds were fired this day because the observers at the field could not locate the shell. The film from the cameras was developed and inspected and it was found that considerable fin damage was occurring from the rubber obturator; therefore the remaining rounds were bullet pulled, the obturators removed, and the rounds reassembled without crimping. Eleven more rounds were fired between 23 and 25 June with only five projectiles being recovered. The remaining five rounds are at Aberdeen Proving Ground and will be fired at a later date.

3.2 (C) Results

Thirteen T384 HEAT shell were recovered and inspected. The fuzes of all these rounds failed to function on ground or plywood impact.

Five T384E1 HEAT shell were recovered and inspected. The fuzes of all these rounds functioned except for one round which had a fuze wire broken before it was fired.

The instrumentation results of all rounds fired are averaged according to the type of round and banding arrangement used. A summary of results is contained in Table I.

Table I. Instrumentation Results

Rounds Considered	Ammunition Type	Ammo Lot No. PA-E-	Banding Arrangement	Velocity, fps Muzzle Chron	Velocity, fps Muzzle Max Spread	Pressure, psi M3 Gages Average	Pressure, psi M3 Gages Max Spread
4	Slug, T384	28465	Slip type	3817	46	52,750	800
15	Shell, T384	29162	Slip type	3988	79	[a]52,310	[a]3800
4	Shell, T384E1, Type II	29255	Slip type and obt.	4017	15	51,325	2200
6	Shell, T384E1, Type II	29255	Slip type	3974	48	49,035	2900
5	Shell, T384E1, Type I	29254	Slip type	3986	52	50,340	4000

[a]Eleven rounds considered.

3.3 (C) Observations and Remarks

The T384 slug round, Lot PA-E-28465, was used as a conditioning and spotting round during the first recovery firing. However, the rounds served only as tube conditioners because they did not reach the 9600-yard recovery field when fired at 220 mils elevation. But the T384 HEAT shell did reach the field. Thirteen of the fifteen HEAT rounds fired were recovered, inspected and photographed. Photographs of these shell are inclosed in Appendix D-2 and D-3. It is believed that the T384 slugs fell more than 1500 yards short of the field; therefore it will be necessary to fire these slug rounds at a range of approximately 5500 yards (approximate maximum range) to insure recovery, or, they should be fired into a recovery box.

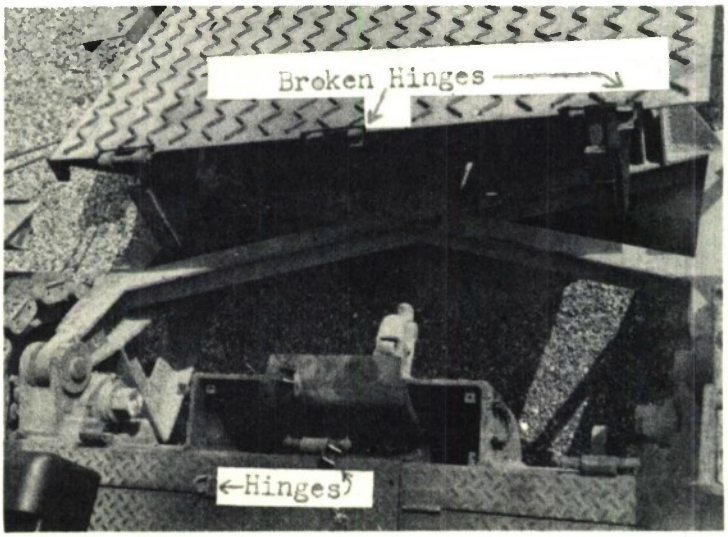


Figure 6

After the third round was fired it was noted that the blast broke the platform off the rear of the motor carriage. Close inspection showed the hinges sheared off as indicated in Figure 6. The condition of the sheared pieces of metal indicated that they had been cracked for some time, rusted, and were weakened sufficiently to break at any time.

Upon inspection of the obturation and smear photographs of the first four T384E1 rounds fired it was noted that considerable fin damage occurred. This fin damage was possibly due to the obturator wedging against the bore and damaging the fins before the projectile left the tube. The fin damage contributed materially to the erratic flight causing the rounds to miss the field. It was decided to remove the obturator from each of the remaining rounds before firing them for recovery. Figure 7 shows obturators removed from nine of the rounds. Note that the Type II obturators are much wider than the Type I.

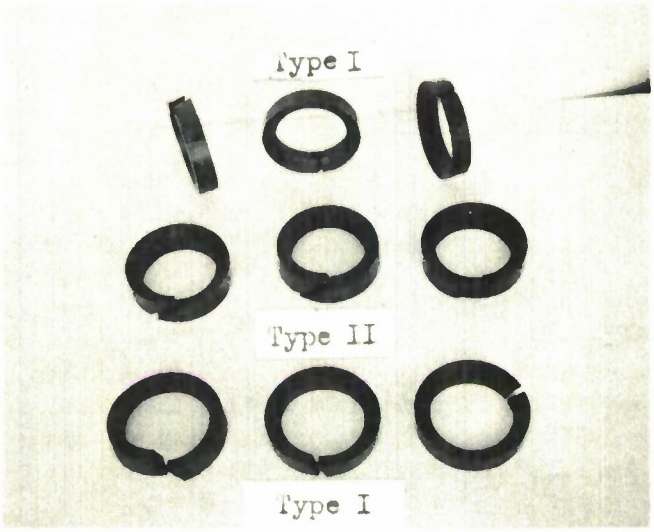


Figure 7. Obturators Removed from Rounds.

Photographs of these projectiles in flight and the obturation photographs are inclosed in Appendix D-9 to D-16. Note the difference in the obturation photographs before and after the obturator was removed. The obturation became worse after the obturator was removed but there was no further evidence of fin damage. In general the dispersion of velocities and pressures seemed to be much worse when firing without obturators. The velocity dispersion with obturator was 15 fps and without it was 63 fps, while the pressure dispersion with obturator was 2200 psi and without obturator it was 4700 psi. These figures, however, are not statistically weighted due to the sample size, and therefore may not be conclusive. Only four rounds were fired with obturators and eleven were fired without obturators. The lack of proper obturation could have been the reason for the wide range dispersion when the rounds were fired at a constant elevation and azimuth and may have materially influenced recovery.

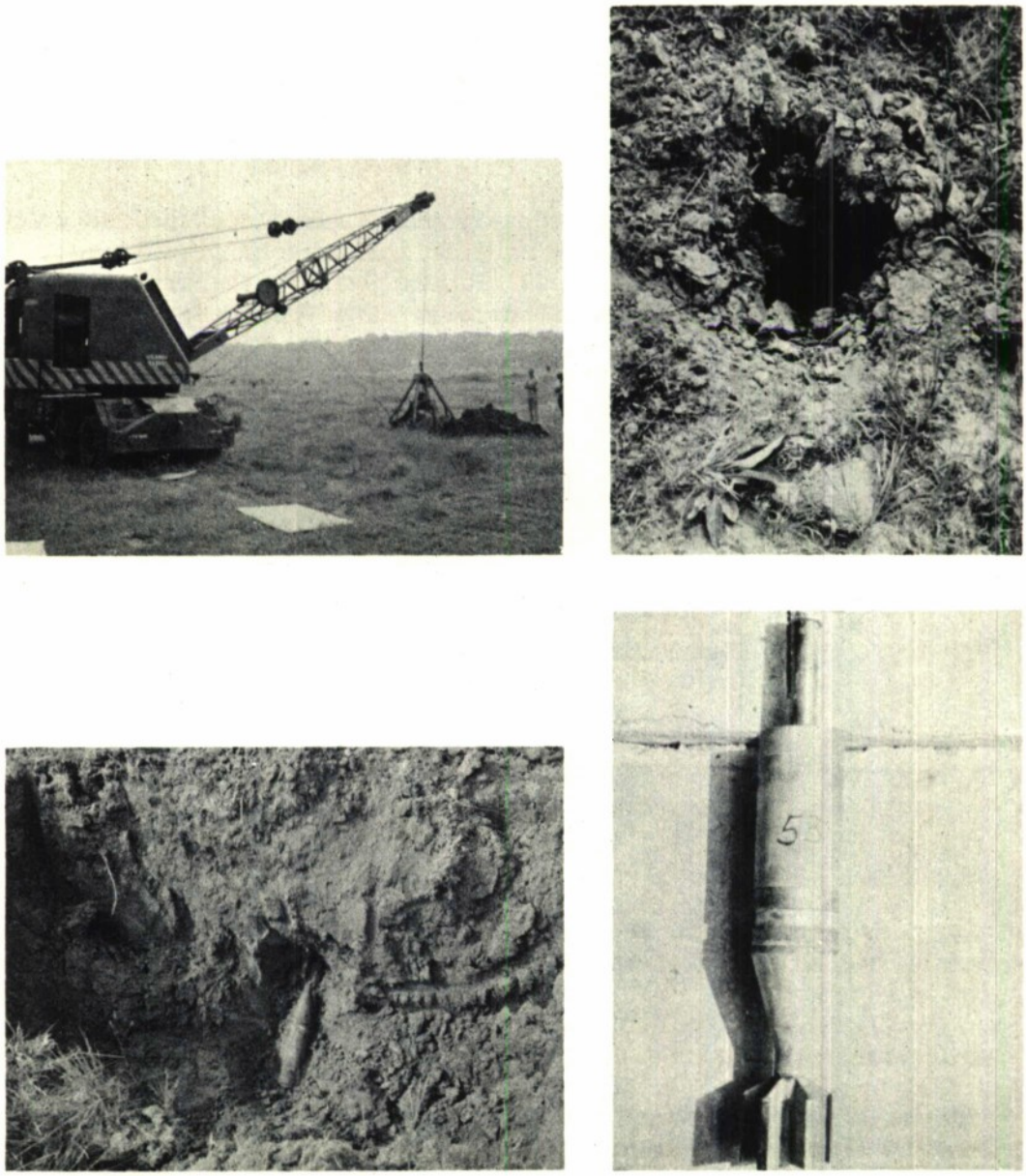


Figure 8. Recovery Operations.

Only five of the eleven rounds fired without obturators were recovered even though observers were sure the rounds impacted on the field. Figure 8 shows the recovery field, the method of recovery by bucket crane, the small hole made by the projectile entering the ground, the position of the round in the base of the hole after digging operation, and the recovered round after it was cleaned. These shell were approximately five to seven feet underground when recovered. The impact angle was approximately 45° for all T384 rounds of the initial firing but was approximately 65° to 80° for the T384E1 rounds fired in the second test.

When round 7 of the second recovery phase was fired the cam stop worked loose, causing the arm to raise against the breechblock linkage, keeping the gun out of battery 7-5/8 inches. Figure 9 shows the arm against the breechblock linkage and the gun out of battery. The Weapons Processing Section was called to inspect the malfunction. The gun was checked, and the program was continued after the cam-stop malfunction was corrected.

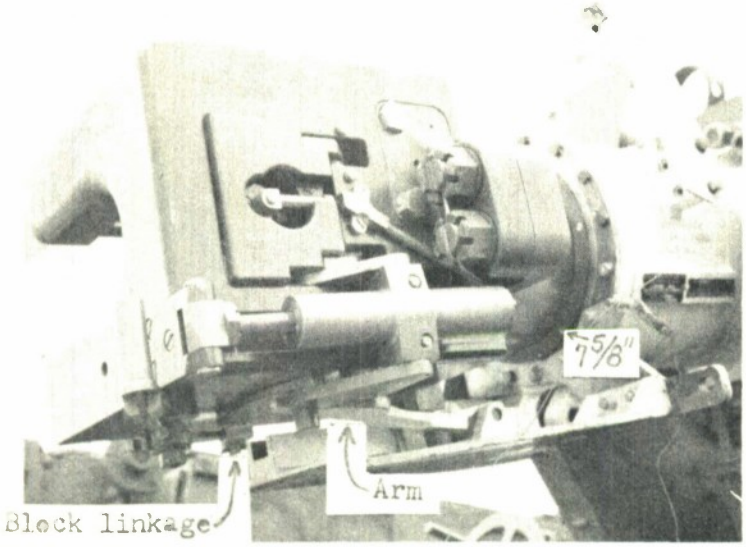


Figure 9. Cam-Stop Malfunction.

Inspection of the recovered shell after firing indicated approximately 40% of the rounds had eroded around the crimping groove, band seat, and on the leading edge and top of the fins. Figure 10 shows typical erosion encountered.

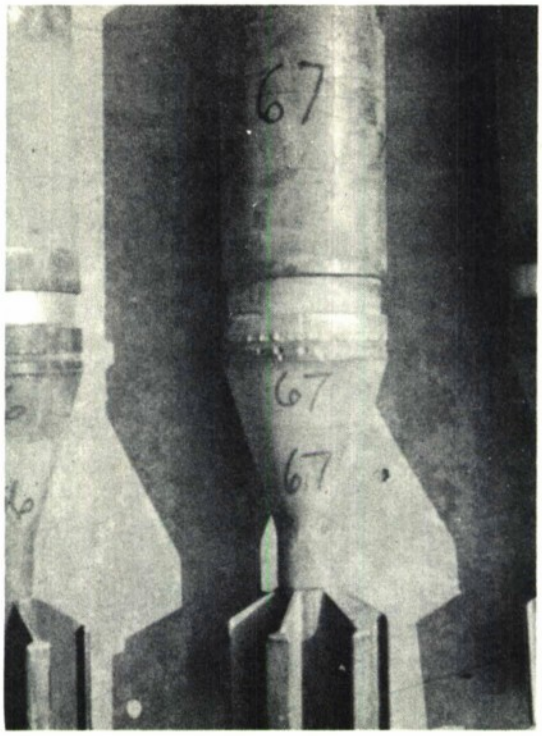


Figure 10. Typical Erosion.

4. (C) CONCLUSIONS

It is concluded that:

a. The present obturator yields very good obturation and resulting pressure-velocity uniformity but damages the fins too severely to be used effectively.

b. The obturator fin damage materially affects range dispersion.

c. Firing with the obturator removed improves range dispersion due to the elimination of fin damage but increases the pressure-velocity dispersion.

d. Erosion of the shell body is considered undesirable.

e. The fuzes of the T384 shell (Fuze Lot PA-E-29173) are considered to function unsatisfactorily.

f. The fuzes of the T384E1 shell (Fuze Lot PA-E-29261) are considered to function satisfactorily.

5. (C) RECOMMENDATIONS

It is recommended that:

a. A lighter, more efficient obturator be fabricated that will break up sufficiently in order to prevent fin damage, and/or the fins be designed to withstand forces encountered in the T384 shell-obturator system.

b. The erosion of the shell body and fins be eliminated by improving obturation.

c. The fuzes from Lot PA-E-29261 be considered satisfactory for use in future testing.

SUBMITTED:

Joseph C. Sleeper, Jr.
JOSEPH C. SLEEPER, JR.
Test Director

REVIEWED:

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Chief, Artillery
Ammunition Branch

H. A. Bechtol
H. A. BECHTOL
Chief, Artillery
Division

APPROVED:

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

REFERENCES

1. OTCM 36799 on Development of Ammunition for 105-mm Gun, T254 (M6-58 and M7-58 S).

2. Sleeper, Joseph C, Jr. Second Report on Ordnance Project No. TW-419, Development of Cartridge, 105-mm, HEAT, T384 for 105-mm Gun, T254. Aberdeen Proving Ground.

APPENDICES

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APPENDIX A

ORDNANCE CORPS
PICATINNY ARSENAL
DOVER, NEW JERSEY
Correspondence

Mr.R.F.Campoli/McC/6179

MAY 1 8 '59 -10 AM

MAC CD 59-2159

IN REPLY
REFER TO:
Feltman Research and Engineering Labs.
ORDBB-TE5

SUBJECT: Test Program Request No. TE-212 (C), Recovery Test for Cartridge, HEAT, T384 for 105mm Gun, T254E2

TO: Commanding General
Aberdeen Proving Ground
Aberdeen, Maryland
ATTENTION: ORDBG-DP-TA, Mr. H. Carothers

1. Inclosed is Test Program Request No. TE-212 (C), D/A Priority 1A, covering a Recovery Test with the 105mm T384 Round. This test will consist of firing Inert Loaded T384 Rounds with live fuze detonator and live lead into a 5500 yard recovery field to determine if the electrical wiring system is adequate for the 105mm T384 design.

2. The items listed in paragraph 1a of the inclosed Test Program Request will be shipped to your Proving Ground approximately 14 May 1959. It is requested that this test be conducted as soon as possible in view of the urgency of the item.

3. Funding Data:

Funds are available under AIF Order No. 97110100-99-60057 and Job Order 3136-06-901 (425), OMS 5550.16.52000.412.

4. Coordination:

a. OCO, ORDTW

b. APG, ORDBG-DP-TA

c. Picatinny Arsenal - Engineer primarily responsible for the test is Mr. R. F. Campoli, phone: Picatinny Arsenal, Extension 6179.

18167

MAY 1 8 '59 -10 AM

ORDBB-TE5
SUBJECT: Test Program Request No. TE-212 (C), Recovery Test for Cartridge, HEAT, T384 for 105mm Gun, T254E2

5. Notification of Test Attendance:

Mr. R. F. Campoli will attend the test and requests notice three days prior to the firing.

FOR THE COMMANDER:

1 Incl f/d DPS in quad
1. TPR No. TE-212 (C) (6 copies)
u/d 1 cy for DPS & 1 cy for Conarc

R. H. WOOD
Assistant

CC:
OCO, ORDTW w/incl
APG, Comp Ofc, w/o incl

Mr.R.F.Campoli/McC/6179
Test Program Request No. TE-212 (C)
Job Order No. 3136-06-901 (425)
Picatinny Arsenal, Dover, N. J.
8 May 1959

1. Material for Test:

(U) a. To be furnished by Picatinny Arsenal:

20 - Cartridge, HEAT, 105mm, T384 (Shell Inert Loaded) with live fuze, tracer, primer and propellant for 105mm Gun, T254.

2. Project Authority:

(U) a. Project No. TW-419.

(U) b. Funds available under AIF Order No. 97110100-99-60057 and Job Order indicated above, OMS No. 5550.16.52000.412.

3. Object of Development or Experiment:

(C) To develop Cartridge, HEAT, 105mm, T384 for 105mm Gun, T254.

4. History Sketch:

(C) The assignment to develop a 105mm HEAT Round for the 105mm T254E2 Gun was given to Picatinny Arsenal. This work was initiated in February 1958 at which time the first design was prepared similar to the successful 90mm T300. Due to the urgency of completion of the development, a dual approach was taken. A second design, the T384E1, was prepared similar to the 120mm T153 except that two different obturators are being investigated; one is a slip type nylon band and the other a rubber obturator assembled to a flat base surface of the shell. The requirement for the 105mm HEAT round is that it be fired at a muzzle velocity of 4000 fps at a working pressure below 50,000 psi. At this velocity, an accuracy of .17 mils Hor. and Vert. is desired at both 1000 and 2000 yards. Penetration should be 7" at 60° obliquity.

(C) The British 105mm brass case will be used and will be modified for rear loading. It will be necessary to use a case over band design which will require the case to be necked down behind the band in order to obtain crimping surface. The T384 design will use one crimping groove whereas the E1 design will have two.

Incl: C 59-2159

TPR TE-212 (C) (Cont)

(C) Contracts were placed with two companies, Budd Company who is manufacturing the T384 design and Electro-Mechanical Research Company who will produce the E1 design. Tests were conducted at Aberdeen Proving Ground from the T254 Gun, on 23 March, firing both the T384 and T384E1 design to establish charge. Since the T384 round weighed 23 lbs which was 1.5 lbs heavier than the actual round, a charge of 11 lbs 12 ozs of .0574 web M17 Propellant, Lot RAD-38300, was used. The T384E1 design which weighed 22 lbs, simulating the actual flight round, was loaded with 12 lbs of the same propellant. A velocity of 3900 fps was established at a working pressure of approximately 50,000 psi at ambient temperatures. In addition to establishing charge, spin level was determined for both designs. It was found that the T384 round gave a muzzle spin between 17 and 20 rps whereas the T384E1 design ranged between 25 and 30 rps.

5. Description in Detail of Improvements Made Since Last Proving Ground Test:

(U) None

6. Local Tests:

(U) None

7. Object of Test:

(U) The object of this test is to recover rounds and determine if the present designed wiring system, and other components, are suitable to withstand the high acceleration.

8. Precautions in Handling and Testing:

(C) Care should be taken not to damage the spike nose cap in handling, otherwise the usual precautions in handling and testing inert loaded HEAT Shell with fuzes containing live detonators, live tracers and primers should be observed.

9. Recommended Test Program:

(C) It is requested that a 105mm T254E2 Gun be made available for this recovery test. If possible, it would be much more suitable to have the T254E2 Gun assembled to an M48 Tank. The gun should be assembled in a fashion so that high angles of fire can be obtained in order to drop the projectile in a recovery field at approximately 5500 yards. All rounds should be assembled with two pressure gages. In addition, velocity will be recorded for each round fired. Angles of elevation should be recorded for each round. If possible, muzzle pictures of each round should also be taken in order to determine obturation. The 20 rounds will be fired in groups of 5 rounds each. After firing the first 5 rounds they should be recovered and inspected to determine if the live detonators of the M509 Fuze had functioned on ground impact. If it is found that malfunctioning is due to improper nose impact, the next 5 rounds will be fired through 1/4" plywood placed at approximately 100 feet from the muzzle. These rounds will also be recovered and inspected for functioning. The remaining 10 rounds will be fired depending on the outcome of the previous 2 groups. Upon recovering each group of rounds, the following inspection should be performed:

(C) a. Remove cap, note any damage to potting compound and prongs.

(C) b. Apply ohmmeter to front terminal and spike to determine if fuze functioned. Resistance reading ranging between 100,000 and 140,000 ohms, indicates fuze did not function.

(C) c. Remove fin adapter and spacer. Make visual inspection. If discoloration exists around fuze cavity, detonator functioned. Apply ohmmeter to terminal at rear and terminal at the nose end to determine if continuity exists.

(C) d. Remove fuze (if fired, no further inspection required), if not, disassemble fuze and perform visual inspection to determine if rotor is in the armed position.

(U) It is requested, in addition to the above data, that the tube be stargaged before and after firing. Data should be recorded and furnished to the Project Engineer.

10. References:

(U) None

TPR TE-212 (C) (Contd)

11. Report Distribution:

(U) a. Test Report Security Classification: Confidential

(U) b. 2 copies - OCO, ORDTW
6 copies - Aberdeen Proving Ground, Attn: ORDBG-DP-TA
4 copies - Picatinny Arsenal:
1 copy - Inspection Division
1 copy - ORDBB-TE5
1 copy - ORDBB-TH8
1 copy - Arty Ammo Dev Lab Planning Office

R. H. WOOD
Chief, Artillery Ammunition
Development Laboratory,
Feltman Research and
Engineering Laboratories

ORDNANCE CORPS
PICATINNY ARSENAL
DOVER, NEW JERSEY

Mr.R.F.Campoli/as/6179

Mur CD 59.2434

IN REPLY
REFER TO:
Feltman Research and Engineering Labs.
ORDBB-TE5

JUN 3 '59 -3 PM

SUBJECT: Test Program Request No. TE-213 (C), Recovery Test for Cartridge, HEAT, T384E1, Types I and II, for 105mm Gun, T254E2

TO: Commanding General
Aberdeen Proving Ground
Aberdeen, Maryland
ATTENTION: ORDBG-DP-TA, Mr. H. Carothers

1. Inclosed is Test Program Request No. TE-213 (C), D/A Priority 1A, covering a Recovery Test with the 105mm T384E1 Round. This test will consist of firing Inert Loaded T384 Rounds with live fuze detonator and live lead into a 5500 yard recovery field to determine if the electrical wiring system is adequate for the 105mm T384E1 design.

2. The items listed in paragraph 1a of the inclosed Test Program Request will be shipped to your Proving Ground approximately 1 June 1959. It is requested that this test be conducted as soon as possible in view of the urgency of the item.

3. Funding Data:

Funds are available under AIF Order No. 97110100-99-60057 and Job Order 3136-06-901 (425), OMS 5550.16.520CO.412.

4. Coordination:

a. OCO, ORDTW

b. APG, ORDBG-DP-TA

c. Picatinny Arsenal - Engineer primarily responsible for the test is Mr. R. F. Campoli, phone: Picatinny Arsenal, Extension 6179.

18971

ORDBB-TE5
SUBJECT: Test Program Request No. TE-213 (C), Recovery Test for Cartridge, HEAT, T384E1, Types I and II, for 105mm Gun, T254E2

5. Notification of Test Attendance:

Mr. R. F. Campoli will attend the test and requests notice three days prior to the firing.

FOR THE COMMANDER:

1 Incl
1. TPR No. TE-213(C) (6 copies)

R. H. WOOD
Assistant

CC:
OCO, ORDTW w/incl
APG, Comp Ofc, w/o incl

Mr. R.F.Campoli/sfg/6179
Test Program Request No. TE-213 (C)
(Job Order No. 3136-06-901(425))
Picatinny Arsenal, Dover, NJ
May 1959

1. (U) Material for Test:

To be furnished by Picatinny Arsenal

a. 10 each Cartridge, HEAT, 105 mm T384E1, Type I (shell inert loaded) with live fuze detonator and lead, tracer, primer and propellant for Gun, T254E2.

b. 10 each Cartridge, HEAT, 105 mm T384E1, Type II (shell inert loaded) with live fuze detonator and lead, tracer, primer and propellant for Gun, T254E2.

2. (U) Project Authority:

a. Ordnance Project No. TW-419

b. Department of the Army Number D/A 504-03-089

c. Funds available under Army Industrial Fund Order Number 97110100-99-60057 and Job Order No. indicated above, OMS No. 5550.16.52000-412.

3. (C) Object of Development or Experiment:

To develop Cartridge, HEAT, 105 mm T384 for 105 mm Gun, T254.

4. (C) History Sketch:

See Test Program Request No. TE-212 dated 8 May 1959.

5. (U) Description in Detail of Improvements Made Since Last Proving Ground Test:

None

6. (U) Local Tests:

None

7. (U) Object of Test:

The object of this test is to recover rounds and determine if present designed wiring system, and other components, are suitable to withstand the high acceleration.

Rich' CJ 59-2434

Test Program Request No. TE- 213 (C) (Contd)

8. (C) Precautions in Handling and Testing:

Care should be taken not to damage the spike nose cap in handling, otherwise the usual precautions in handling and testing inert loaded HEAT Shell with fuzes containing live detonators, live tracers and primers should be observed.

9. (C) Recommended Test Program:

It is requested that a 105 mm T254E2 Gun be made available for this recovery test. If possible, it would be much more suitable to have the T254E2 Gun assembled to an M48 Tank. The gun should be assembled in a fashion so that high angles of fire can be obtained in order to drop the projectile in a recovery field at approximately 5500 yards. All rounds should be assembled with two pressure gauges. In addition, velocity will be recorded for each round fired. Angles of elevation should be recorded for each round. If possible, muzzle pictures of each round should also be taken in order to determine obturation. The 20 rounds will be fired in groups of five rounds each. After firing the first five rounds they should be recovered and inspected to determine if the live detonators of the M509 Fuze had functioned on ground impact. If it is found that malfunctioning is due to improper nose impact, the next five rounds will be fired through 1/4" plywood placed at approximately 100 ft from the muzzle. These rounds will also be recovered and inspected for functioning. The remaining 10 rounds will be fired depending on the outcome of the previous two groups. Upon recovering each group of rounds, the following inspection should be performed.

a. Remove cap, note any damage to potting compound and prongs.

b. Apply ohm-meter to front terminal and spike to determine if fuze functioned. Resistance readings above 100,000 ohms indicate fuze did function.

c. Remove fin adapter and spacer. Make visual inspection. If discoloration exists around fuze cavity, detonator functioned. Apply ohm-meter to terminal at rear and terminal at the nose end to determine if continuity exists.

d. Remove fuze (if fired, no further inspection required), if not, disassemble fuze and perform visual inspection to determine if rotor is in the armed position.

It is requested, in addition to the above data, that the tube be star-gaged before and after firing. Data should be recorded and furnished to the Project Engineer.

10. (U) References:

None

Test Program Request No. TE-213 (C) (Contd)

11. (U) Report Distribution:

a. Test Report Security Classification: Confidential

b. 2 Copies - OCO-ORDTW
6 Copies - Aberdeen Proving Ground, Attn: ORDBG-DP-TA
4 Copies - Picatinny Arsenal:

1 Copy - Inspection Division
1 Copy - ORDBB-TE5
1 Copy - ORDBB-TH8
1 Copy - Art Ammo Dev Lab Planning Office

R. H. Wood

R. H. WOOD
Chief, Artillery Ammunition
Development Laboratory
Feltman Research and Engineering Laboratories

APPENDIX B

DEVELOPMENT AND PROOF SERVICES
ABERDEEN PROVING GROUND, MARYLAND
FIRING RECORD

Fuze Functioning and Engineering Performance of Cartridge, HEAT, T384 for 105-mm Gun, T254 (U)

Firing Record No.: P-64406
Dates of Test: 8 to 10 June 1959
Authority: ORDBB-TE5 (TW-419/TE-212)
M&R CI 59-2159

Project No.: TW-419
Development Test

W.O. No. 332-434-02 evh

AMMUNITION (C)

Test Rounds

Cartridge, HEAT, 105-mm, T384 (inert-loaded shell) with live fuze, tracer, primer, and propellant Lot No. PA-E-29162. Complete details on ammunition components are contained in Data Card No. 90698 inclosed in Appendix C.

Conditioning Rounds

Cartridge, Slug, 105-mm, T384, Lot PA-E-28465. Complete details on ammunition components are contained in Data Card No. 89669 inclosed in Appendix C.

Propellant Used

All rounds were loaded with Propellant, MP, M17, 0.0574-inch web, Lot RAD-38300.
Propellant charge for conditioning rounds was 11 pounds 12 ounces.

MATERIEL (U)

Gun	:	105-mm, British, B.R. No. L/7287, F.L. 9000, R.O.F. CF. 20 P_R. TK.MK.1.
Tube	:	105-mm, British, No. E/2894; Muzzle No. 57043.
Mount	:	Combination Gun, T148, No. 11736.
Recoil	:	Mechanism, Concentric, 90-mm, T88, No. 11736.
Carriage	:	Gun Motor, 155-mm, No. 777 (Platform Gun, Portable, No.3).

INSTRUMENTATION (U)

Pressures

Medium Pressure M3 Gages; Coppers Lot 9C55. F.A. Metal 1955, Annealed 1955; Comp Curve Dwg FD-18222, Cyl Dwg No. A7274851. (Two gages per round; readings averaged.)

Velocities

Standard 30-inch velocity coil cages were used and positioned as follows:

Dates of Firing 1959	Test Round Numbers	Muzzle to First Coil, ft	Muzzle to Second Coil, ft
8 June	1 to 5	95.60	30.00
9 June	6 to 14	98.00	30.00
10 June	15 to 19	98.00	30.00

Sky screens were set up on 8 June because trouble had been encountered on previous tests in securing velocities by the conventional velocity coil method. These screens were set at 171.15 feet and 240.98 feet, respectively, from the muzzle. The velocities secured by this method compared favorably with the velocity-coil data, so the sky screens were removed to another firing program. No velocities were lost in this test by the velocity coil method.

Camera

A Fastax camera was placed at the muzzle, approximately 20 feet to the right of the line of fire, to record obturation. Representative photographs of this obturation are inclosed in Appendix D.

ROUND-BY-ROUND DATA (C)

Azimuth: 54° West of South. All rounds conditioned at +70°F. Impact Area: 9600-yard Recovery Field.

Round No. Test	Round No. Tube	Time of Firing	Shell No.	Proj Type	MV, fps	Chamber Press., psi/100	Elev, mils	Wind Vel, mph	Wind Direction From	Range, yards	Condition of Crimping Groove	Condition of Band Seat	Condition of Fin	Continuity between Spike and Nose Terminal	Circuit through Cone
Date of Firing: 8 June 1959															
1	51	1422	S1-34	Cond	3796	529	142	6	SSE	Lost	--	--	--	--	--
2	52	1452	S1-6	Cond	3798	525	180	6	SSW	Lost	--	--	--	--	--
3	53	1458	52	Test	3979	N.T.	180	6	SSW	Lost	Lost	--	--	--	--
4	54	1521	73	Test	3991	N.T.	220	6	SSW	7643	Good	Good	Eroded	Open	Open
5	55	1532	53	Test	4017	N.T.	220	6	SSW	7508	Good	Good	Eroded	Open	Open
Date of Firing: 9 June 1959															
6	56	1012	S1-23	Cond	3842	524	220	Calm		Lost	--	--	--	--	--
7	57	1016	S1-10	Cond	3833	532	220	Calm		Lost	--	--	---	--	--
8	58	1025	71	Test	3984	532	220	3	S	7609	Eroded	Eroded	Eroded	Terminal broke; open.	Open
9	59	1030	74	Test	4012	534	220	3	S	7555	Good	Good	Eroded	Open	Open
10	60	1035	51	Test	3969	528	220	3	S	7427	Eroded	Eroded	Eroded	Open	Open
11	61	1108	55	Test	4001	534	220	3	S	7654	Good	Good	Eroded	Terminal broke; open.	Good
12	62	1111	69	Test	3979	531	220	5	S	7526	Eroded	Eroded	Eroded	Terminal broke; open.	Open
13	63	1117	58	Test	4012	536	220	4	S	7383	Good	Eroded	Eroded	Terminal broke; open.	Good
14	64	1122	65	Test	3984	506	220	3	S	7564	Good	Good	Eroded	Terminal broke; open.	Good
Date of Firing: 10 June 1959 — One-quarter-inch plywood bursting screen used on last coil (photographs inclosed in Appendix D).															
15	65	1106	76	Test	4012	524	220	3	SSE	7641	Good	Good	Eroded	Terminal broke; open.	Open
16	66	1114	56	Test	3984	506	220	4	SSE	7476	Good	Good	Eroded	Terminal broke; open.	Short
17	67	1122	67	Test	3938	498	220	3	SSE	7299	Eroded	Eroded	Eroded	Terminal broke; open.	Short
18	68	1128	79	Test	3984	525	220	3	SSE	7504	Good	Good	Eroded	Cap broke; N.C.	Open
19	69	1135	64	Test	3974	N.T.	220	4	SSE	Lost	Lost	--	--	--	--

N.T. = Not taken; N.C. = Not checked.

Inspection of the fuzes upon recovery showed the potted nose element was good and all fuzes were live and armed. Good continuity was encountered between the cap and spike, spike and chamber, spike and body, and between the body and the chamber. Complete circuit between all parts.

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Remarks (C)

All rounds were fired for recovery from the Railway Range into the 9600-yard recovery field.

The last five rounds of this group were fired through $\frac{1}{4}$-inch plywood bursting screens placed on the last coil. Photographs of these impacts on the plywood are inclosed in Appendix C-1.

The muzzle flash was large (about 20 by 10 feet) but the smoke cloud was small on all rounds fired.

Representative obturation and in-flight photographs are inclosed in Appendix D.

The gas leakage around the loading plug seemed to have improved on these test shell with only approximately 50% being eroded enough to be loose.

Approximately 90% of the cases stuck in the chamber after firing and had to be forced out.

The remaining five rounds of this group were returned to Picatinny Arsenal for further inspection.

This firing record forms a part of the Fourth Report on Ordnance Project No. TW-419.

SUBMITTED:

Joseph C. Sleeper, Jr.
JOSEPH C. SLEEPER, JR.
Test Director

REVIEWED:

H B Anderson
H. B. ANDERSON
Chief, Artillery
Ammunition Branch

APPROVED:

H. A. Bechtol
H. A. BECHTOL
Chief, Artillery
Division

APPENDIX B

Firing Record

DEVELOPMENT AND PROOF SERVICES
ABERDEEN PROVING GROUND, MARYLAND
FIRING RECORD

Fuze Functioning, Engineering Performance, and Recovery of Cartridge, HEAT, T384E1, Type I and II, for 105-mm Gun, T254 (U)

Firing Record No. P-64407
Dates of Test: 22 to 25 June 1959
Authority: ORDBB-TE5, TPR TE-213; M&R C I 59-2434

Project No.: TW-419
Development Test

W. O. No.: 332-434-03 tsp

AMMUNITION (C)

Test Rounds

Cartridge, HEAT, 105-mm, T384E1, Type I, Lot PA-E-29254, inert-loaded shell with live fuze, live tracers, primers and propellant. Complete details on ammunition components are contained in Data Card No. 90859 inclosed in Appendix C.

Cartridge, HEAT, 105-mm, T384E1, Type II, Lot PA-E-29255, inert-loaded shell with live fuze, live tracers, primers and propellant. Complete details on ammunition components are contained in Data Card No. 90860 inclosed in Appendix C.

Propellant Used

All rounds were loaded with propellant, MP, M17, 0.0574-inch web, Lot RAD-38300.

MATERIEL (U)

Gun:	105-mm, British, B.R. No. L/7287, F.L. 9000, R.O.F. CF. 20 P_R. TK.MK.1.
Tube:	105-mm, British, TK X15E8, No. E/2894; Muzzle No. 57043
Mount:	Combination Gun, T148, No. 11736.
Recoil:	Mechanism, Concentric, 90-mm, T88, No. 11736.
Carriage:	Gun Motor, M40, 155-mm, No. 4019477 (Platform Gun, Portable, No. 3).

INSTRUMENTATION (U)

Pressures

Medium Pressure M3 Gages, Coppers Lot 9C55. F.A. Metal 1955, Annealed 1955; Comp Curve Dwg. FD-18222, Cyl Dwg No. A7274851. (Two gages per round; readings averaged.)

Velocities

Standard 30-inch velocity coil cages were used and positioned as follows:

Dates of Firing 1959	Test Round Numbers	Muzzle to First Coil, ft	Muzzle to Second Coil, ft
22 June	1 and 2	96.20	30.00
22 June	3	99.40	30.00
22 June	4	102.40	30.00
23 June	5 to 7	98.80	30.00
24 June	8	100.80	30.00
24 June	9 to 12	103.30	30.00
25 June	13 to 15	103.75	30.00

Camera

A Fastax camera was placed at the muzzle approximately 20 feet to the right of the line of fire to record obturation and a smear camera was placed approximately 30 feet from the muzzle and to the right of the line of fire to record the projectile in flight. Representative photographs of these cameras are inclosed in Appendix D.

OBSERVATIONS (C)

All rounds were fired for recovery from the Railway Range into the 9600-yard recovery field. However after the fourth round was fired and did not reach the field the photographs made by the cameras were printed and inspected. It was found that the rubber obturators were damaging the fins of the projectile and causing it to have erratic flight; therefore the obturators were removed and the remainder of the rounds fired without them. The removal of the obturator eliminated the fin damage but made obturation very poor. It is believed that the dispersion of the round on the impact area also increased as did velocity and pressure dispersion. This condition could have been a reason that only four rounds were recovered out of the eleven that were fired.

ROUND-BY-ROUND DATA (C)

Azimuth: 54° west of south. All rounds conditioned at +70°F Impact Area: 9600-yard Recovery Field

Round No. Test	Round No. Tube	Time of Firing	Shell No.	Projectile Wt, lb	MV, fps	Chamber Pressure, psi/100	Elev, mils	Wind Vel, mph	Wind Direction From	Range, yards	Condition of Crimping Groove	Condition of Band Seat	Condition of Fin	Concentricity Fin	Concentricity Spike	Center of Gravity	Fuze Shell Resistance
Date of Firing: 22 June 1959																	
Type II Projectile Lot PA-E-29255 with obturator and 8000 psi bullet pull.																	
1	70	1130	84	21.29	4012	508	220	14	SSW	Lost	-	-	-	0.005	0.005	12.260	Broken wire
2	71	1150	86	21.23	4012	502	230	10	SSW	Lost	-	-	-	.012	.013	12.300	120,000
3	72	1214	82	21.31	4016	524	300	9	SSW	Lost	-	-	-	.006	.004	12.300	120,000
4	73	1410	89	21.36	4027	519	370	8	SSW	Lost	-	-	-	.004	.007	12.300	140,000
Date of Firing: 23 June 1959																	
Type II with obturators removed and no crimping pressure.																	
5	74	1115	90	21.32	3979	485	250	6	NNE	Lost	-	-	-	.005	.002	12.260	120,000
6	75	1137	88	21.35	3953	478	265	4	NNE	Lost	-	-	-	.003	.007	12.280	110,000
7	76	1142	85	21.33	3974	490	265	4	NE	Lost	-	-	-	.004	.007	12.260	110,000
Date of Firing: 24 June 1959																	
8	77	1107	83	21.31	3948	477	300	4	NNE	7217	Good	Good	[a]Eroded	.006	.006	12.280	105,000
9	78	1302	87	21.32	3996	506	350	3	NNE	7430	Good	Good	[a]Eroded	.006	.005	12.260	95,000
10	79	1312	81	21.35	3996	506	365	4	NNE	Lost	-	-	-	.004	.004	12.260	135,000
Type I Projectile Lot PA-E-29254 with obturators removed and no crimping pressure.																	
11	80	1316	63	21.30	4012	524	365	4	NNE	Lost	-	-	-	.003	.005	12.280	102,000
12	81	1319	61	21.24	4001	513	365	4	NNE	Lost	-	-	-	.010	.005	12.280	90,000
Date of Firing: 25 June 1959																	
13	82	1055	66	21.25	3960	484	365	6	SSW	7573	Good	Good	[a]Eroded	.004	.005	12.360	120,000
14	83	1140	69	21.22	3970	490	365	6	WSW	7455	Good	Good	[a]Eroded	.004	.006	12.280	110,000
15	84	1339	62	21.22	3985	506	365	6	SSW	7415	Good	Good	[a]Eroded	.012	.005	12.260	Broken wire

[a]Very slight erosion.

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REMARKS (C)

The first four rounds fired showed very good obturation, with flash and smoke cloud being small; however, the rubber obturator damaged the fins severely enough to necessitate its removal. This condition is undoubtedly the reason these four rounds did not reach the recovery field. The remaining eleven rounds fired were without obturator and the smear photographs indicated no more fin damage; however, the obturation became very poor. A very large flash and smoke cloud occurred on these rounds. The condition of erosion on these recovered rounds was better than on those fired under TPR TE-212. There was no erosion around the crimping groove, and only very slight erosion on the sharp edge of the band seat and leading edge of the fin pads.

Representative obturation and in-flight photographs are inclosed in Appendix D.

Approximately 50% of the leading plugs in these cases were loose and gave evidence of gas leakage and erosion around the plug seat after firing.

Since approximately 90% of the cases stuck in the chamber after firing, in the last test these cases were greased before firing. This helped considerably and only about 30% of these cases had to be pried from the chamber.

Inspection of the fuzes upon recovery indicated good continuity throughout and the fuzes did function. However, only five rounds were recovered and one of these had a broken fuze wire before firing.

The remaining five rounds of this 20-round group will be fired at a later date with the expectation of better recovery and verification of the fuze functioning.

A complete star-gauge report of the gun tube with bore photographs is inclosed in Appendices C and D.

This firing record forms a part of the Fourth Report on Ordnance Project No. TW-419.

SUBMITTED:
Joseph C. Sleeper, Jr.
JOSEPH C. SLEEPER, JR.
Test Director

REVIEWED:
HB Anderson
H. B. ANDERSON
Chief, Artillery
Ammunition Branch

APPROVED:
H.A. Bechtol
H. A. BECHTOL
Chief, Artillery Division

APPENDIX C

ARMY-P.A. DOVER, N.J.
DROSS FORM 43 7-28-5 Campoli-6179

EXPERIMENTAL AMMUNITION DATA CARD

NO. 89669

T.P.R. NO.	KIND				AMM. LOT NO.
	Cartridge, Slug, T384 With Live Tracer, Live Primer, and Without Propellant For 105MM Gun, T254				PA-E-28465
SPEC. NO.					QUANTITY IN LOT 25
DRG. NO.	DRG. DATE OR REV.	ALLOT. ADVICE	PROJECT NO.	RAD OR EPO NO.	QUANTITY IN SHIPMENT
*FXP-106679	11-20-58				25
P.A.X.O.	PROP. CHARGE	EXPECTED M.V.	EXPECTED PRESSURE	ASSEMBLED BY	DATE OF ASSEMBLY
3136-25	None			PA	March, 1959

REMARKS: Packed: Improvised. 2 Rounds/wooden box.
Cartridge Cases crimped to slug with 12 5/8" stab crimps. Loading plug assembled hand tight. Primers inspected 100% for presence of all flash holes. Rounds not chamber gage. Try in gun prior to firing. Bullet pull of 8000 lbs. ± 1000 lbs. waived. *Dwg. used as a guide in assembly of Cartridges.

(Over)

COMPONENT	Fin	Fin	Band	Tracer	Primer	Body Slug	
KIND		Adapter Slug	Obturating	T-	Parc Elec XM-77	N/Pop-out Fin Assembly	
DRG. NO.	CXP-96887	DXP-106008	BXP-96897	CXP-90142	DXP-96841	CXP-106009	BXP-107185
DRG. DATE OR REV.	Rev. 10-30-58	9-15-58	2-19-58	8-21-57	9-2-58	9-15-58	12-5-58
MFG'D BY	Budd Co.	Budd Co.	Budd Co.	PA	PA	Budd Co.	
DATE	1958	1958	1958	1958	1958	1958	
LOT NO.	unk	unk	unk	PA-E-27921	PA-E-27975	unk	

PREPARED BY A. Kurtulik
Ars Opers DIVISION

PICATINNY ARSENAL 816
DOVER, NEW JERSEY

CERTIFIED TO BY: F. Lewis F. Lewis INSPECTOR
Inspection DIVISION

Card No. 89669

COMPONENT	Case Cartg. T-105MM	Plug
KIND	Modified (British Case)	Loading
DRG. NO.	FXP-96886	BXP-106085
DRG. DATE OR REV.	11-19-58	unk
MFG'D. BY	Budd Co.	Budd Co.
DATE	1958	1958
LOT NO.	unk	unk

ARMY-P.A. DOVER, N.J.
ORDBB FORM Hegedus-6179

EXPERIMENTAL AMMUNITION DATA CARD

NO. 90698

T. P. R. NO.	KIND				AMM. LOT NO.
	Cartridge, HEAT, 105MM, T384 (Inert Loaded Shell) With Live Fuze, Tracers, Primers and Propellant for 105MM Gun, T254				PA-E-29162
SPEC. NO.					QUANTITY IN LOT 20
DRG. NO.	DRG. DATE OR REV.	ALLOT. ADVICE	PROJECT NO.	RAD OR EPO NO.	QUANTITY IN SHIPMENT
FXP-96881	3-18-59		TW-419		20
P. A. X. O.	PROP. CHARGE	EXPECTED M. V.	EXPECTED PRESSURE	ASSEMBLED BY	DATE OF ASSEMBLY
3136-25	12 lbs.	3775 ft./sec.	50,000 PSI	PA	May, 1959

REMARKS: Packed: Improvised. 2 Cartridges/saddle type/wood box. Loading Plug assembled hand tight without cement. Pettman cement on primer threads & torque of Primers waived. Tracer assembled in accordance with Dwg. FXP-106671. Bullet pull of 7500 lbs. ± 500 lbs. using 12, 5/8" Stab crimp. *Shells received Inert Loaded. Rounds not chamber gaged; try in gun prior to firing. Cement eliminated on all metal parts.

(Over)

COMPONENT	Metal	Case	Primer	Tracer	Potted	Band	
KIND	Parts Assembly	Cartg. T-	Perc Elec XM-83	T-	Nose Element	Obturating	
DRG. NO.	FXP-96883	FXP-96886	DXP-96841	CXP-90142	BXP-94425	BXP-96897	
DRG. DATE OR REV.	2-19-58	2-19-59	1-21-59	10-31-58	11-18-57	2-19-58	
MFG'D BY	Budd Co.	Budd Co.	PA	PA	Centra Lab	Budd Co.	
DATE	1959	1959	1959	1959	1958	1959	
LOT NO.	None	none	PA-E-29135	PA-E-27921	Unk	unk	

PREPARED BY A. Kurtulik — Ars Opers DIVISION

PICATINNY ARSENAL DOVER, NEW JERSEY 816

CERTIFIED TO BY: M. E. Smith, INSPECTOR — Inspection DIVISION

Card No. 90698

Remarks: Fuzes formerly from lot DOF-E-214 and modified by Picatinny Arsenal by removing the live booster pellet and inserting an inert booster pellet.

COMPONENT	Powder	*Filler	Fuze, PI, BD
KIND	Prop. M17 .0574 Web	Inert	M509E4 Modified
DRG. NO.			F-8799735
DRG. DATE OR REV.			10-10-58
MFG'D. BY	Radford		PA
DATE	1952		1959
LOT NO.	RAD-38300		PA-E-29173

ARMY-P.A. DOVER, N.J.
ORDRB FORM 43 FEB Hegedus-617

EXPERIMENTAL AMMUNITION DATA CARD

NO. 90859

T. P. R. NO.	KIND				AMM. LOT NO.
SPEC. NO.	Cartridge, HEAT, M384E1, Type I (Inert Loaded Shell) With Live Fuze, Live Tracers, Primers and Propellant for 105MM Gun, T254				PA-E-29254
					QUANTITY IN LOT 10
DRG. NO.	DRG. DATE OR REV.	ALLOT. ADVICE	PROJECT NO.	RAD OR EPO NO.	QUANTITY IN SHIPMENT
FXP-106670	11-20-58		TW-419		
P. A. X. O.	PROP. CHARGE	EXPECTED M. V.	EXPECTED PRESSURE	ASSEMBLED BY	DATE OF ASSEMBLY
3136-25	12 lbs.	3800 ft./sec.	50,000 psi	PA	June, 1959

REMARKS: Packed: 2 Cartridges/saddle type/wood box.
Loading plug assembled hand tight without cement. Pettman cement on Primer threads and torque of primer waived. Tracer assembled in accordance with Dwg. FXP-106671. Bullet pull of 7500 lbs. ± 500 lbs. using 24, 5/8" stab crimp. *Filler Inert: 40% Dead Burned Gypsum mfgr. US Gypsum Co., 20% Iron Oxide mfgr. Stanley Doggett Co.; 35% Glyceride mfgr. Baker Castor oil Co., 5% Wood Rosin mfgr. Newport Ind. (Over)

COMPONENT	Metal Parts	Case	Primer	Tracer	Potted	Obturator	
KIND	Assembly Type I	Cartg. T-	Perc Elec XM83	T-	Nose Element	Type I	
DRG. NO.	FXP-98437	FXP-96886	DXP-96841	CXP-90142	BXP-94425	BXP-98436	
DRG. DATE OR REV.	9-15-58	2-19-58	1-21-59	10-31-58	11-18-57	1-7-59	
MFG'D BY	Elec. Mech	Elec. Mech.	PA	PA	Centra-Lab	Elec. Mech.	
DATE	1959	1959	1959	1959	1958	1959	
LOT NO.	~~none~~ EMKC-1-2	none	PA-E-29135	PA-E-27921	unk	unk	

PREPARED BY A. Kurtulik
Ars Opers DIVISION

PICATINNY ARSENAL 816
DOVER, NEW JERSEY

CERTIFIED TO BY: W. Kishpaugh, INSPECTOR
Inspection DIVISION

Card No. 90859

Remarks: Shell painted Olive Drab in lieu of black. Rounds not chamber gaged; try in gun prior to firing.
Fuzes formerly from lot DOF-E-214 and modified by Picatinny Arsenal by removing the live booster pellet and inserting an inert booster pellet.

COMPONENT	Powder	Filler*	Fuze, PI, BD,
KIND	Prop. M17 .0574 Web	Inert	M509E4 Mod. With Inert Booster Pellet
DRG. NO.			F-8799735
DRG. DATE OR REV.			10-10-58
MFG'D. BY	Radford		PA
DATE	1952		1959
LOT NO.	RAD-38300		PA-E-29261

ARMY-P.A. DOVER, N.J. ORDER FORM 43 FEB 54 Hegedus-617

EXPERIMENTAL AMMUNITION DATA CARD

NO. 90860

T. P. R. NO.	KIND				AMM. LOT NO.
	Cartridge, HEAT, T384E1, Type II (Inert Loaded Shell) With Live Fuze, Live Tracers, Primers and Propellant for 105MM Gun, T254				PA-E-29255
SPEC. NO.					QUANTITY IN LOT 10
DRG. NO.	DRG. DATE OR REV.	ALLOT. ADVICE	PROJECT NO.	RAD OR EPO NO.	QUANTITY IN SHIPMENT
FXP-106670	11-20-58		TW-419		10
P. A. X. O.	PROP. CHARGE	EXPECTED M. V.	EXPECTED PRESSURE	ASSEMBLED BY	DATE OF ASSEMBLY
3136-25	12 lbs.	3800 ft./sec.	50,000 psi	PA	June, 1959

REMARKS: Packed: 2 Cartridges/saddle type/wood box.
Loading plug assembled hand tight without cement. Pettman cement on primer threads and torque of primer waived. Tracer assembled in accordance with Dwg. FXP-106671. Bullet pull of 7500 lbs. ± 500 lbs. using 24, 5/8" stab crimp. *Filler Inert: 40% Dead burned gypsum mfgr. US Gypsum Co., 20% Iron Oxide mfgr. Stanley Doggett Co., 35% Glyceride mfgr. Baker Castor Oil Co., 5% Wood Rosin mfgr. Newport Ind.

(Over)

COMPONENT	Metal Parts	Case Cartg.	Primer	Tracer	Potted	Obturator	
KIND	Assembly Type I	T-	Perc Elec XM83	T-	Nose Element	Type II	
DRG. NO.	FXP-98437	FXP-96886	DXP-96841	CXP-90142	BXP-94425	XP-106006	
DRG. DATE OR REV.	9-15-58	2-19-58	1-21-59	10-31-58	11-18-57	11-20-58	
MFG'D BY	Elec. Mech.	Elec Mech	PA	PA	Centra-Lab	Elec. Mech	
DATE	1959	1959	1959	1959	1958	1959	
LOT NO.	none	none	PA-E-29135	PA-E-27921	unk	unk	

PREPARED BY A. Kurtulik
Ars Opers DIVISION

PICATINNY ARSENAL DOVER, NEW JERSEY 816

CERTIFIED TO BY: W. Kishpaugh, INSPECTOR
Inspection DIVISION

Card No. 90860

Remarks: Shell painted Olive Drab in lieu of black. Rounds not chamber gaged. Try in gun prior to firing.
Fuzes formerly from lot DOF-E-214 and modified by Picatinny Arsenal by removing the live booster pellet and inserting an inert booster pellet.

COMPONENT	Powder	Filler*	Fuze, PI, BD
KIND	Prop., M17 .0574 Web	Inert	M509E4 Modified w/Inert Booster Pellet
DRG. NO.			F-8799735
DRG. DATE OR REV.			10-10-58
MFG'D. BY	Radford		PA
DATE	1952		1959
LOT NO.	RAD-38300		PA-E-29261

ORDBG-672
Rev 13 Aug 52

RANGE FIRING SUMMARY

Sheet 1 of 1 Sheets

Development & Proof Services
Aberdeen Proving Ground, Md.

Cant Data					Tide Readings			
					Time	Feet	Time	Feet
Boresight Elevation								
Distance Between Points								
After Rd.	R.T.	L.T.	Diff.					

Gun 105 M/M HOW
Date 8, 9, + 10 JUNE 1959
Proof Officer MR. SLEEPER
Elevation of Trunnions 18.18 Ft.
Coordinates of Muzzle
X 4142 Yds. Y 14295 Yds.

Azimuth Line of Fire
Rds. 1 to 12 Az. 59°00'30"
Rds. 15 to 19 Az. 59°00'30"

Gun Rd. No.	Time	Deflections Mils	Deflections Yds.	Range Yds.	Altitude Yds.	Fuze Sett.	Order of Det.	Times of Flight Obs. 1 UPPER E.P.	Obs. 2 LOWER E.P.	Obs. 3	Obs. 4	Obs. 5	Mean
		8 JUNE 1959											
1		LOST	LOST	LOST				LOST	LOST				LOST
2		LOST	LOST	LOST				LOST	LOST				LOST
3		LOST	LOST	LOST				LOST	LOST				LOST
4		0.7L	5L	7643				24.06	24.06				24.06
5		2.2L	16L	7508				23.69	23.69				23.69
		9 JUNE 1959											
6		11.3L	84L	7609				23.24					23.24
7		10.1L	75L	7555				22.71					22.71
8		7.2L	52L	7427				22.67					22.67
9		2.4L	18L	7654				22.52					22.52
10		7.3L	54L	7526				22.82					22.82
11		0.8L	6L	7383				22.66					22.66
12		2.0L	15L	7564				22.89					22.89
		10 JUNE 1959											
15		1.9L	14L	7641				23.33					23.33
16		0.6	4	7476				23.85					23.85
17		7.0	50	7299				23.30					23.30
18		0	0	7504				23.09					23.09
19		LOST	LOST	LOST				LOST					LOST

"A" Indicates "Approximate"
"L" After Deflection Indicates "Left"
"X" After a Time of Flight Indicates "Not Considered in Mean
All Azimuths Given in ° West of 0° South"

Remarks

ARMY---OS---ABERDEEN PROVING GROUND, MD.--189

C-5

ORDBG-672
Rev 13 Aug 52

RANGE FIRING SUMMARY

Sheet 1 of 1 Sheets

Development & Proof Services
Aberdeen Proving Ground, Md.

Cant Data				Tide Readings			
				Time	Feet	Time	Feet
Boresight Elevation							
Distance Between Points							
After Rd.	R.T.	L.T.	Diff.				

Gun 105 M/M HOW
Date 24 & 25 JUNE 1959
Proof Officer MR. SLEEPER
Elevation of Trunnions 18.18 Ft.
Coordinates of Muzzle
X 4148 Yds. Y 14295 Yds.

Azimuth Line of Fire
Rds. * SEE BELOW to Az.
Rds. to Az.

Gun Rd. No.	Time	Deflections Mils	Deflections Yds.	Range Yds.	Az. LF ~~Altitude~~ * ~~Yds.~~	Fuze Sett.	Order of Det.	Times of Flight Obs. 1	Obs. 2	Obs. 3	Obs. 4	Obs. 5	Mean
	24	JUNE	1959										
1		8.2L	58L	7217	54°03'								
2		27.9L	203L	7430	54°45'								
	25	JUNE	1959										
1		30.3	225	7573	54°45'								
2		5.3	39	7455	53°21'								
3		30.4L	221L	7415	53°21'								

"A" Indicates "Approximate"
"L" After Deflection Indicates "Left"
"X" After a Time of Flight Indicates "Not Considered in Mean
All Azimuths Given in ° West of 0° South"

Remarks

ARMY---OS---ABERDEEN PROVING GROUND, MD.-- 189

UNCLASSIFIED ~~SECRET~~

Downgraded as per authority
OTCM 37002 dtd 19 Feb 1959

[redacted] (Formerly SPOTZ-570)
15 Sept 49

105 m/m Tube, TK X15E8, British

CASTING NUMBER: X

MANUFACTURER:

PROOF OFFICER: Mr. Melocik
W.O. 391-312-01

MODEL: TK X15E8

NUMBER OF ROUNDS: 50

NUMBER: 57043 (Stamped on muzzle face); P1/13012 E/2894 (Stamped on breech end)

FIRING STATUS (Check One): BEFORE / X AFTER

105 m/m Tube (British)

DATE OF GAUGING: 16 March 1959

Distance (Inches) from Muzzle Face		Rear Face of Tube	Measurements in 1/1000" of an inch. LANDS Basic-4.134" Vert.	Horz.	GROOVES Basic-4.224" Vert.	Horz.
.10		210.40	.000	.000	+.003	+.003
2.50		208.00	0	0	3	3
6.50		204.00	0	0	3	3
10.50		200.00	0	0	3	3
14.50		196.00	0	0	3	3
18.50		192.00	0	0	3	3
22.50		188.00	0	0	3	3
26.50		184.00	0	0	3	3
30.50		180.00	0	0	3	3
34.50		176.00	0	0	3	3
38.50		172.00	+.001	0	3	3
42.50		168.00	1	0	3	3
46.50		164.00	1	0	3	3
50.50		160.00	1	0	3	3
54.50		156.00	1	0	3	3
58.50		152.00	1	0	3	3
62.50		148.00	1	0	3	3
66.50		144.00	1	0	3	3
70.50		140.00	1	0	3	3
74.50		136.00	1	0	3	3
78.50		132.00	1	0	3	3
82.50		128.00	1	0	3	3
86.50		124.00	1	0	3	3
90.50		120.00	1	0	3	3
94.50		116.00	0	0	3	3
98.50		112.00	0	0	3	3
102.50		108.00	0	0	3	3
106.50		104.00	0	0	3	3
110.50		100.00	0	0	3	3
114.50		96.00	0	0	3	3
118.50		92.00	0	0	3	3
122.50		88.00	0	0	3	3
126.50		84.00	0	0	3	3
130.50		80.00	0	-.001	3	3
134.50		76.00	0	1	3	3
138.50		72.00	0	1	3	3
142.50		68.00	0	1	3	2
146.50		64.00	0	0	2	2
150.50		60.00	0	0	3	2
154.50		56.00	+.004	+.005	3	2
158.50		52.00	7	6	3	3
162.50		48.00	8	8	3	3
166.50		44.00	9	9	3	3
170.50		40.00	11	11	8	8
173.21		37.29	13	13	9	12
175.50		35.00	15	15	13	13
177.34		33.16	17	17	14	14
179.50		31.00	19	19	14	16
181.47		29.03	22	23	19	18
182.50		28.00	23	24	23	21
182.60		27.90	23	24	23	21
183.60		26.90	22	22	26	27
184.60		25.90	23	23	23	27
185.10		25.40	26	26	24	24
185.35		25.15	28	29	25	24
185.50		25.00	+.036	+.036	+.025	+.026

~~SECRET~~ UNCLASSIFIED

UNCLASSIFIED ~~SECRET~~

DRDBG-859 (Formerly SPOTZ-570)
PART 2

105 m/m Tube, TK X15E8, British — Chamber

105 m/m Tube, TK X15E8, #57043 (Stamped on muzzle end)
P1/13012 E/2894 (on breech)
16 March 1959
After Firing 50 Rounds

DISTANCE (Inches) FROM REAR FACE OF BREECH	MUZZLE FACE	REAR FACE OF TUBE	BASIC DIAMETER	ZERO	GAUGE MEASUREMENTS INDICATED IN 1/1000 OF AN INCH — Y: GAUGE READING	Y: ACTUAL DIAMETER	Y: DIFFERENCE	X: GAUGE READING	X: ACTUAL DIAMETER	X: DIFFERENCE
		24.00		4.400"	+.020	4.420		+.020	4.420	
		23.00			.029	4.429		.029	4.429	
		22.00			+.037	4.437		+.037	4.437	
		18.30		5.000"	-.018	4.982		-.018	4.982	
		17.00			+.007	5.007		+.007	5.007	
		16.00			.027	5.027		.027	5.027	
		15.00			.047	5.047		.047	5.047	
		14.00			.067	5.067		.067	5.067	
		13.00			.088	5.088		.088	5.088	
		12.00			.108	5.108		.108	5.108	
		11.00			.129	5.129		.129	5.129	
		10.00			.148	5.148		.148	5.148	
		9.00			.168	5.168		.168	5.168	
		8.00			.188	5.188		.188	5.188	
		7.00			.209	5.209		.209	5.209	
		6.00			.230	5.230		.230	5.230	
		5.00			.250	5.250		.250	5.250	
		4.00			.270	5.270		.270	5.270	
		3.00			.289	5.289		.289	5.289	
		2.00			.309	5.309		.309	5.309	
		1.00			.329	5.329		.329	5.329	
		.50			.341	5.341		.341	5.341	
		.25			+.346	5.346		+.346	5.346	
	(Dist.)	R.F.T.			Vert.	Horz.				
		25.00			4.168	4.168				
Pull-Over Measurements		25.15			4.161	4.161	88%			
		25.40			4.158	4.158				
		25.90			4.155	4.156				

SPECIAL MEASUREMENTS

	BASIC	ACTUAL		BASIC	ACTUAL
TOTAL LENGTH OF GUN			ROTATION OF TUBE AT BREECH		
TOTAL LENGTH OF TUBE			MOVEMENT OF TUBE AT BREECH		
DEPTH OF BREECH RECESS			NUMBER OF LANDS AND GROOVES		

Borescope Remarks: Non-plated tube. Light smooth erosion with moderate to light heat checking encircling origin and extending forward to approximately 56.00" from rear face of tube. Lands lightly rounded in this area. Light deposits thru-out bore. No photos or impressions made at this time.

Proof Officer: Mr. Melocik
W.O. 391-312-01

STAMPED	STARGAUGED AND INSPECTED BY	REVIEWED BY
A P G	BOYD	EJB
RODMAN DAVIS	TIME	COMPILATOR
RECORDER BEVINS	PLACE 525	GRAPHED BY

UNCLASSIFIED ~~SECRET~~

ARMY---OS---ABERDEEN PROVING GROUND, MD---673

Downgraded as per authority
OTCM 37002 dtd 19 Feb 1959

UNCLASSIFIED SECRET

165 m/m TUBE TK 21558 BRITISH

DISTANCE INCHES FROM MUZZLE FACE		REAR FACE OF TUBE	MEASUREMENTS IN 1/1000 OF AN INCH. LANDS BASIC DIAM. 4.134" VERT.	HOR.	GROOVES BASIC DIAM. 4.224" VERT.	HOR.
.10		210.40	+002	+002	+003	+003
2.50		208.00	2	2	3	3
6.50		204.00	2	2	3	3
10.50		200.00	2	1	3	3
14.50		196.00	1	1	3	3
18.50		192.00	1	1	3	3
22.50		188.00	1	1	3	3
26.50		184.00	1	1	3	3
30.50		180.00	1	1	3	3
34.50		176.00	1	1	3	3
38.50		172.00	1	1	3	3
42.50		168.00	1	1	3	3
46.50		164.00	1	2	3	3
50.50		160.00	1	2	3	3
54.50		156.00	1	2	3	3
58.50		152.00	1	2	3	3
62.50		148.00	1	2	3	3
66.50		144.00	1	2	3	3
70.50		140.00	1	2	3	3
74.50		136.00	2	2	3	3
78.50		132.00	2	2	3	3
82.50		128.00	2	2	3	3
86.50		124.00	2	2	4	3
90.50		120.00	2	2	4	3
94.50		116.00	2	2	4	3
98.50		112.00	2	2	3	3
102.50		108.00	2	2	3	3
106.50		104.00	2	2	3	3
110.50		100.00	2	2	3	3
114.50		96.00	2	2	3	3
118.50		92.00	2	2	3	3
122.50		88.00	2	2	3	3
126.50		84.00	2	2	3	3
130.50		80.00	1	2	3	3
134.50		76.00	1	3	3	3
138.50		72.00	1	3	3	3
142.50		68.00	1	4	3	3
146.50		64.00	2	4	3	3
150.50		60.00	5	4	4	3
154.50		56.00	8	8	4	3
158.50		52.00	10	10	4	4
162.50		48.00	13	12	4	5
166.50		44.00	15	15	5	6
170.50		40.00	18	19	8	12
173.21		37.29	20	21	11	12
175.50		35.00	23	23	16	13
177.34		33.16	26	26	17	14
179.50		31.00	28	30	22	18
181.47		29.03	33	32	23	22
182.50		28.00	34	36	26	24
182.60		27.90	34	35	28	23
183.60		26.90	30	30	39	25
184.60		25.90	32	31	35	34
185.10		25.40	39	36	35	33
185.25		25.25	39	38	35	34
185.35		25.15	41	41	35	34
185.50		25.00	+052	+053	+035	+034

83% LIFE REM.

CASTING NUMBER: X 1

MANUFACTURER: PROOF OFFICER MR SLEEPER WO 332-434-02

PROJ. TW-419/TE-212

MODEL: TKX15E8

NUMBER OF ROUNDS: 69

NUMBER: 57043 (STAMPED ON MUZZLE FACE) P/13012 (STAMPED ON BREECH END) E/2894

FIRING STATUS (Check One): BEFORE / AFTER ✓

DATE OF GAUGING: 6/12/59

105 m/m TUBE (BRITISH)

UNCLASSIFIED SECRET

UNCLASSIFIED ~~SECRET~~

105 m/m Tube, TK X15E8, #57043 (Stamped on muzzle end)
P1/13012 E/2894 (on breech)
12 June 1959

After 69 Rounds

Proof Officer: Sleeper
W.O. 332-434-02 Proj. TW-419/TE-212

PART 2

105mm Tube TK X15E8 Chromed

DISTANCE (Inches) FROM — GAUGE MEASUREMENTS INDICATED IN 1/1000 OF AN INCH

REAR FACE OF BREECH	MUZZLE FACE	REAR FACE OF TUBE	BASIC DIAMETER	ZERO	VERTICAL Y GAUGE READING	VERTICAL Y ACTUAL DIAMETER	VERTICAL Y DIFFERENCE	HORIZONTAL X GAUGE READING	HORIZONTAL X ACTUAL DIAMETER	HORIZONTAL X DIFFERENCE
		36.00		4.420"	+.020	4.420		+.020	4.420	
		35.00			.029	.429		.029	.429	
		34.00			+.038	.438		.038	.438	
		18.30		Tube	-.018	4.982		-.018	4.982	
		17.00			+.007	5.007		+.007	5.007	
		16.00			.027	5.027		.027	5.027	
		15.00			.047	5.047		.047	5.047	
		14.00			.067	5.067		.067	5.067	
		13.00			.087	5.087		.087	5.087	
		12.00			.109	5.109		.109	5.109	
		11.00			.130	5.130		.130	5.130	
		10.00			.149	5.149		.149	5.149	
		9.00			.168	5.168		.168	5.168	
		8.00			.188	5.188		.188	5.188	
		7.00			.209	5.209		.209	5.209	
		6.00			.230	5.230		.230	5.230	
		5.00			.250	5.250		.250	5.250	
		4.00			.270	5.270		.270	5.270	
		3.00			.289	5.289		.289	5.289	
		2.00			.309	5.309		.309	5.309	
		1.00			.329	5.329		.329	5.329	
		.50			.341	5.341		.341	5.341	
		.25			.346	5.346		.346	5.346	
	Lost	N.F.T.								
Fall		25.00			4.177	[illegible]				
Medium		25.15			4.173	[illegible]				
		25.25			4.173	[illegible]				
		25.40			4.167	[illegible]				
		25.90			4.167	4.167				

SPECIAL MEASUREMENTS

	BASIC	ACTUAL		BASIC	ACTUAL
TOTAL LENGTH OF GUN			ROTATION OF TUBE AT BREECH		
TOTAL LENGTH OF TUBE			MOVEMENT OF TUBE AT BREECH		
DEPTH OF BREECH RECESS			NUMBER OF LANDS AND GROOVES		

Borescope Remarks: Non-Plated tube. Light smooth erosion with moderate heat checking encircling origin and extending forward to approximately 60.00" from rear face of tube. Lands rounded in this area. Light heat checking thru-out remainder of bore. Light erosion encircling bore evacuator holes.
Bore photographs taken at commencement at 6 and 12 o'clock and of a general view at the commencement. No impressions made.

83% Life Rem.

STAMPED A P G	STARGAUGED AND INSPECTED BY BOYD	REVIEWED BY
RODMAN BOOTH	TIME	COMPILATOR
RECORDER BARNARD	PLACE	GRAPHED BY

UNCLASSIFIED ~~SECRET~~

ARMY—OS—ABERDEEN PROVING GROUND, MD—673

UNCLASSIFIED ~~SECRET~~

Downgraded as per authority
OTCM 37002 dtd 19 Feb 1959

~~00000-000~~ 15 Sept 49 (Formerly SPOTZ-570)

105 M/M TUBE TK X15E8 British

CASTING NUMBER

MANUFACTURER

PROOF OFFICER MR SLEEPER W.O. 332-434-03

MODEL TKX15E8

NUMBER OF ROUNDS 84

20 PR. TK. MK. I.

NUMBER 57043 (STAMPED ON MUZZLE FACE STAMPED) (E/2894) P1/13012 (ON BREECH END)

FIRING STATUS (Check One) BEFORE ✓ AFTER

L/7287 (FL 9000)

105 M/M (BRITISH)

BREECH RING No.

DATE OF GAUGING 29 JUNE 1959

Distance inches Muzzle Face		From Rear face of tube	Measurements in 1/1000 of an inch. Lands Basic Diam 4.134" Vert.	Lands Horz.	Grooves Basic Diam 4.224" Vert.	Grooves Horz.
.10"		210.40"	+002	+002	+003	+003
2.50		208.00	2	2	3	3
6.50		204.00	2	2	3	3
10.50		200.00	2	2	3	3
14.50		196.00	2	2	3	3
18.50		192.00	2	2	3	3
22.50		188.00	2	2	3	3
26.50		184.00	2	2	3	3
30.50		180.00	2	2	3	3
34.50		176.00	2	2	3	3
38.50		172.00	2	2	3	3
42.50		168.00	2	2	3	3
46.50		164.00	2	2	3	3
50.50		160.00	2	2	3	3
54.50		156.00	2	2	3	3
58.50		152.00	2	2	3	3
62.50		148.00	2	2	3	3
66.50		144.00	2	2	3	3
70.50		140.00	2	2	3	3
74.50		136.00	2	2	3	3
78.50		132.00	2	2	3	3
82.50		128.00	2	3	3	3
86.50		124.00	2	2	3	3
90.50		120.00	2	2	3	3
94.50		116.00	2	2	3	3
98.50		112.00	2	2	3	3
102.50		108.00	2	2	3	3
106.50		104.00	2	2	3	3
110.50		100.00	2	2	3	3
114.50		96.00	2	2	3	3
118.50		92.00	2	2	3	3
122.50		88.00	2	2	3	3
126.50		84.00	2	2	3	3
130.50		80.00	2	3	3	3
134.50		76.00	3	3	3	3
138.50		72.00	3	3	3	3
142.50		68.00	3	4	3	3
146.50		64.00	3	4	3	3
150.50		60.00	5	5	3	3
154.50		56.00	8	7	4	4
158.50		52.00	11	11	4	4
162.50		48.00	13	13	5	4
166.50		44.00	15	17	6	6
170.50		40.00	21	20	11	8
173.21		37.29	23	23	13	15
175.50		35.00	27	26	18	19
177.34		33.16	31	29	20	20
179.50		31.00	33	31	23	25
181.49		29.03	37	35	28	26
182.50		28.00	39	37	31	30
182.60		27.90	39	37	34	33
183.60		26.90	35	33	45	44
184.60		25.90	36	36	48	45
185.10		25.40	40	41	42	41
185.25		25.25	42	43	40	40
185.35		25.15	47	47	40	40
185.50		25.00	+057	+057	+041	+41

79% LIFE REM.

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ORDBB-659 (Formerly SPOTZ-570)
PART 2

105 M/M TUBE TK X15E3 British — CHAMBER

105 M/M TUBE No. 57043 Model TK X15E3 Proof Officer Mr. Sleeper

30 June 1959. After firing 84 rounds. W.O. 332-434-03

DISTANCE (Inches) FROM REAR FACE OF BREECH	MUZZLE FACE	REAR FACE OF TUBE	BASIC DIAMETER	ZERO	GAUGE MEASUREMENTS INDICATED IN 1/1000 OF AN INCH — ~~VERTICAL~~ Y: GAUGE READING	ACTUAL DIAMETER	DIFFERENCE	~~HORIZONTAL~~ X: GAUGE READING	ACTUAL DIAMETER	DIFFERENCE
		24.00		4.400"	+021	4.421		+021	4.421	
		23.00			029	.429		029	.429	
		22.00			038	.438		038	.438	
		18.30		5.000"	-018	4.982		-018	4.982	
		17.00			+008	5.008		+008	5.008	
		16.00			028	.028		028	.028	
		15.00			048	.048		048	.048	
		14.00			068	.068		068	.068	
		13.00			089	.089		089	.089	
		12.00			109	.109		109	.109	
		11.00			130	.130		130	.130	
		10.00			149	.149		149	.149	
		9.00			169	.169		169	.169	
		8.00			189	.189		189	.189	
		7.00			210	.210		210	.210	
		6.00			230	.230		230	.230	
		5.00			250	.250		250	.250	
		4.00			270	.270		270	.270	
		3.00			289	.289		289	.289	
		2.00			309	.309		309	.309	
		1.00			329	.329		329	.329	
		.50			341	.341		341	.341	
		.25			346	.346		346	.346	
	Dist.				VERT.	HORZ.				
Pullover Measurements		25.00			4.196	4.195				
		25.15			4.187	4.186				
		25.25			4.180	4.179	Remaining Life. 79%			
		25.40			4.177	4.177				
		25.90			4.173	4.171				

SPECIAL MEASUREMENTS

	BASIC	ACTUAL		BASIC	ACTUAL
TOTAL LENGTH OF GUN		220.02"	ROTATION OF TUBE AT BREECH		
TOTAL LENGTH OF TUBE			MOVEMENT OF TUBE AT BREECH		0.010"R
DEPTH OF BREECH RECESS		9.50"	NUMBER OF LANDS AND GROOVES		

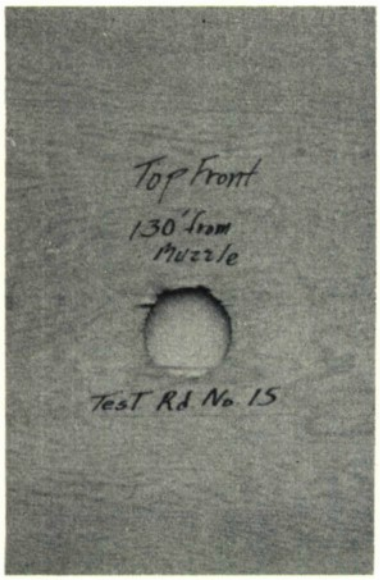
Remarks: Borescoped. (Not Plated) Light smooth erosion with moderate heat checking encircling origin and extending forward th (approx) 76.00" from rear face of tube. Lands in this area are rounded. Light heat checking throughout remainder of bore. Light erosion encircling bore evacuator holes.
Bore photographs taken at commencement at 6:00 and 12:00 o'clock and a general view at the commencement. No impressions taken at this time.

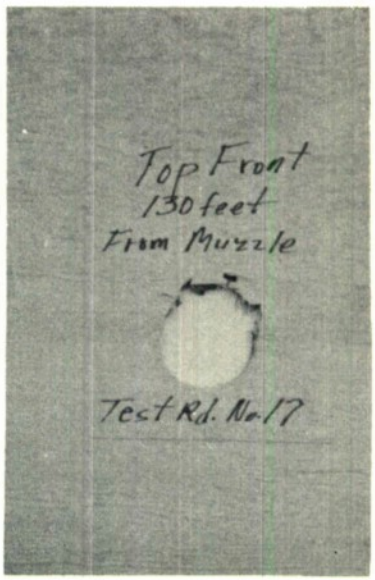
STAMPED	STARGAUGED AND INSPECTED BY	REVIEWED BY
APG-	Edwards	J. Edwards
RODMAN	TIME	COMPILATOR
RECORDER Levins Tasch	PLACE	GRAPHED BY

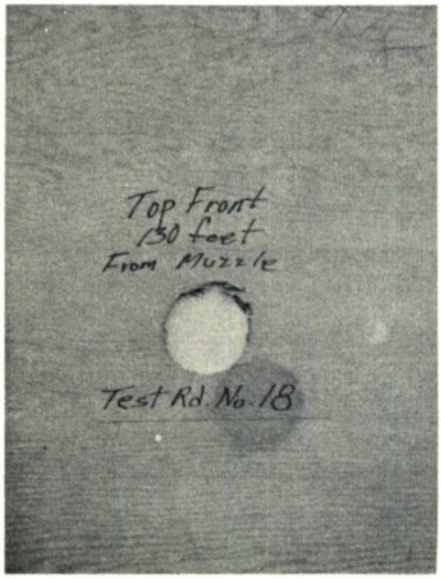
UNCLASSIFIED ~~SECRET~~

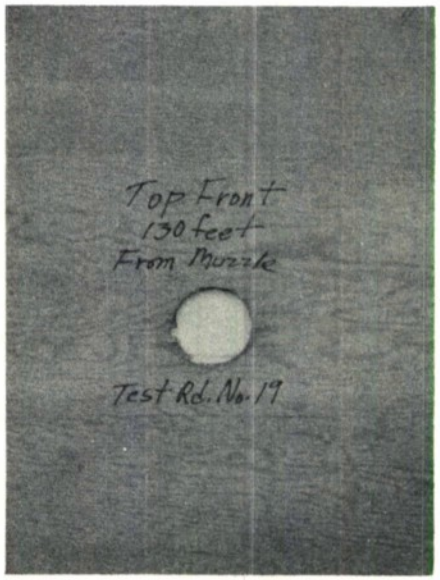
C-1

ARMY—ABERDEEN PROVING GROUND, MD.—673

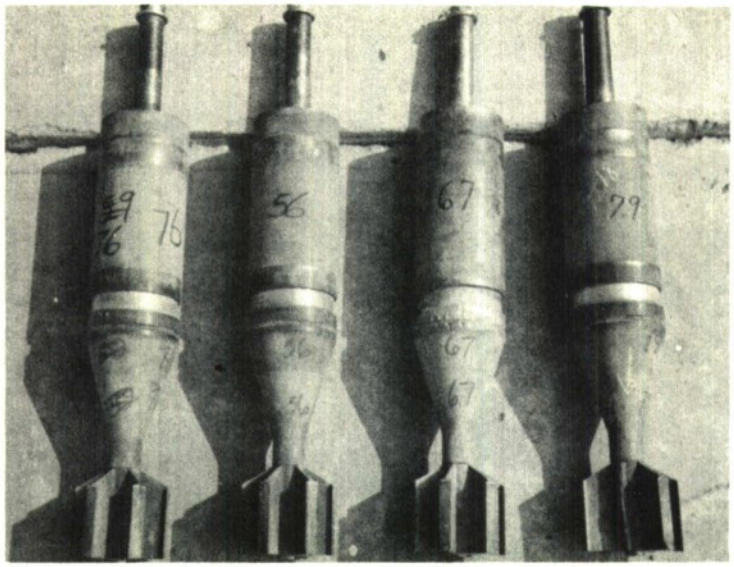


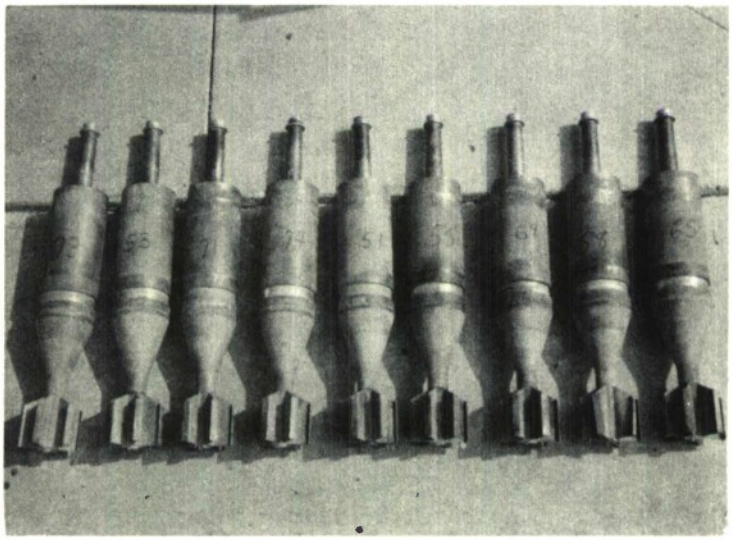




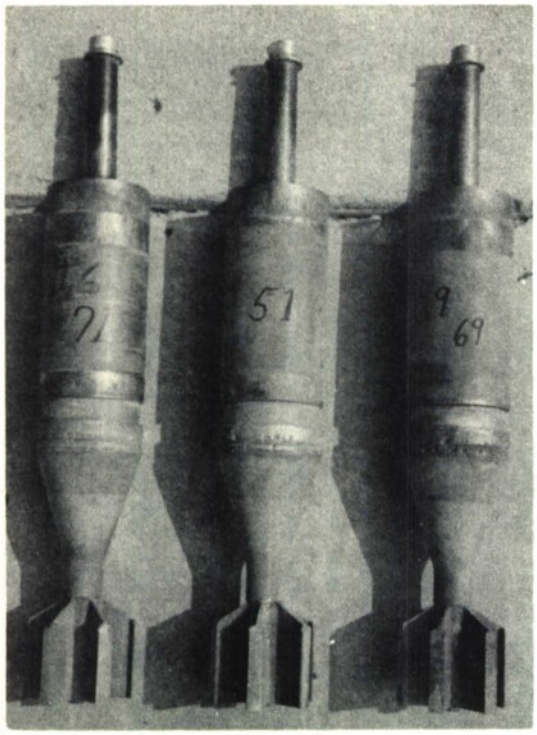


Photographs of ¼-inch plywood bursting screens used on the 10 June 1959 recovery shoot. Note: Fin marks as projectile passed through the plywood indicating yaw on these rounds.

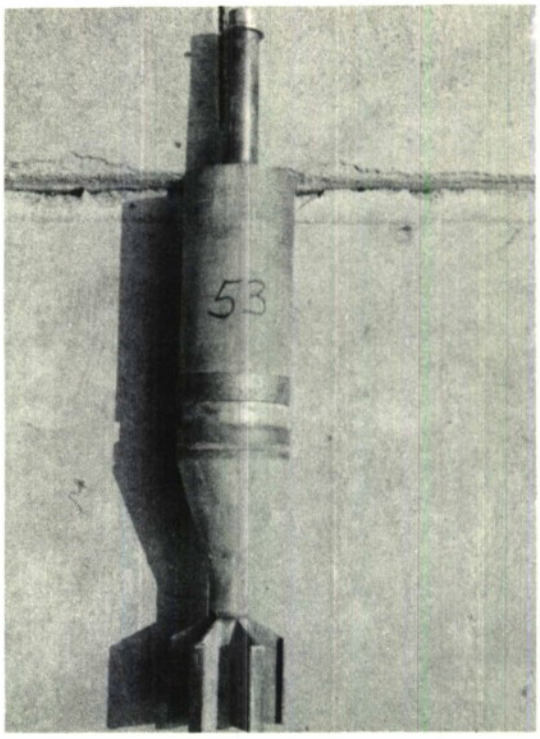




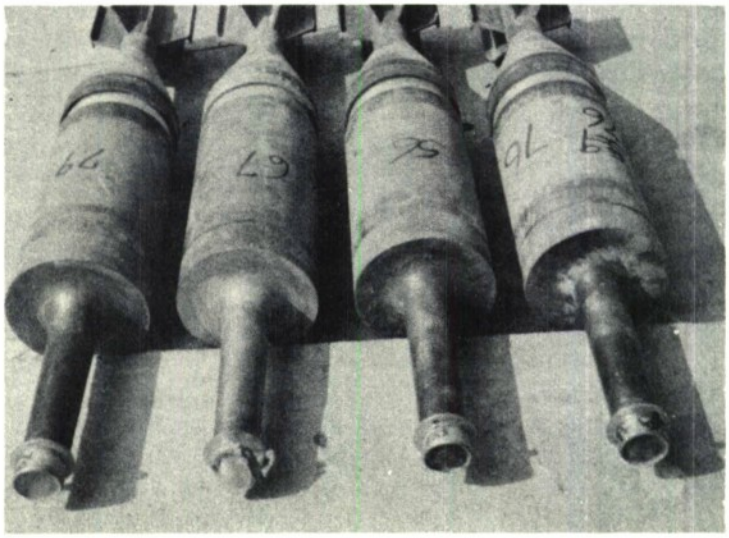
The recovered rounds in the order of firing reading from left to right and bottom to top. The numbers on the shell are the shell numbers as recorded in the round by round data of the firing record.



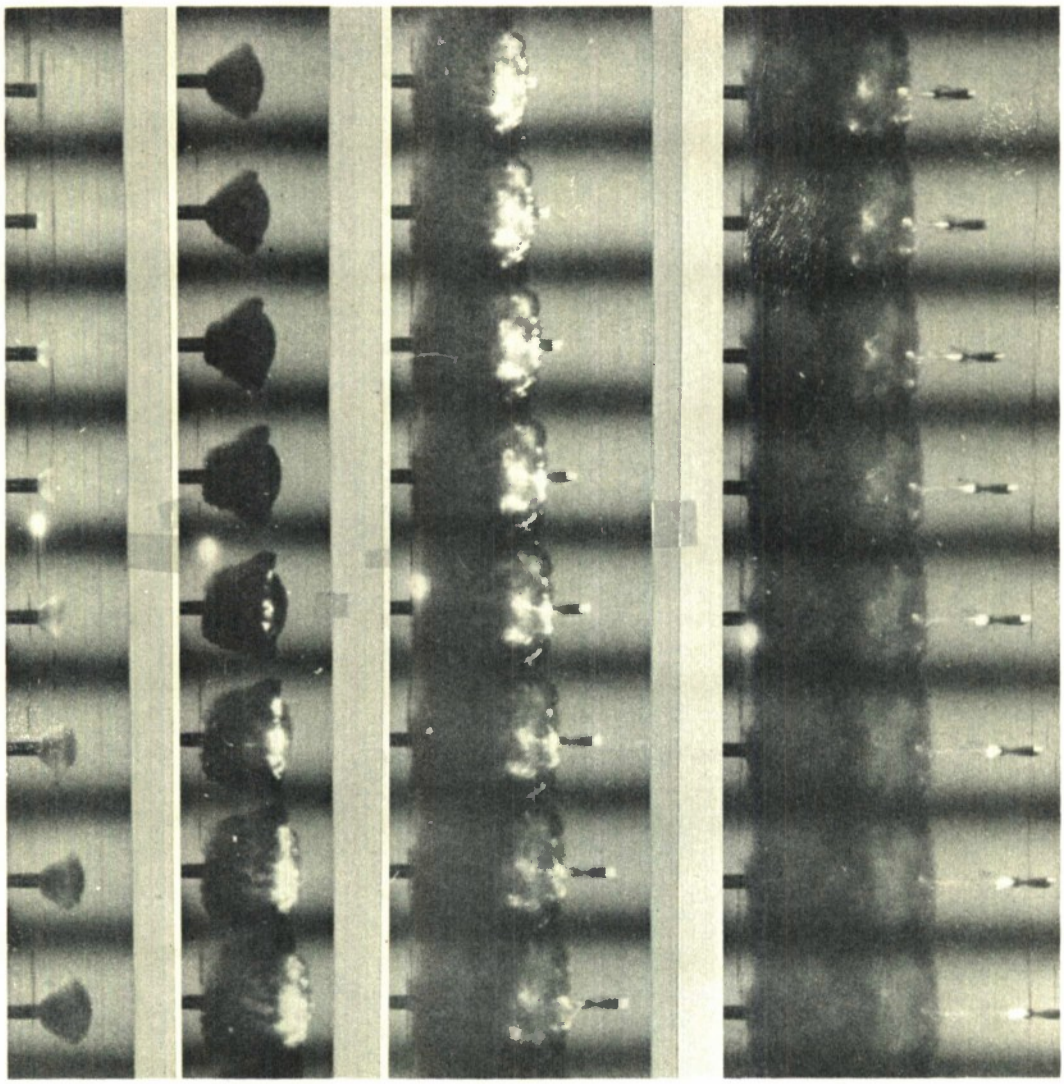
Note erosion of crimping groove.



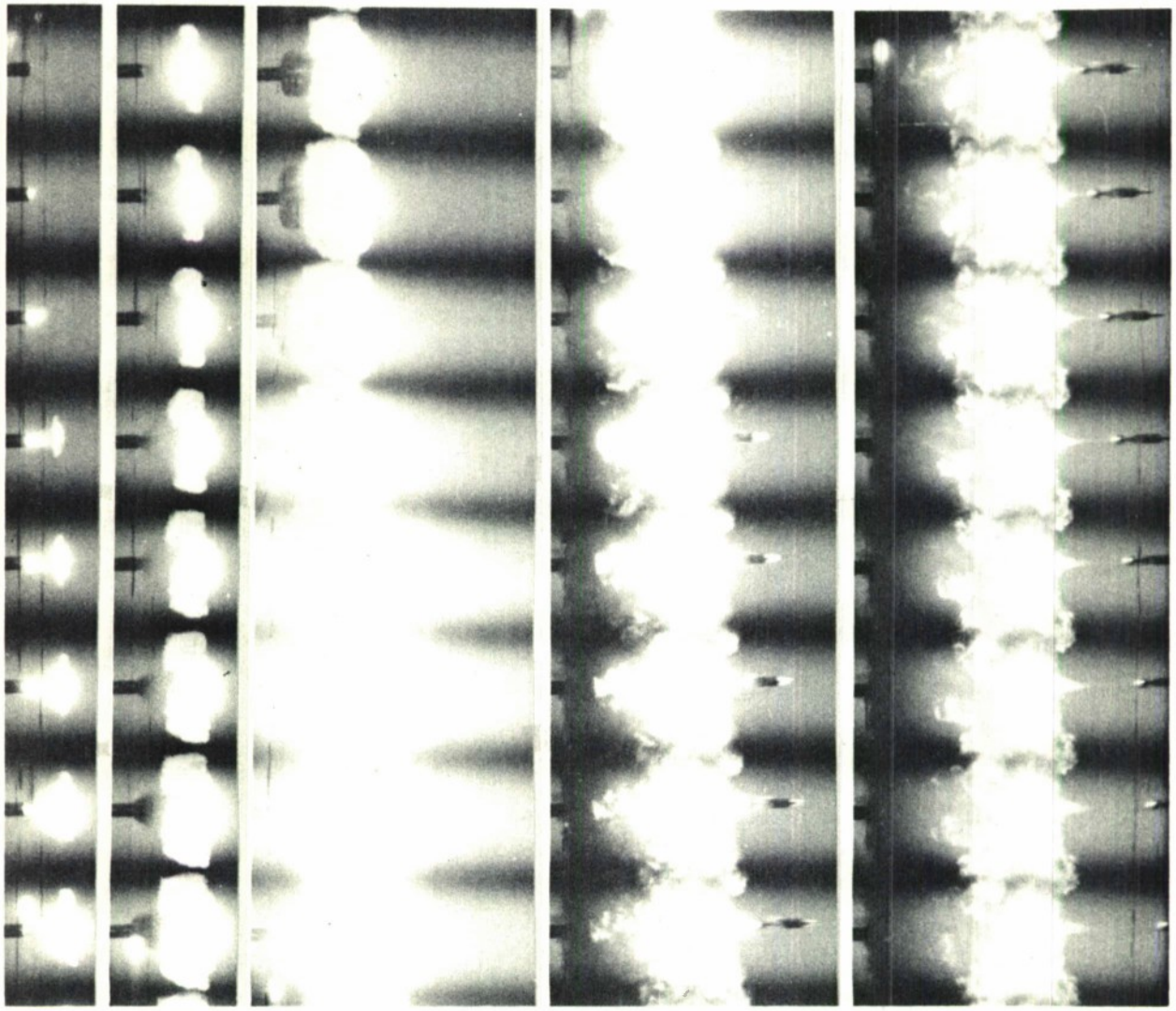
Note erosion of band seat.



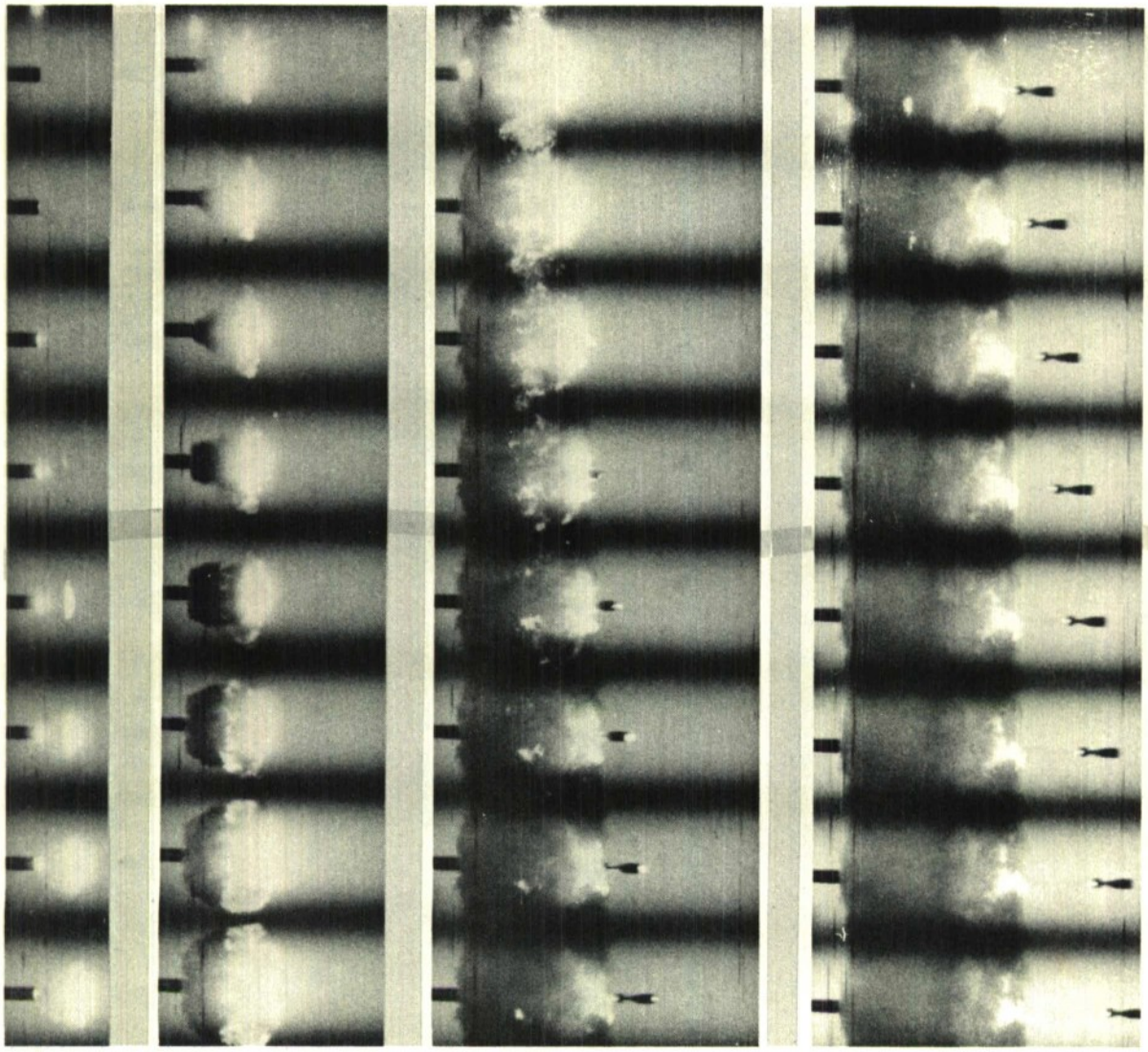
Note damage to nose of shell on impact.



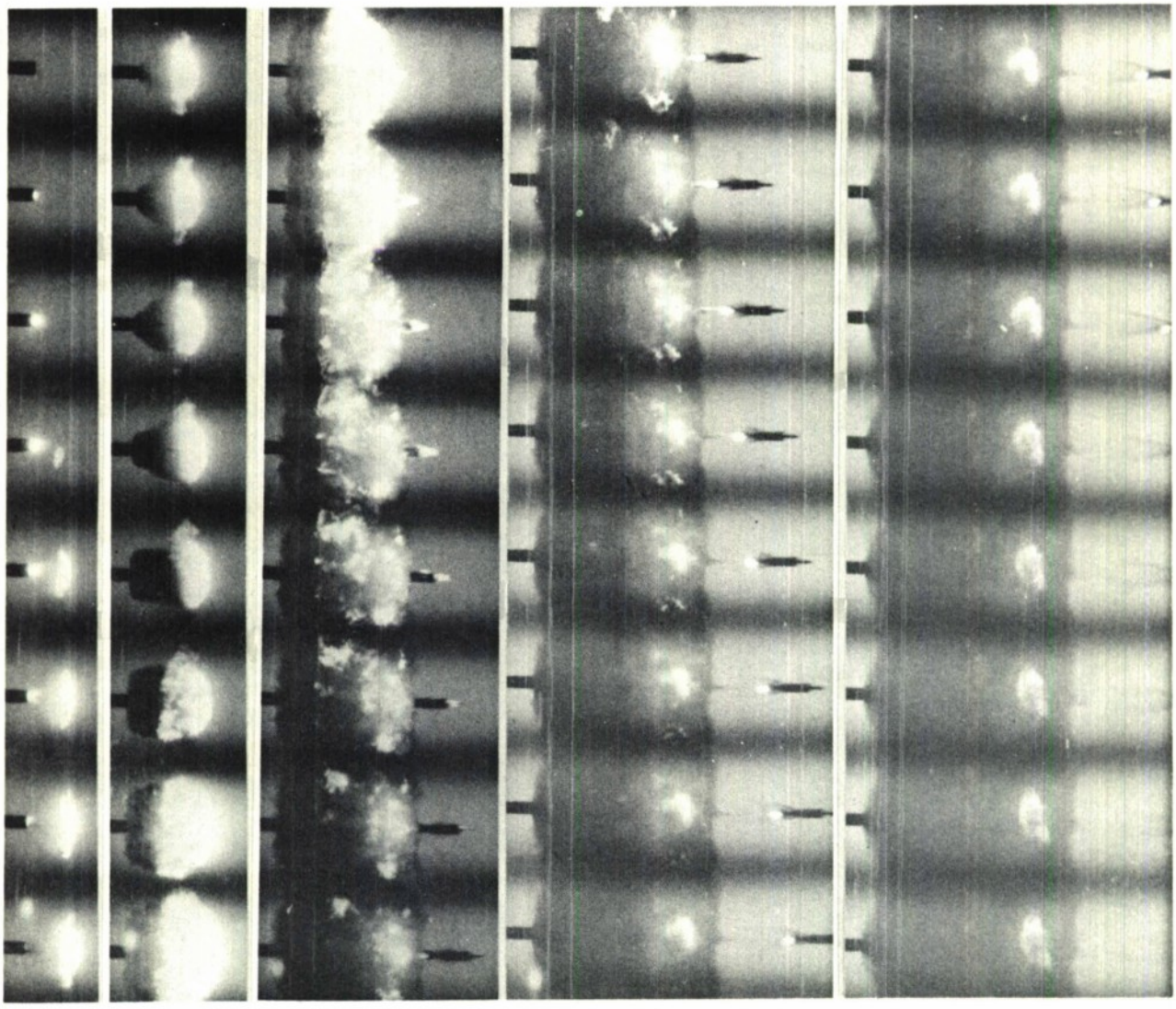
Obturation photographs of tube round number 52 fired on 8 June 1959. This is a T384 Slug round PA-E-Lot-28465, slug number S1-6, used as a conditioning round.



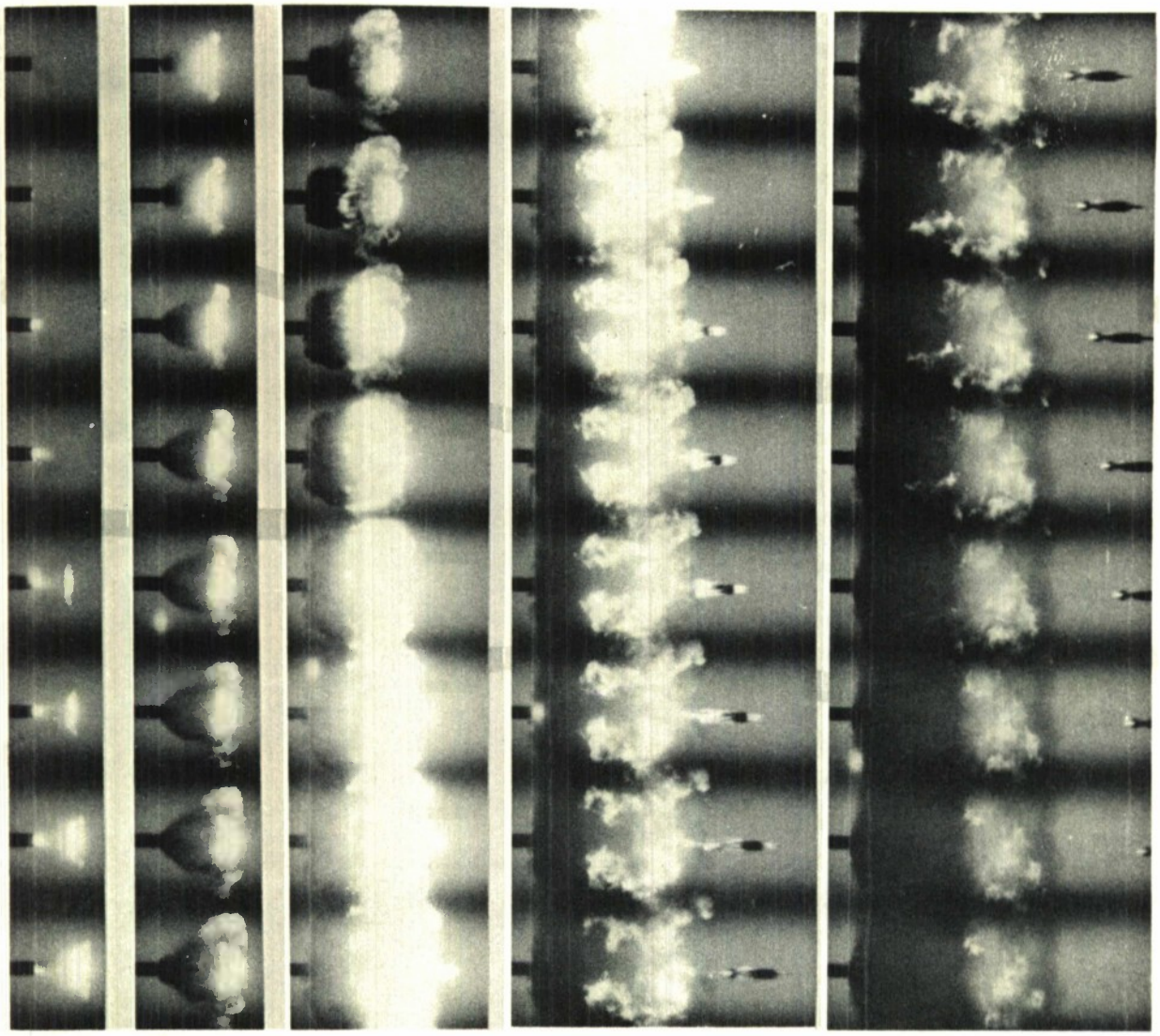
Obturation photographs of tube round number 53 fired on 8 June 1959. T384 HEAT shell number 52 of Lot PA-E-29162; the first test round fired.



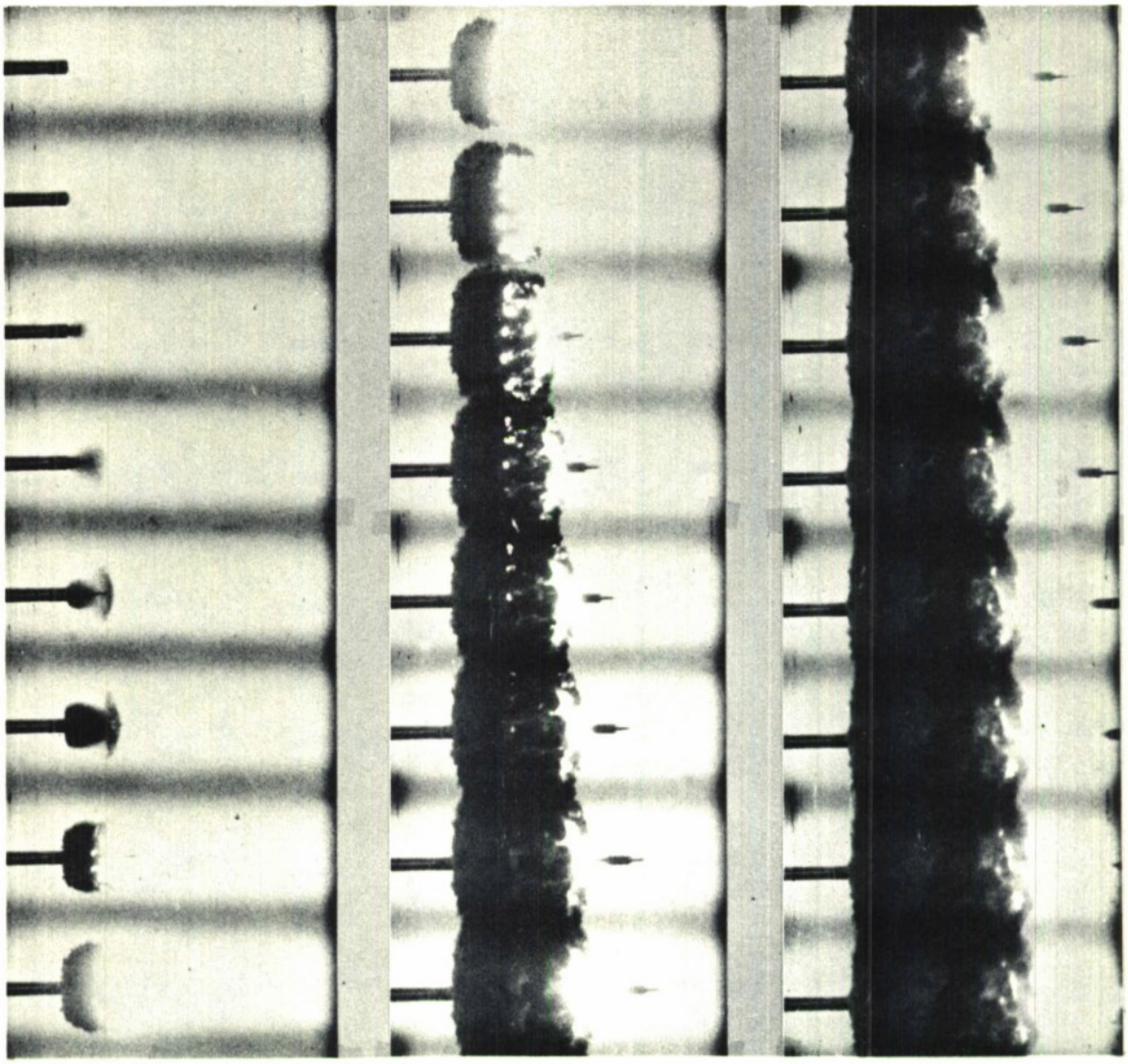
Obturation photographs of tube round number 56 fired 9 June 1959. T384 Slug number S1-23 of Lot PA-E-28465 used as a conditioning round.

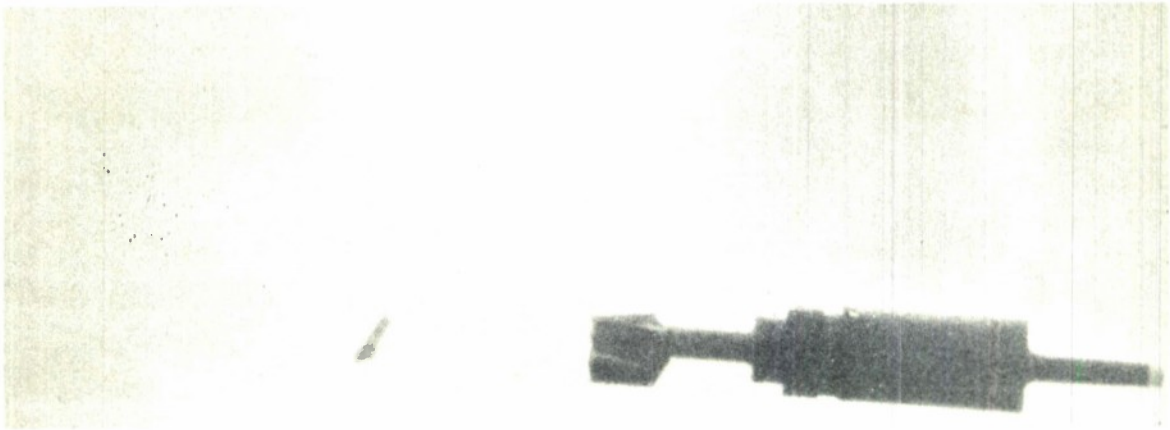


Obturation photographs of tube round number 65 fired 10 June 1959.
T384 HEAT Shell number 76 of Lot PA-E-29162.

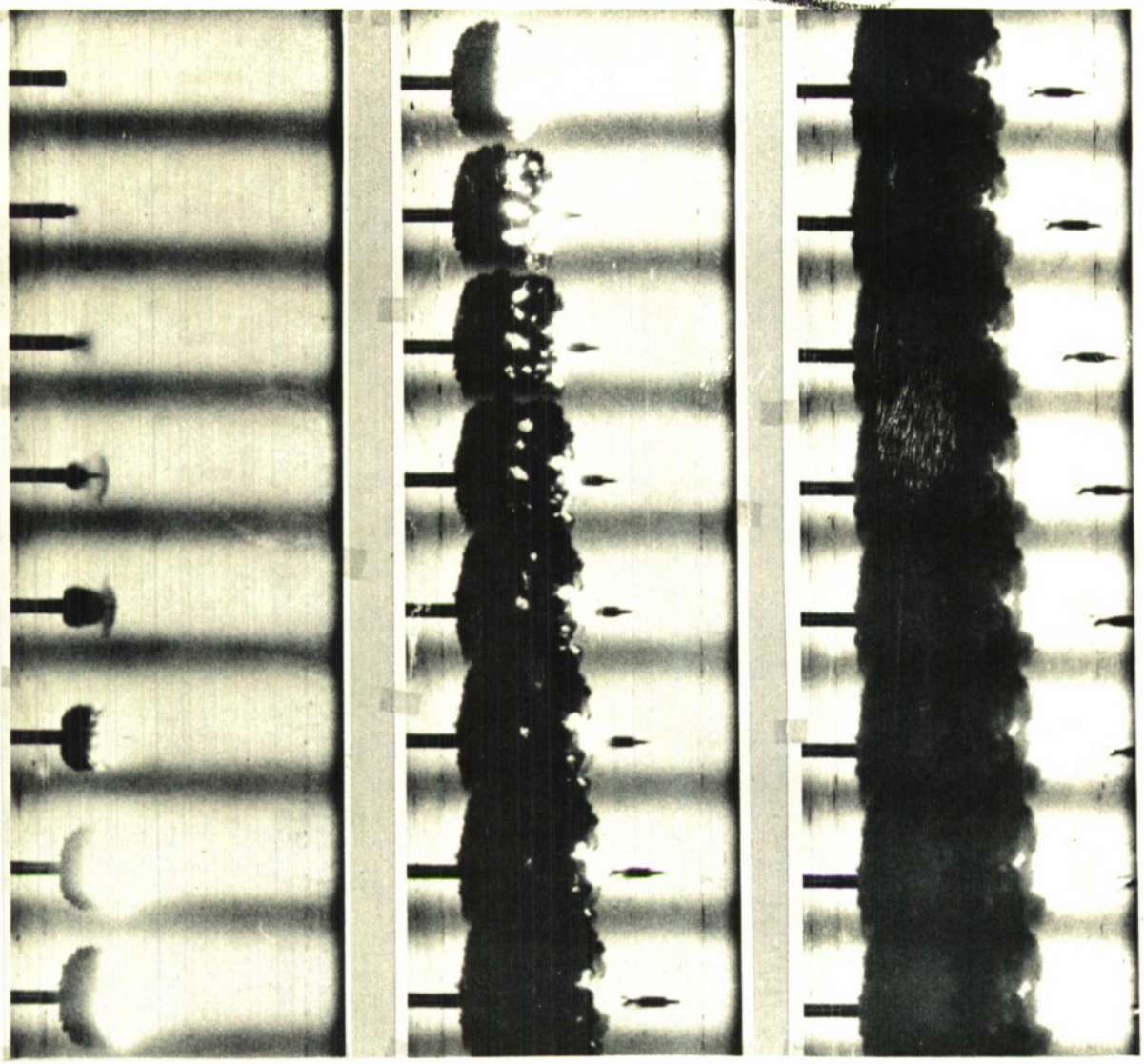


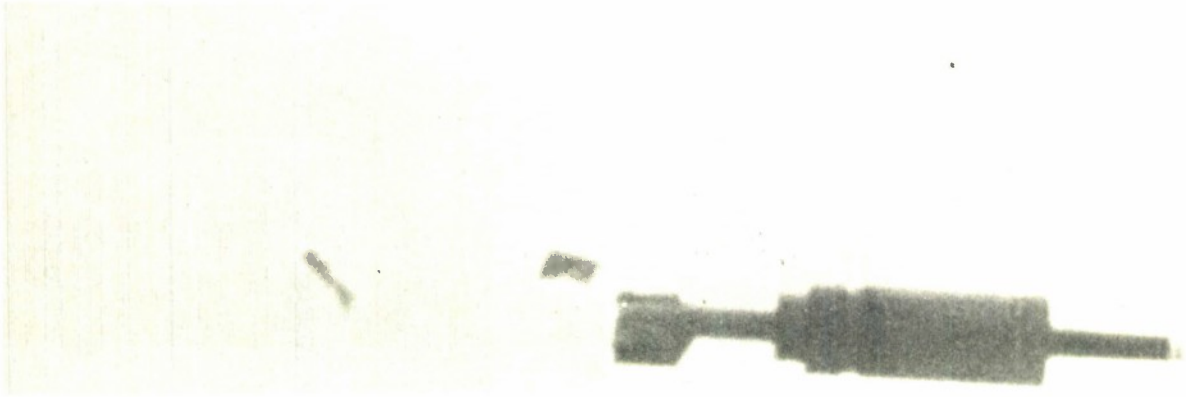
Obturation photographs of tube round number 68 fired on 10 June 1959. T384 HEAT Shell number 79 of Lot PA-E-29162.



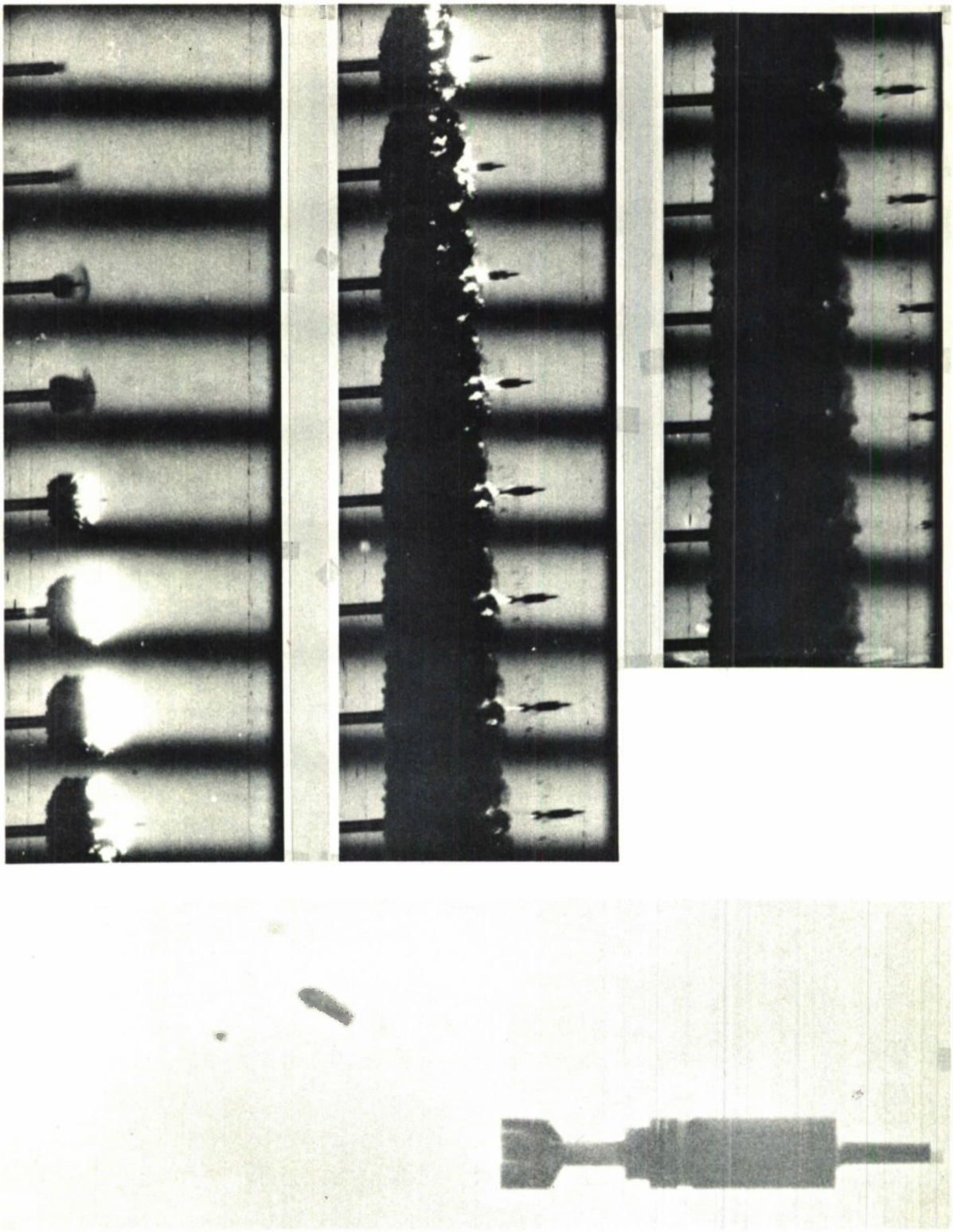


105-mm HEAT Shell, T384E1 Type II, number 86, with obturator, fired on 22 June 1959.

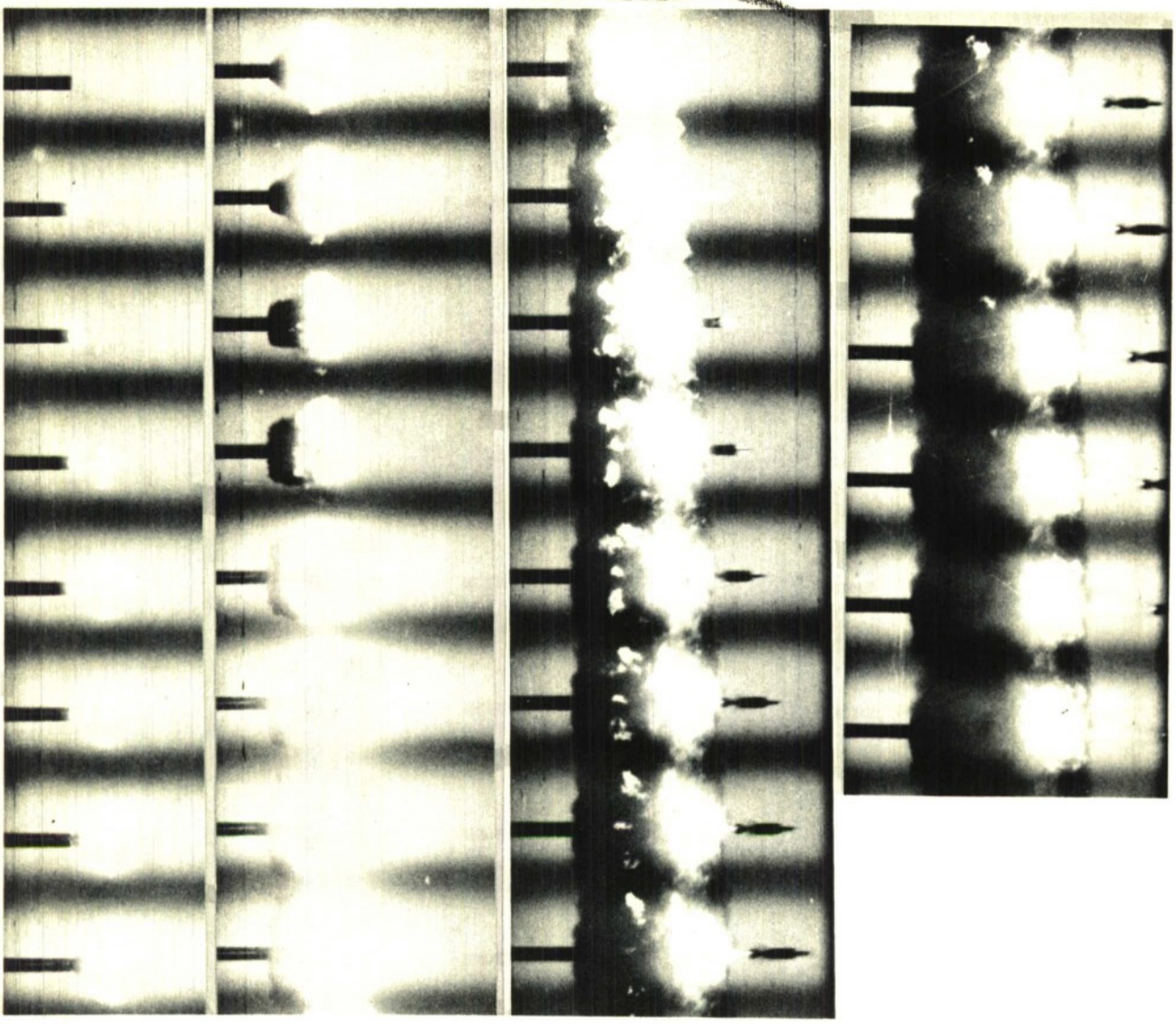


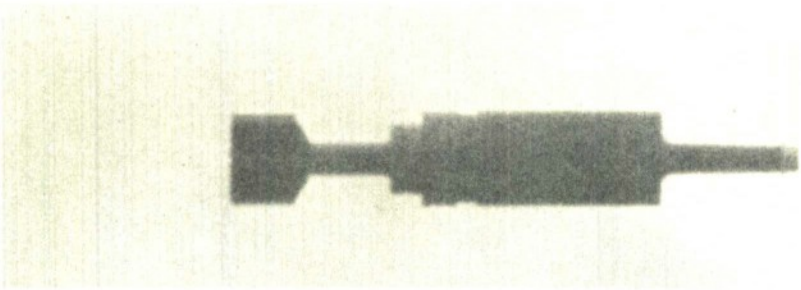


105-mm HEAT Shell Number 82, T384E1 Type II, with obturator, fired on 22 June 1959.

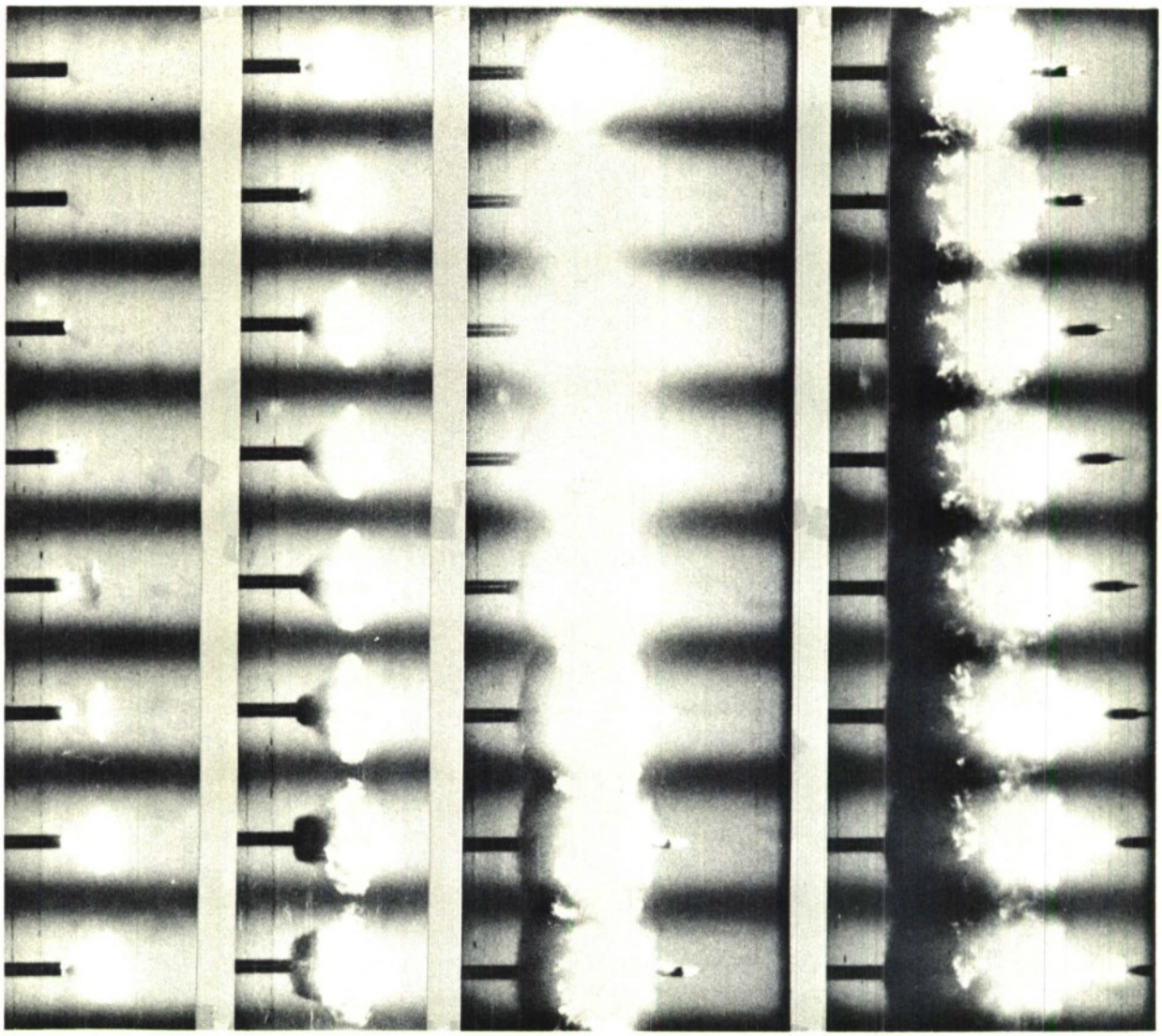


105-mm HEAT Shell Number 89, T384E1 Type II, with obturator, fired on 22 June 1959.

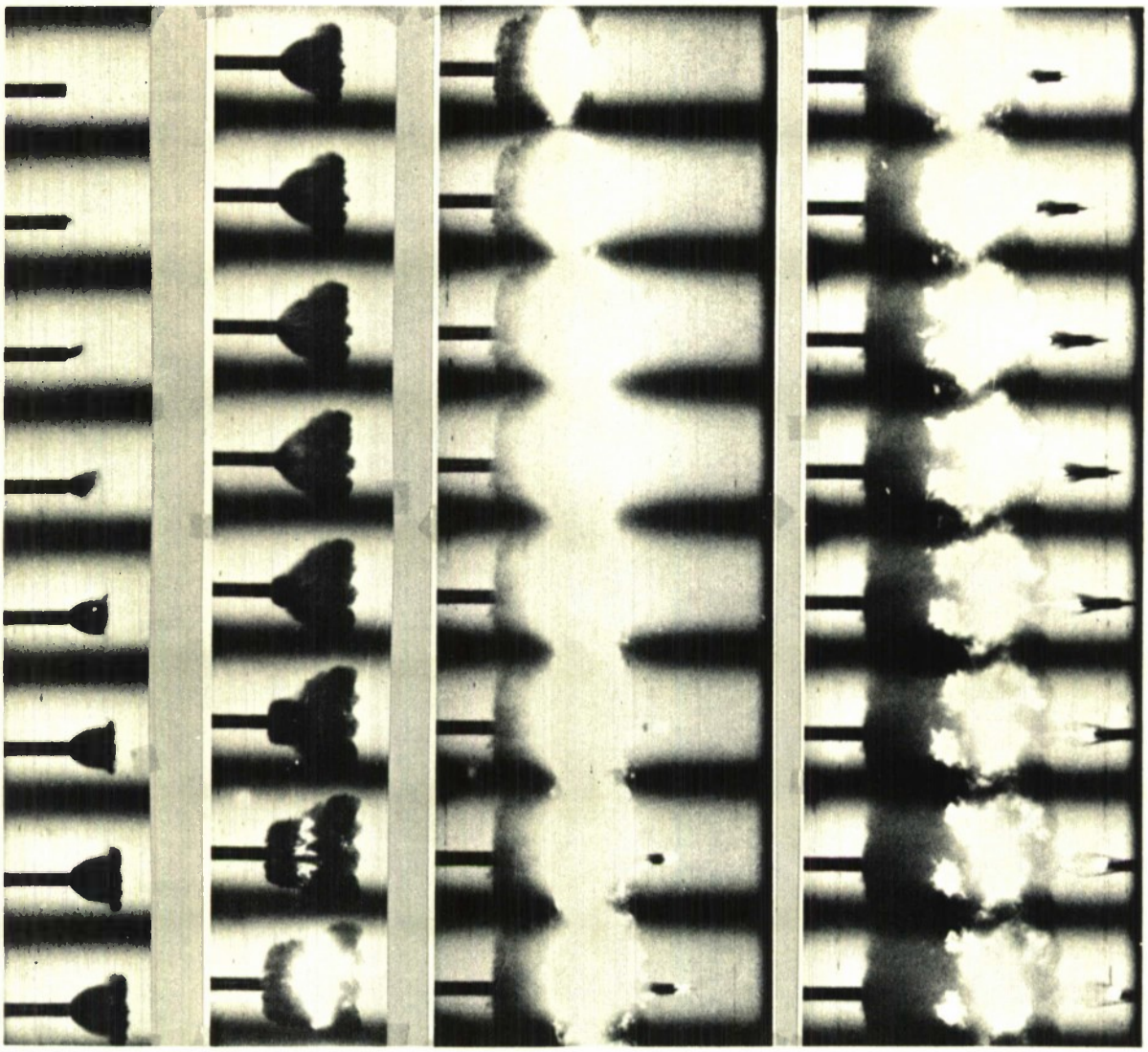


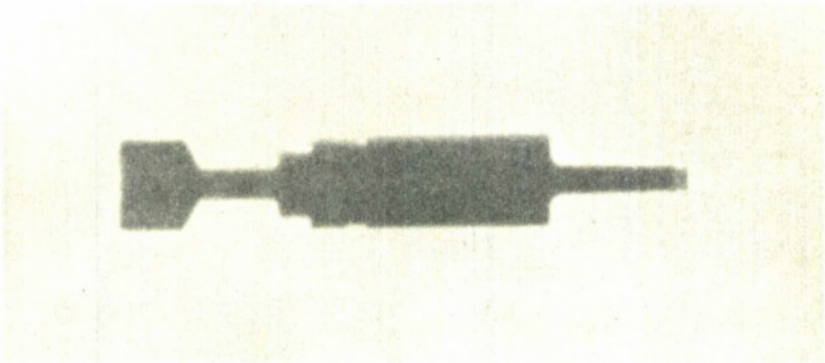


105-mm HEAT Shell Number 90, T384E1 Type II, without obturator, fired 23 June 1959.

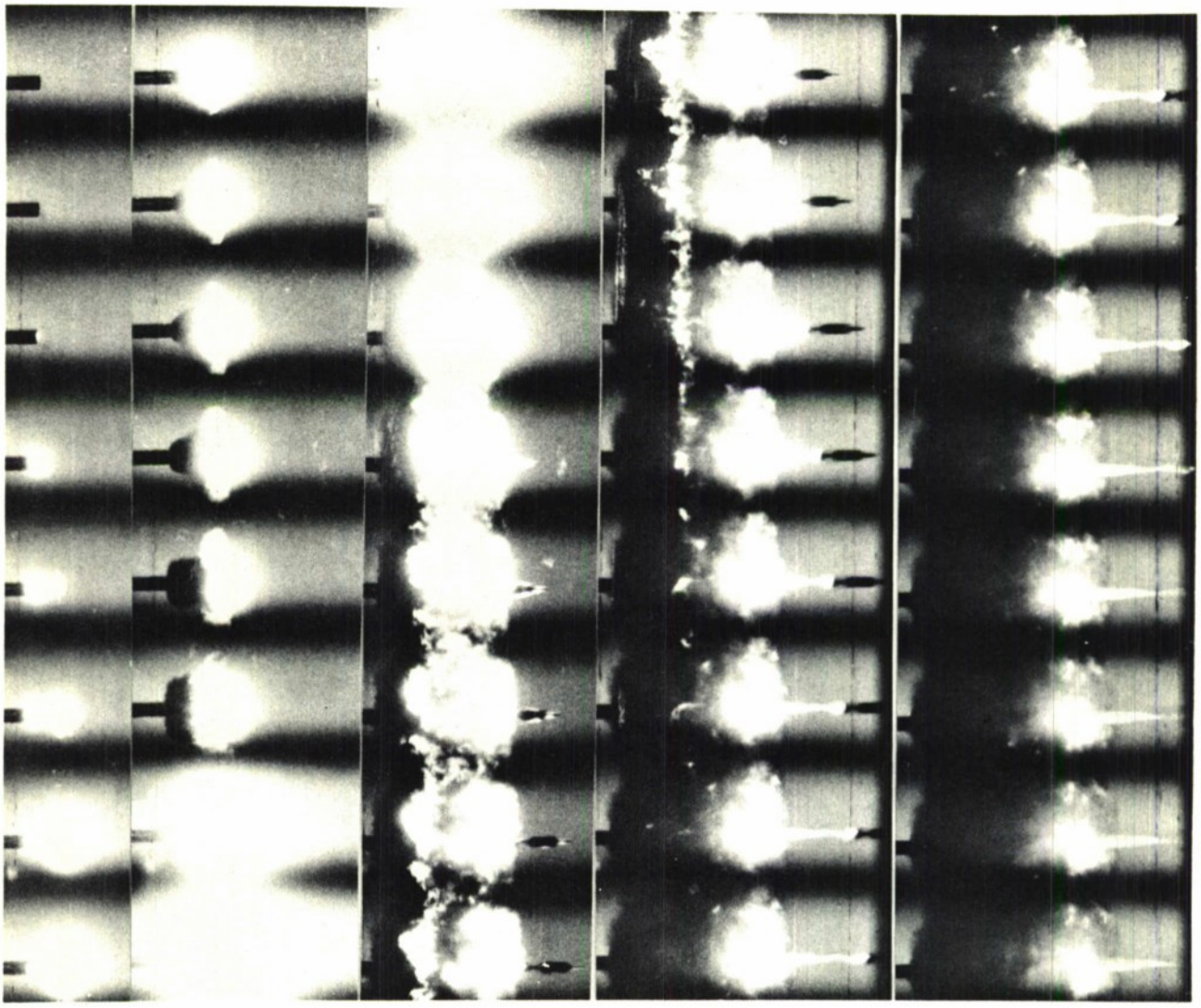


105-mm HEAT Shell Number 88, T384E1 Type II, without obturator, fired 23 June 1959.

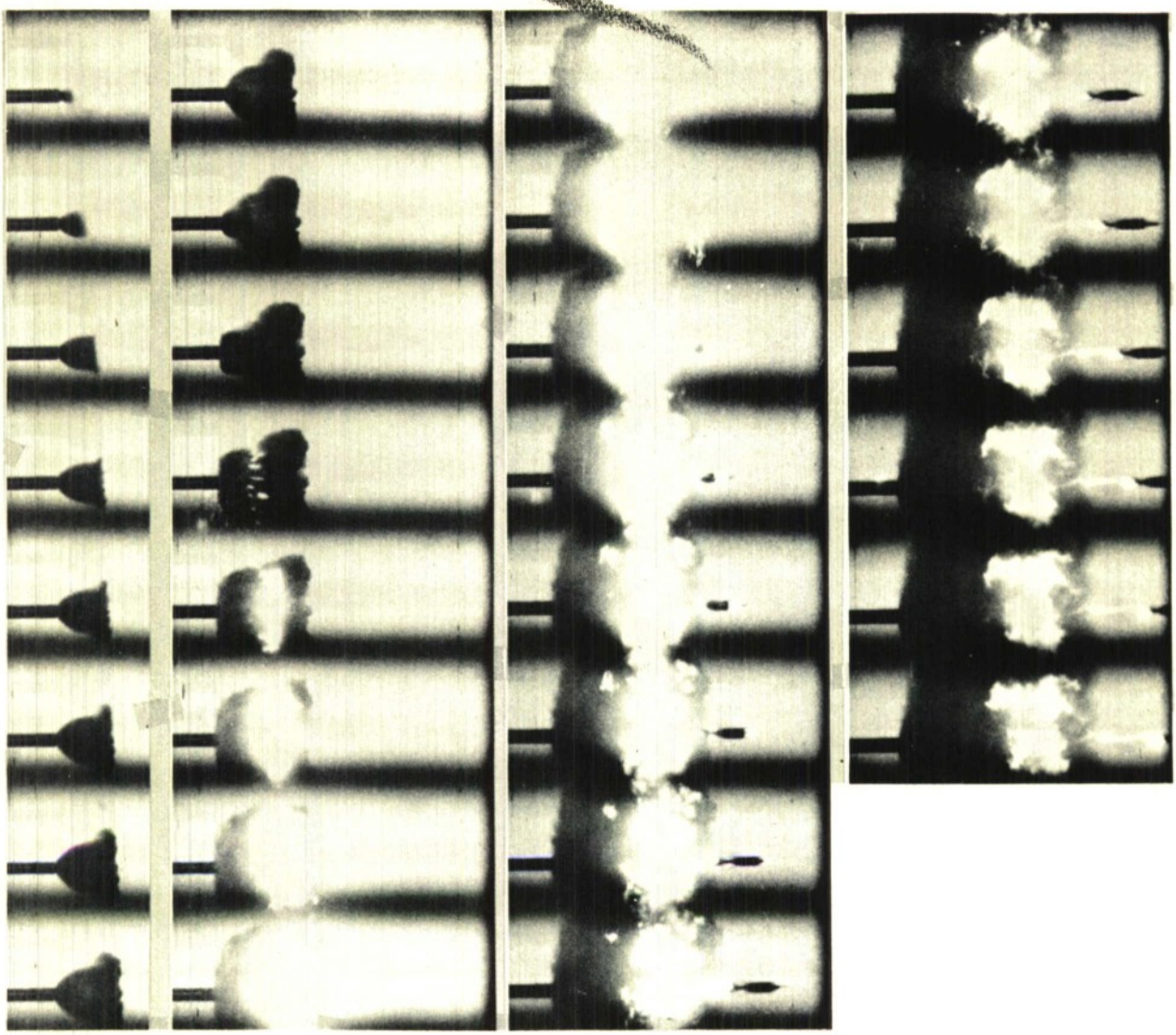


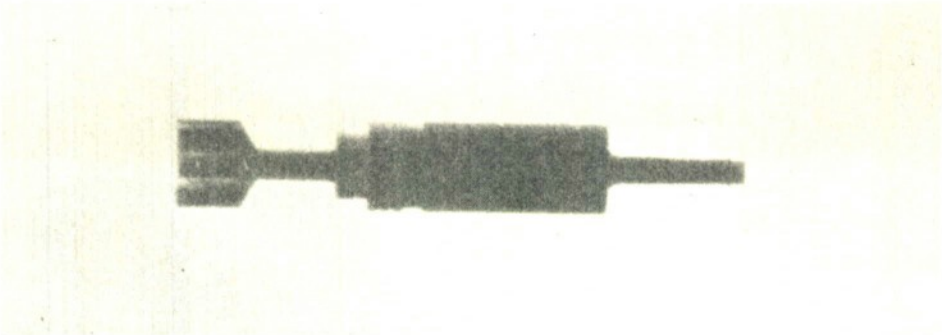


105-mm HEAT Shell Number 83, T384E1 Type II, without obturator, fired 24 June 1959.



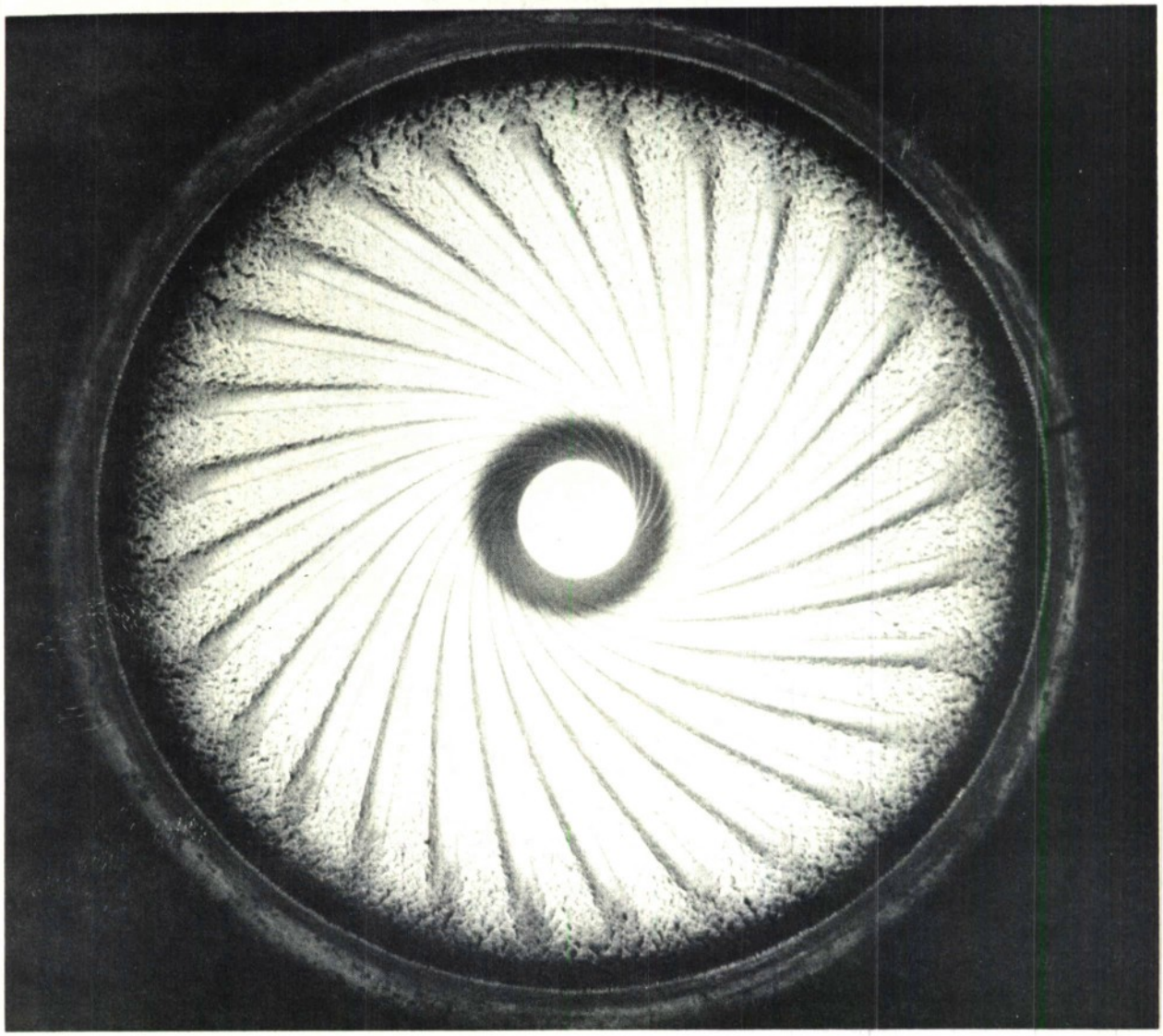
105-mm HEAT Shell Number 61, T384E1 Type I, without obturator, fired 24 June 1959.



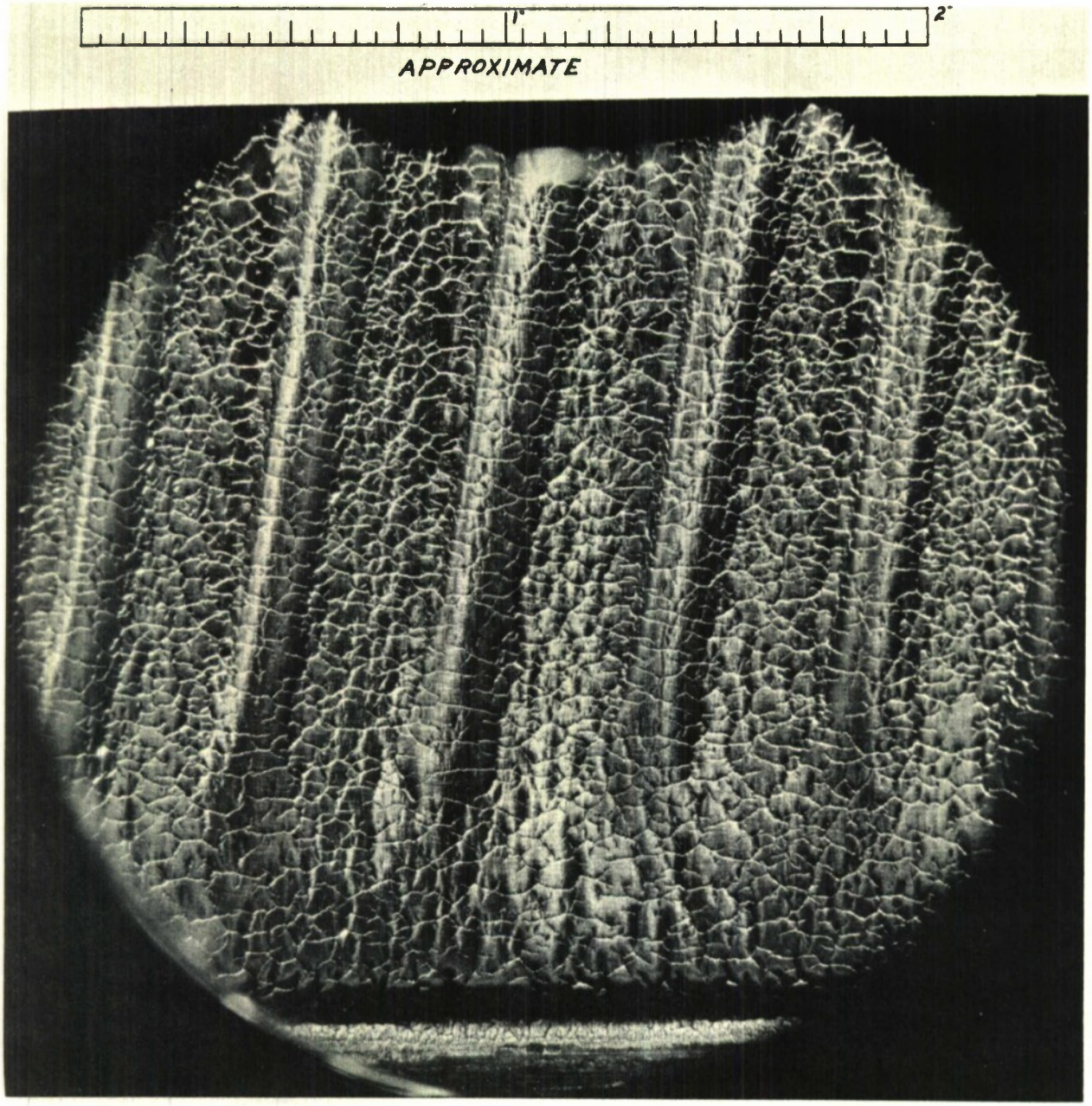


105-mm HEAT Shell Number 69, T384E1 Type I, without obturator, fired 25 June 1959.

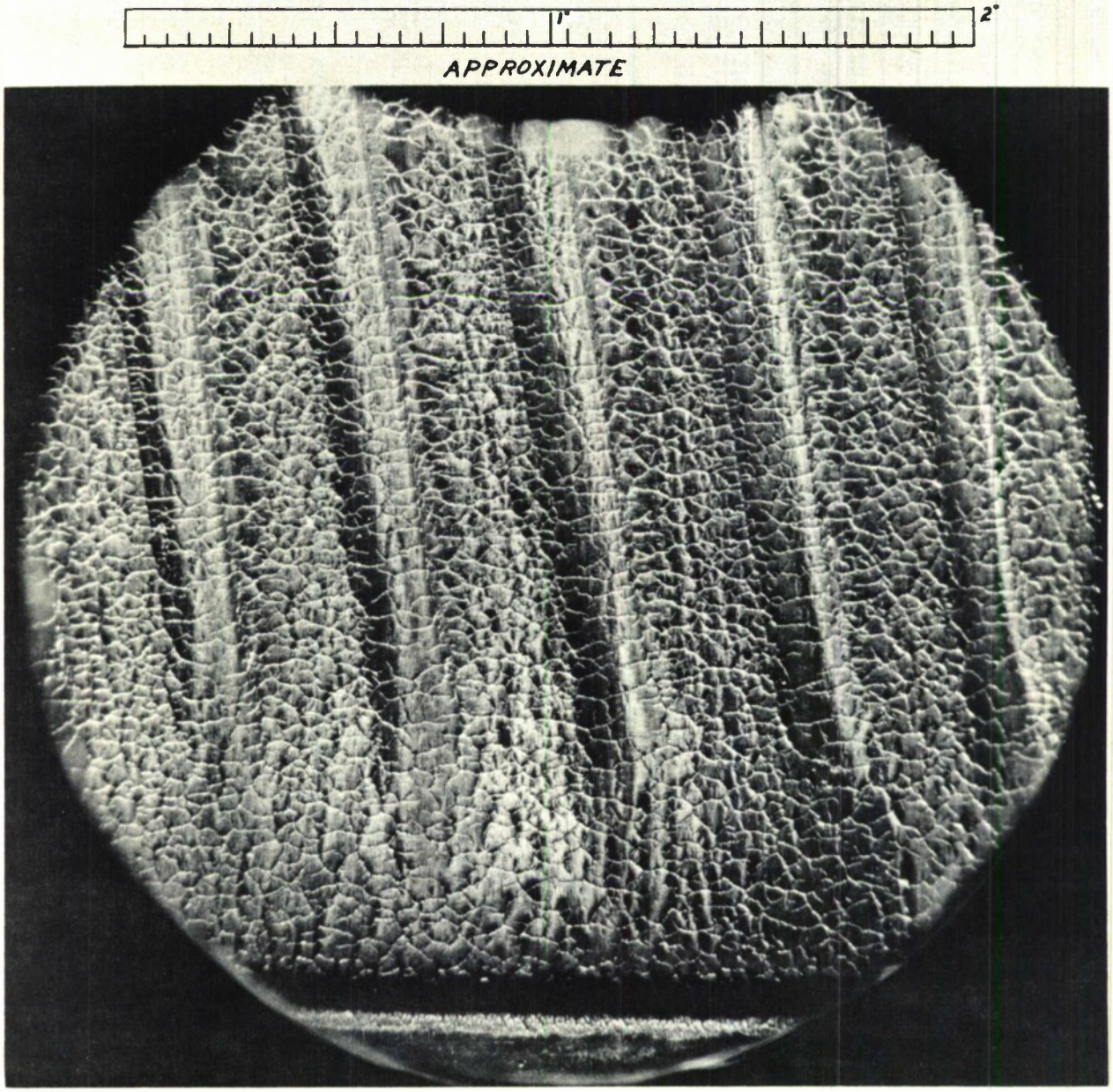
12:00 O'clock



59T2315: Bore Photograph Showing Condition of Rifling at Origin, After Firing 84 Rounds.

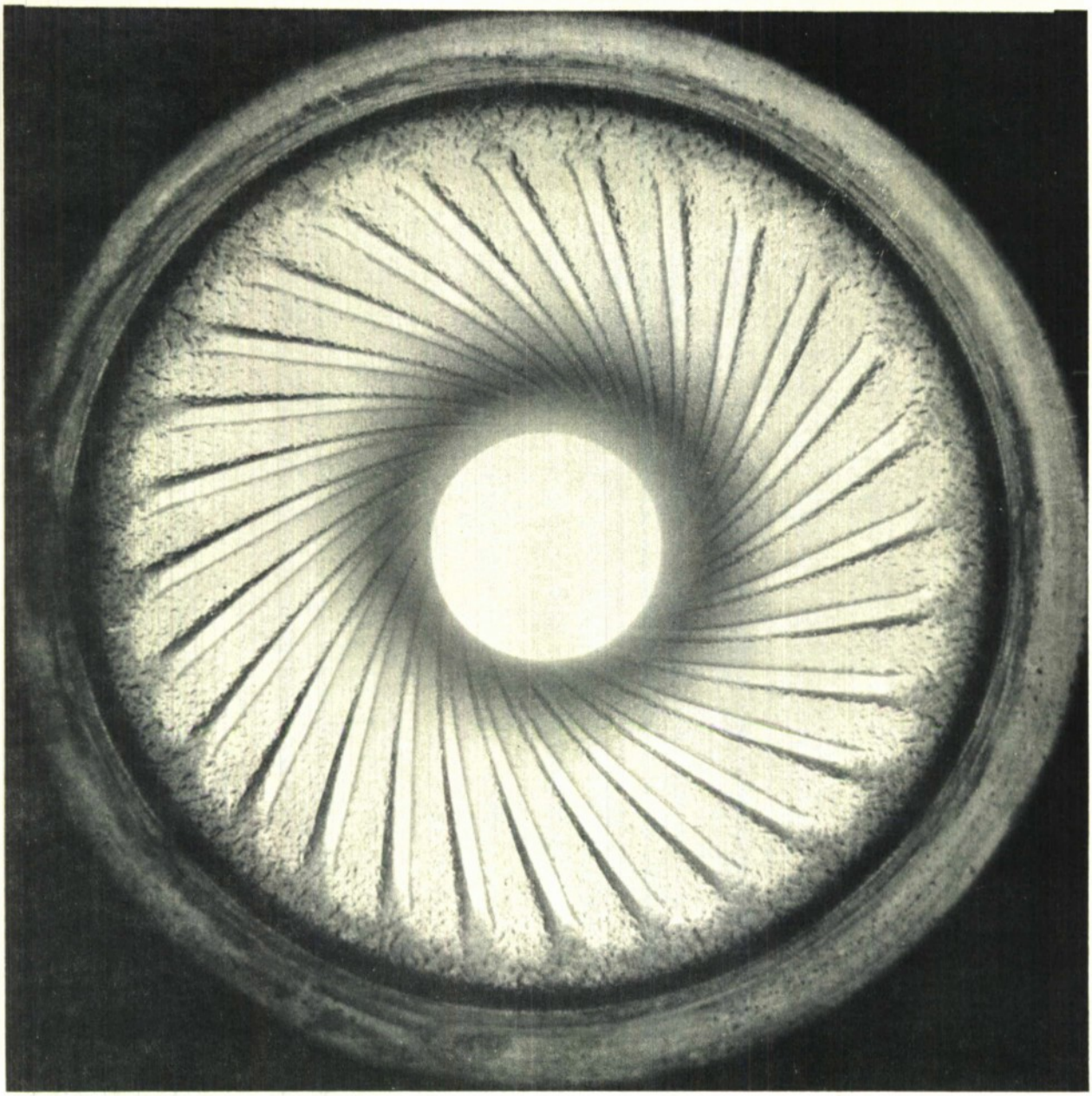


59T2314: Bore Photograph Showing Condition of Rifling at Origin at 12:00 O'Clock, After Firing 84 Rounds.

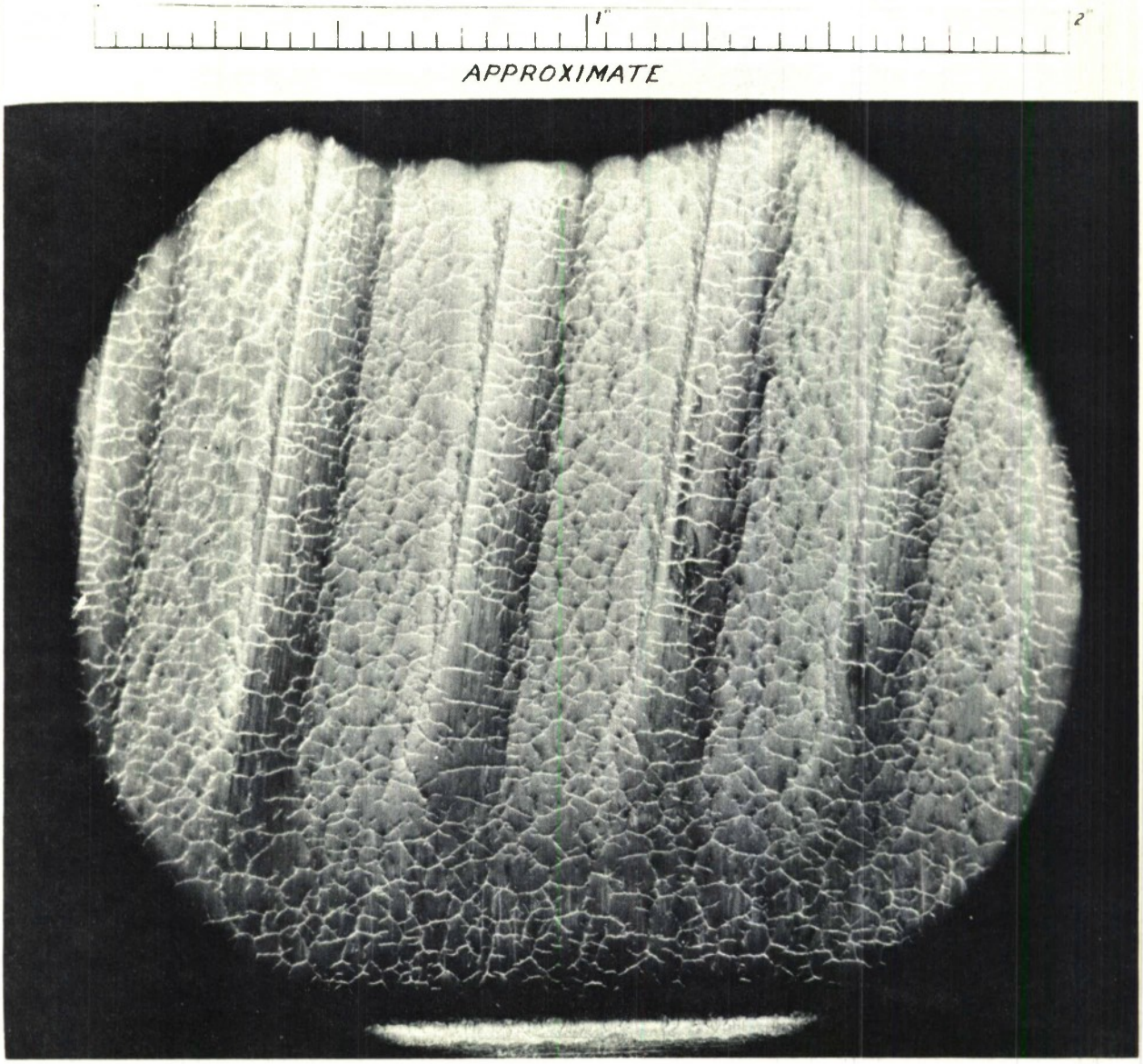


59T2313: Bore Photograph Showing Condition of Rifling at Origin at 6:00 O'Clock, After Firing 84 Rounds.

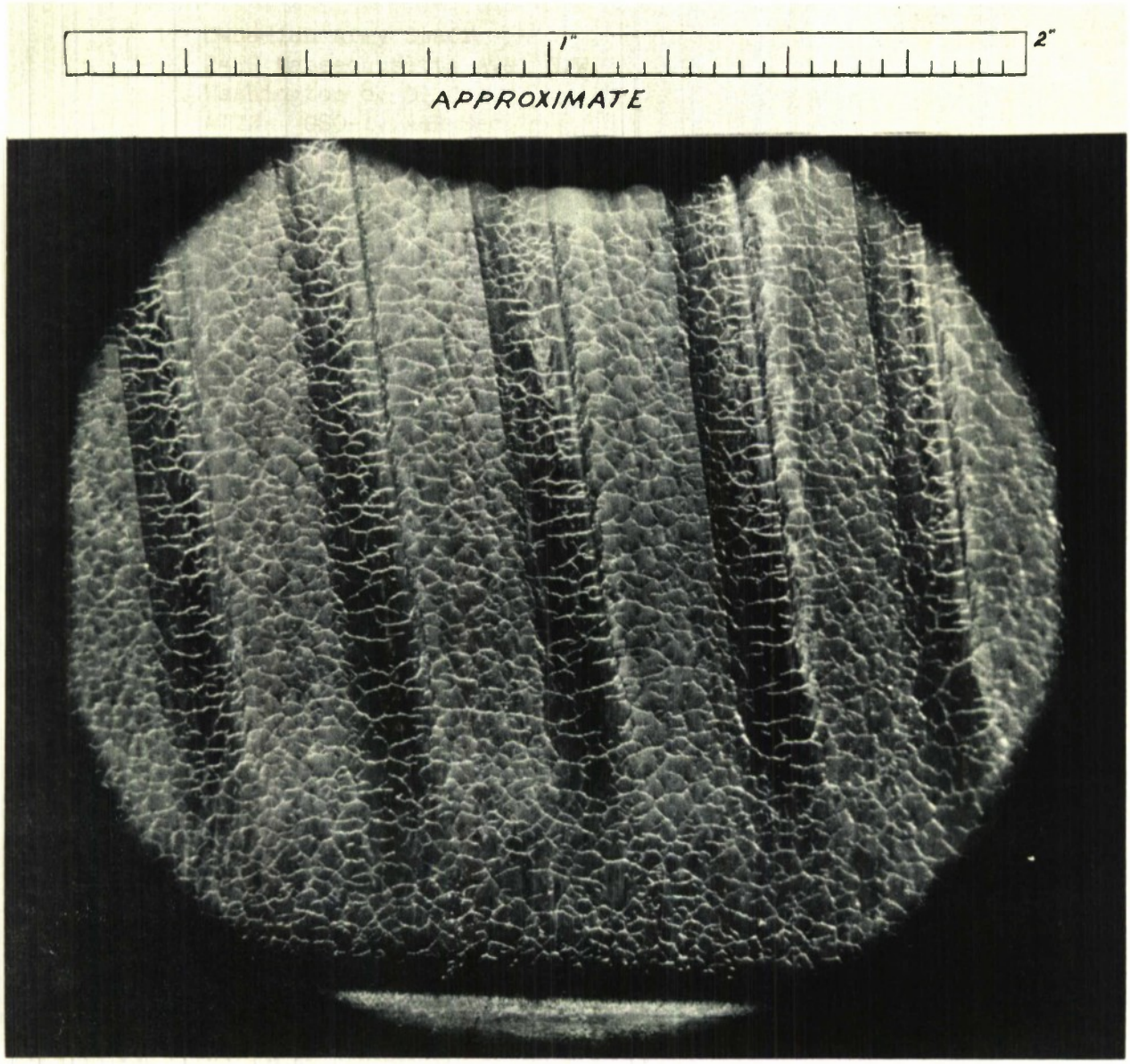
12:00 O'clock



59T2088: Bore Photograph Showing Condition of Rifling at Origin After Firing 69 Rounds.



59T2086: Bore Photograph Showing Condition of Rifling at Origin at 12:00 O'Clock, After Firing 69 Rounds.



59T2087: Bore Photograph Showing Condition of Rifling at Origin at 6:00 O'Clock, After Firing 69 Rounds.

APPENDIX E

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