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U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

REPORT NO. 971

DEVELOPMENT OF AIRCRAFT ROCKET FUZES

18th Partial Report

AIRCRAFT ROCKET FUZES;
XR-51A, XR-8D. AND EX-108;
DEVELOPMENT OF

FINAL Report

Copy No. 19

Task

Assignment NPG-Re2b-11-1-52

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NPG REPORT NO. 971

Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108;
Development of

PART A

SYNOPSIS

1. One of the aircraft rocket fuzes currently being developed at the Naval Ordnance Laboratory is the XR-51A. It is being considered for use in a proposed round consisting of a 540 HPAG motor and a new 540 A.P. head. It is also being considered for a rocket to be launched underwater. Concurrently the EX-108 fuze is being developed by the Naval Ordnance Test Station for similar usage.

2. a. The tests conducted on the XR-51A rocket fuze had three prime functions:

- (1) To determine the ability of the fuze to withstand heavy plate impacts at velocities of 1800 and 2800 ft./sec.
- (2) To determine the functioning sensitivity when subjected to light plate impacts at velocities of 1800 ft./sec.
- (3) To determine the arming distance when used in combination with motors at various temperatures.

b. The EX-108 fuze body was tested against a heavy plate target to determine its ability to withstand a heavy plate impact at 2300 ft./sec.

3. It is concluded that:

a. XR-51A fuze bodies made from 4140 steel will withstand any impacts to which they might be subjected in service. They were fired against 3" STS at 1800 ft./sec., 4" Class B at 1950 ft./sec., and 6" Class B armor plate at 2400 and 2800 ft./sec. (all at 0° obliquity) with the fuzes recovered in good condition in all cases. Dural fuze bodies broke up and the threads on 1137 steel bodies sheared when subjected to 3" armor plate impacts at 1750 ft./sec.

b. The XR-51A fuze as presently designed and constructed will not meet the requirement of consistent functioning after 1/8" or 1/4" mild steel plate impact. Only one of eight fired at 1800 ft./sec. against 1/8" mild steel functioned (30° obliquity impact) and two of seven fired against 1/4" mild steel at 0° obliquity functioned.

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Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108;
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Several rounds failing to fire after the steel target impact were reported to have functioned upon water impact 400 feet beyond the target where they may have been subjected to a more severe deceleration.

c. The limited tests conducted indicate that a reduction in the pressure orifice from W009 diameter to W008 diameter will supply the required minimum arming distance of 400 feet from the launching point, at temperatures ranging from -30°F to 120°F. Although one of the six arming devices tested with an W008 diameter orifice functioned just short of the 400 ft. minimum distance (390 feet) it is believed that the friction and inertia in the plunger movement required to complete arming in an assembled fuze would extend this distance sufficiently to meet the requirements.

4. It is recommended that the plate sensitivity tests be continued after the following steps have been taken:

a. Fire several XR-51A fuzes in smoke puff loaded rounds against 1/2" STS plate to see if consistent functioning will result.

b. If the fuze functions consistently on 1/2" plate reduce the friction between the plunger and fuze body by undercutting the plunger's circumference to leave a narrow bourrelet at its forward and after ends. Test some of the modified fuzes on various plate thicknesses.

c. If consistent functioning is not obtained on 1/2" plate, as described in 4 (a) above, fire several rounds containing XR-51A fuzes (inert except for primer, delay elements, and lead-ins) for recovery and examination.

Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108;
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PART B

INTRODUCTION

1. AUTHORITY:

The tests described herein were authorized by Task Assignment NPG-Re2b-11-1-52, reference (a), and fired in accordance with test directive reference (c) and shoot requests listed as references (b) and (d) through (n). Although the test directive also covered XR-8 fuzes, none were submitted for test at this time.

2. REFERENCES:

- a. BUORD Conf ltr NP9-Re2b-DBLaP:bjn Ser 23965 of 4 August 1951
- b. NOL unofficial memo WA:RSM:mbw of 12 July 1951
- c. NOL Conf ltr NP/NOL/X1-1(850) DF:GDB Ser 01347 of 28 July 1951
- d. NOL unofficial memo WA:RSM:mbw of 6 August 1951
- e. NOL Conf ltr NP/NOL/X1-1(1038) WA:LJdeS Ser 01496 of 24 August 1951
- f. NOL Conf ltr WA:RSM:eb of 9 September 1951
- g. NOL Conf ltr NP/NOL/X1-1(1115) WA:RSM:eb Ser 01585 of 10 September 1951
- h. NOL Conf ltr NP/NOL/X1-1(1211) Ser 01738 of 28 September 1951
- i. NOL Conf ltr WA:RG:dmm of 4 October 1951
- j. NOL Conf ltr NP/NOL/X1-1(1400) DF:FCK:dlg Ser 02058 of 8 November 1951
- k. NPG Work Request from NOL WA-1 of 20 November 1951
- l. NPG Work Request from NOL WA-2 of 21 November 1951.
- m. NPG Work Request from NOL WA-6 of 22 January 1952
- n. NPG Work Request from NOL WA-10 of 11 February 1952

3. BACKGROUND:

One of the aircraft rocket fuzes currently being developed at the Naval Ordnance Laboratory is the XR-51A. It is being considered for use in a proposed round consisting of a 540 HPAG motor and a new 540 A.P. head. It is also being considered for a rocket to be launched underwater. Concurrently the EX-108 fuze is being developed by the Naval Ordnance Test Station for similar usage.

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4. OBJECT OF TEST:

a. The tests conducted on the XR-51A rocket fuse had three prime functions:

(1) To determine the ability of the fuse to withstand heavy plate impacts at velocities of 1800 and 2800 ft./sec.

(2) To determine the functioning sensitivity when subjected to light plate impacts at velocities of 1800 ft./sec.

(3) To determine the arming distance when used in combination with motors at various temperatures.

b. The EX-108 fuse body was tested against a heavy plate target to determine its ability to withstand a heavy plate impact at 2300 ft./sec.

5. PERIOD OF TEST:

a. Date Project Letter	28 July 1951
b. Dates Necessary Material Received	13 July 1951
	30 July 1951
	3 August 1951
	15 August 1951
	7 September 1951
	14 September 1951
	26 November 1951
	23 January 1952
	13 February 1952
c. Date Commenced Test	23 July 1951
d. Test Completed	15 February 1952

6. REPRESENTATIVES PRESENT:

J. A. Templeton	Naval Ordnance Laboratory
L. J. DeSabra	Naval Ordnance Laboratory
R. S. March	Naval Ordnance Laboratory

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Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108;
Development of

PART C

DETAILS OF TEST

7. DESCRIPTION OF ITEM UNDER TEST:

a. The XR-51A is a mechanical type base fuze intended for air-to-ground work in a 5" A.P. rocket head. It may possibly be employed in a rocket to be launched underwater.

b. Figure 1 is a general arrangement drawing of the fuze. It arms as a result of the introduction of motor gas pressure into the fuze followed by the action of creep force to move the plunger into firing position and line up the firing train. A 5 millisecond $\pm 25\%$ delay after impact is obtained by the use of a pyrotechnic delay train. Dual ignition into the booster is provided to insure functioning. The entire booster end of the fuze is waterproofed by being enclosed in a metal cup, rolled into a groove and soldered in place.

c. The pressure arming system was used by itself in the flight arming tests, as shown in Figure 11. Motor gas enters the fuze through a filter in the base. It then bleeds into an inner chamber through a small orifice (7009 diameter for the first tests and 7008 diameter for the last test). When sufficient pressure has been accumulated the diaphragm is extended. In these test fixtures extension of the diaphragm drives a firing pin into the detonator which in turn initiates the firing of a smoke puff. However in the actual fuze, extension of the diaphragm is only the first step in the arming cycle since it rotates the plunger and moves it forward.

d. Fuze bodies made of various materials were tested in 6" A.P. projectiles Mk 35 Mod 5 having their diameter built up to 6V248 by the addition of cold rolled steel bands at the bourrelet and tail, as shown in Figure 2. In the initial tests the windshield and cap were removed to reduce weight and simulate the proposed design of armor piercing rocket head as closely as possible (it was believed that these items would not be incorporated in a rocket head). When it was found that the projectiles would break up in penetrating the desired plate thickness without the cap and windshield, they were left in place for later tests.

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Aircraft Rocket Fuses; XR-51A, XR-8D, and EX-108;
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8. DESCRIPTION OF TEST EQUIPMENT:

a. Launchers

- (1) NPG 1050 ft. launcher
- (2) Mk 31 launcher
- (3) 6725 smoothbore gun Mk 16-0 No. 1198

b. Propulsion

- (1) 5" motors Mk 2 Mod 3
- (2) 5" motors HPAG Model 116C
- (3) Powder Charge for gun: 33.85 lbs. SPDW 3452

c. Test Vehicles

- (1) 5" rocket heads Mk 2 Mod 2
- (2) 5" rocket heads Mk 6 Mod 1
- (3) 5" rocket heads EX-9
- (4) 6" A.P. Projectile Mk 35 Mod 5 (built up to 67248 diameter with steel bands -- 1" wide on forward bourrelet and 3/4" wide on tail)

d. Targets

- (1) 1/8", 3/16", 1/4" mild steel
- (2) 2" and 3" STS armor plate
- (3) 4" and 6" Class B armor plate

e. Cameras

- (1) Bowen Camera
- (2) Mitchell Camera
- (3) 35mm Fastax

f. Controlled temperature rooms (-35°F to +125°F)

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Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108;
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9. PROCEDURE:

a. Heavy Plate Impact Tests

(1) NPG 1050 ft. launcher

Fuze bodies of various materials were tested to find a body that would withstand heavy impacts and still be suitable for large scale production. The fuzes were inserted in inert loaded, semi-armor piercing 5" rocket heads Mk 2 and fired through the heaviest armor plate the heads would penetrate in effective condition (3" STS at 0° obliquity and 2" STS at 30°). They were propelled from the 1050 ft. rocket launcher by a 5" HVAR motor, boosted to approximately 500 ft. per second before ignition by means of a second 5" HVAR motor. The heads were recovered in a sandpile immediately behind the targets.

(2) Inasmuch as these fuzes are intended for use in an armor-piercing rocket head now under development at the Naval Proving Ground, which will penetrate a heavier target at a higher velocity than the existing 5" SAP head, it was desirable to test the fuzes under these more severe conditions. A method was devised of firing the fuzes from a 6725 smoothbore gun (which did not impose any rotational acceleration) at 2800 ft./sec., the approximate terminal velocity of a round fired from an aircraft with a 5" HPAG motor. Standard 6" A.P. projectiles Mk 35 Mod 5 were modified by building up the diameter to 67248 by sweating on a 1" wide, mild steel band at the forward bourrelet and a 3/4" wide band on the tail, just behind the rotating band. To produce impact forces on the fuze as close as possible to those which might be obtained when the fuze is employed in the A.P. rocket head, the cap and windshield were omitted from the projectile on initial rounds tested. When it was found that the projectiles would not penetrate 6" armor plate in effective condition with the cap and windshield removed, they were left in place for subsequent shots. Several rounds were fired through 4" armor plate without the cap and windshield. When recovered (in a sawdust bin behind the target) the noses were chewed off but the projectiles were still effective. High speed motion pictures were taken of the round in flight, with a 35mm Pastax Camera at 3000 frames per second, to ascertain whether it was flying satisfactorily (Figure 6). The fuzes were returned to the Naval Ordnance Laboratory for examination.

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Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108:
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b. Plate Sensitivity

To determine the minimum thickness of plate target required for functioning, fuzes were assembled in smoke puff loaded 5" rocket heads Mk 2 and Mk 6 (Figure 12) and fired from the 1050 ft. launcher at 1800 ft./sec. Two 5" HVAR motors were used for propulsion. Targets were placed at the extreme range available, 1250 feet from the initiation point of the rocket motor carrying the fuse, to insure burnout of the motor before target impact. The impact region was covered by a high speed camera to record the delay in functioning after impact.

c. Arming Distance

The time and distance of arming was checked by assembling so-called arming test fixtures in smoke puff loaded 5" rocket heads and firing them from a short launcher (Mk 31) with a 15° quadrant elevation. The test fixture admitted gas to a chamber above the diaphragm in the usual fashion (Figure 11) and then caused the extended diaphragm to drive a firing pin into a detonator. The detonator fired the boosters, which ignited the 380 gram black powder smoke puff charge. Rounds were fired with both 5" HVAR and 5" HPAG motors at temperatures of -30°F, 90°F, and 120°F. Distances along the trajectory were indicated by markers on the ground every 50 feet. Observers located perpendicular to the trajectory checked the functioning distance visually and also by means of high speed 35mm Mitchell cameras photographing the flight. The time from ignition of the rocket to the functioning point was obtained from the film record.

10. RESULTS AND DISCUSSIONS:

A summary and detailed results of the tests are presented in Appendices (A) and (B). Following is a discussion of the results obtained.

a. Heavy Impact Tests - Table I, Appendix (A)

(1) Rounds containing fuze bodies of the design shown in Figure 1, fired from the long launcher at 1800 ft./sec. versus 3" STS plate and recovered for examination, proved that 24 S-T aluminum and 1137 steel are not suitable materials for this fuze body if it is to be subjected to impacts of this magnitude or greater. The aluminum bodies broke and deformed in several places while the threads of the 1137 body failed in shear. Bodies made of 4140 steel remained in good condition after receiving impacts at these conditions and also versus 2" STS at 30° obliquity.

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(2) Initial tests of fuzes from the 6V25 smoothbore gun at 2800 ft./sec. versus 6" Class B armor plate resulted in break-up of the 6" A.P. projectiles when their caps and windshields were removed before firing. Little could be told about the effect on the fuzes, although it was noted that the only fuzes whose body threads sheared were those made of 1137 steel. Later firings with 4140 steel fuze bodies in similar projectiles tested versus 4" armor plate and in 6" A.P. projectiles retaining their caps and windshields and tested against 6" armor plate, proved that this body would remain in excellent condition with no failure of the threads after these extreme impacts; probably more severe than they will ever be expected to withstand in service.

b. Plate Sensitivity - Table II, Appendix (A)

(1) Extremely poor results were obtained with the fuzes fired for an indication of impact sensitivity. A total of eight fuzes were fired against 1/8" mild steel at 0°, 30°, and 45° obliquity, but only one functioned after the plate impact (at 30° obliquity). Two were reported to have produced a smoke puff when they struck the water, approximately 400 feet beyond the target. One round fired against 3/16" mild steel at 0° obliquity did not function, although a smoke puff was seen on water impact. Only two of seven rounds fired against 1/4" mild steel at 0° obliquity functioned, although three of the five failures did produce a smoke puff on water impact.

c. Arming Distance - Table III, Appendix (A)

(1) Initial tests of the arming fixtures indicated that the fuzes had too short an arming distance, particularly with warm or hot motors. A minimum arming distance of 400 feet from the firing point had been specified as a safety requirement. It is possible that if complete fuzes had been tested that the arming distances obtained might have been extended somewhat due to inertia or friction of the plunger and other moving parts of the arming mechanism.

(2) In the last test of these arming fixtures the orifice in the baffle (Figure 1) was reduced from .009 to an .008 diameter. This further restriction of the gas flow provided greater than the required minimum arming distance on five out of six rounds. Several measurements were made from the film records on the time required for fuze arming from ignition of the rocket motor. Arming time was approximately 0.8 second with the motors at 120°F and 1.5 seconds with the motors at -30°F.

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Aircraft Rocket Fuses; XR-51A, XR-8D, and EX-108;
Development of

PART D

CONCLUSIONS

11. It is concluded that:

a. XR-51A fuse bodies made from 4140 steel will withstand any impacts to which they might be subjected in service. They were fired against 3" STS at 1800 ft./sec., 4" Class B at 1950 ft./sec., and 6" Class B armor plate at 2400 and 2800 ft./sec. (all at 0° obliquity) with the fuses recovered in good condition in all cases. Dural fuse bodies broke up and the threads on 1137 steel bodies sheared when subjected to 3" armor plate impacts at 1750 ft./sec.

b. The XR-51A fuse as presently designed and constructed will not meet the requirement of consistent functioning after 1/8" or 1/4" mild steel plate impact. Only one of eight fired at 1800 ft./sec. against 1/8" mild steel functioned (30° obliquity impact) and two of seven fired against 1/4" mild steel at 0° obliquity functioned. Several rounds failing to fire after the steel target impact were reported to have functioned upon water impact 400 feet beyond the target where they may have been subjected to a more severe deceleration.

c. The limited tests conducted indicate that a reduction in the pressure orifice from .009 diameter to .008 diameter will supply the required minimum arming distance of 400 feet from the launching point, at temperatures ranging from -30°F to 120°F. Although one of the six arming devices tested with an .008 diameter orifice functioned just short of the 400 ft. minimum distance (390 feet) it is believed that the friction and inertia in the plunger movement required to complete arming in an assembled fuse would extend this distance sufficiently to meet the requirements.

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Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108;
Development of

PART E

RECOMMENDATIONS

12. It is recommended that the plate sensitivity tests be continued after the following steps have been taken:

a. Fire several rounds of XR-51A fuzes in smoke puff loaded heads against 1/2" STS plate to see if the fuze will function consistently if it receives a sufficiently great retardation.

b. If consistent functioning is obtained reduce the friction between the plunger and fuze body by undercutting the former's outer circumference, except for a narrow bourrelet at the forward and after ends of the body. Further, reduce its mass by machining away all unnecessary material -- possibly substituting a material with a lower specific gravity. The lower weight and decreased friction of the plunger should require less retardation to drive the firing pin into the plunger as well as reducing the rotational force involved in arming the fuze.

c. If consistent functioning is not obtained on 1/2" STS targets attempt to discover the cause of the malfunctioning by firing several rounds containing XR-51A fuzes (inert except for primer, delay elements, and lead-ins) into a sand pile for recovery and examination.

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Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-106;
Development of

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NPG REPORT NO. 971

**U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA**

**Eighteenth Partial Report
on
Development of Aircraft Rocket Fuzes**

**Final Report
on
Aircraft Rocket Fuzes;
XR-51A, XR-8D, and EX-108;
Development of**

**Project No.: NPG-Re2b-11-1-52
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Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108; Development of NPG REPORT NO. 971

TABLE I

SUMMARY OF RESULTSXR-51A Heavy Plate Impact Tests - Fired from NPG 1050 ft. Launcher
in 5" Rocket Heads Mk 2

Impact Nos.	Date	No. Fds.	Fuze Nos.	Fuze Body Material	Target	Striking Vel. (f/s)	Penetration	Results
39160 39161	7-23-51	2	1, 2	24 S-T Aluminum	3" STS at 0°	1750	Comp.	Arming Failures- Body failed in several places.
39162 39163	7-23-51	2	3, 4	4140 Steel	3" STS at 0°	1750	Comp.	Arming Failures- Fuze bodies in good condition.
39211 39212	8-24-51	2	11, 12	1137 Steel	3" STS at 0°	1750	Comp.	Fuzes functioned- Body weak, sheared through threads.
39254 39255	9-18-51	2	17, 18	4140 Steel	2" STS at 30°	1700	Comp.	Fuze body and threads in excellent condition.

XR-51A Heavy Plate Impact Tests - Fired from 6"25 Smoothbore
Gun in 6" AP Projectiles (modified)

Remark: Cap and windshield removed from projectiles before firing.

39213 39214	8-30-51	2	5, 6	Dural	6" at 0°	2800	Comp.	Projectiles broke up- Part of fuze bodies left in base of shell- All internal components of fuze missing.
39215 39220	8-30-51 8-31-51	2	7, 8	4140 Steel	6" at 0°	2800	Comp.	Projectiles broke up- Major portion of fuzes left intact. Diaphragm missing.

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APPENDIX A

TABLE I (Continued)

XR-51A Heavy Plate Impact Tests - Fired from 6.25 Smoothbore
Gun in 6" AP Projectiles (modified) (Cont'd)

Impact Nos.	Date	No. Rds.	Fuze Nos.	Fuze Body Material	Target	Striking Vel. (f/s)	Pene- tration	Results
39221 39222	8-31-51	2	9, 10	1137 Steel	6" at 0°	2750	Comp.	Projectiles broke up- (1) Base plug threads sheared and fuze missing; (2) Fuze threads sheared- Fuze recovered intact.
39496 39497	11-29-51	2	21, 22	4140 Steel	4" at 0°	1950	Comp.	Nose of projectiles broke off- Fuzes intact, good condition.
39485 39486	11-28-51	2	19, 20	4140 Steel	6" at 0°	2400	Comp.	One proj. broke at band score- Second projectile eff-intact- Fuzes intact.
39487 39488	11-28-51	2	1, 2 (EX-108)	--	6" at 0° #2 base slapped	2300	Comp.	Projectiles eff-intact, Fuzes intact. Sent to NOTS for inspection.

Remark: Cap and windshield removed from projectiles before firing. (Continued)

Remark: Projectiles fired with cap and windshield.

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Aircraft Rocket Fuzes; XR-51A, XR-80, and EX-108; Development of

NFC REPORT NO. 971

TABLE II

SUMMARY OF RESULTSXR-51A Plate Sensitivity - Fired from 1050 ft. Launcher

Remark: Smoke Puff Loaded in 5" heads Mk 2

Impact Nos.	Date	No. Rds.	Fuze Nos.	Fuze Body Material	Target	Striking Vel. (f/s)	Pene- tration	Results
39286 39287	9-26-51	2	13, 14	--	1/8" MS at 0°	1750	Comp.	Did not function.
39288	9-26-51	1	15	--	1/8" MS at 30°	1720	Comp.	Did not function.
39289	9-26-51	1	16	--	1/4" MS at 0°	1641	Comp.	Smoke puff functioned.

Remark: Smoke Puff Loaded in 5" heads Mk 6-1

--	10-17-51	1	23	--	3/16" MS at 0°	1855	Comp.	Did not function on target- All functioned on water.
--	10-17-51	1	24	--	1/8" MS at 45°	1895	Comp.	Did not function on target- All functioned on water.
--	10-17-51	2	25, 26	--	1/4" MS at 0°	1800	Comp.	Did not function on target- All functioned on water.
39481	11-27-51	1	28	--	1/8" MS at 0°	1869	Comp.	Did not function on target.

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APPENDIX A

TABLE II (Continued)

XR-51A Plate Sensitivity - Fired from 1050 ft. Launcher (Continued)

Remark: Smoke Puff Loaded in 5" heads Mk 6-1 (Continued)

Impact Nos.	Date	No. Rds.	Fuze Nos.	Fuze Body Material	Target	Striking Vel. (f/s)	Penetration	Results
39482 39483	11-27-51	2	29, 30	--	1/4" MS at 0°	1700, 1900	Comp.	Did not function on target-- One functioned on water impact.
--	2-15-52	2	31, 35	--	1/4" MS at 0°	1877, 1850	Comp.	One functioned with 10 ft. delay-- One a complete dud.
--	2-15-52	1	32	--	1/8" MS at 0°	1858	Comp.	Did not function.
--	2-15-52	2	33, 34	--	1/8" MS at 30°	N.G. 1926	Comp.	One functioned with 8 ft. delay - Second a dud on target but functioned on water.

TABLE III

SUMMARY OF RESULTS

XR-51A Arming Distance Test - Fired from Short Launcher

Date	No. Rds.	Fuze Nos.	Motor Temp.	Remarks	Smokepuff - Ft. from Breech of Launcher	Time-Ignition to Functioning (Secs)
10-16-51	3	4, 6, 5	+120°F	Smokepuff in 5" head Mk 6 and 5" motor Mk 2	300, 365, 265	---
10-16-51	3	1, 2, 3	-30°F	Smokepuff in 5" head Mk 6 and 5" motor Mk 2	310, 375, 400	---
10-16-51	3	7, 8, 9	-30°F	Smokepuff in 5" head EX-9 and 5" HPAG motor	420, 400, 370	---
10-16-51	3	10, 11, 12	120°F, 90°F, 90°F	Smokepuff in 5" head EX-9 and 5" HPAG motor	285, 260, 340	---
2-1-52	3		-30°F	Smokepuff in 5" head Mk 2 and 5" motor Mk 2	525, 575, 830	1.44, ---, ---
2-1-52	3		+120°F	Smokepuff in 5" head Mk 2 and 5" motor Mk 2. Orifice changed from .009 to .008	460, 570, *350	0.84, 0.88, 0.71

*Film indicated this distance was 390 ft.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIAIMPACT NO. 39160IMPACT DATE 23 July 1951NPG TEST NO CURE 10903

OBJECT HEAVY IMPACT TEST OF XR-51A ROCKET FUZES
FIRE FROM 1050' ROCKET LAUNCHER
 Reference: NPG ltr. Report 720.971 dated _____
 Reference: ~~Back~~ ltr. NP/NOG/XI-1(850)DF:GDR01347 dated 28 Jul 1951
 Task Assignment No. NPG-R 20-11-1-52 dated 14 August 1951

PLATE TARGET

Gage 3"0 Class CL. B.
 Maker MIDVALE
 No. 12315 Group PRAT. TEST
 Dimensions 120" X 240"

OBLIQUITY 0°

PENETRATION COMPLETE
 Thickness at impact 3 1/3
 No. of impact on plate 34
 Dist. from nearest impact 8"
 Dist. from near edges 7.51" and 8.53"
 Impact area 5" X 6"
 Spall: Front 0 Back 0
 Dish 1/4" Spur 2"
 Cracks 0
 Punching (thrown) (started) _____
 Back Button (thrown) (started) _____
 Bulge 0
 Through opening 5" X 5"

ROCKET

HEAD: Cal. 5" Type SEMI-AP
 Mark 2 Mod 2 No 8770 Wt. 46.32*
 Maker CSA
 Lot No. 38
 Filler: Type VERM. Wt. -
 Fuzes XR-51A #1 - DURAL BODY

Boosters _____
 Wt. of head (as fired) 46.32*

MOTOR: Cal. 5" Mk. 2 Mod 9
 Motor temp. 80° Wt. 87.75*

COMPLETE ROUND: Mark _____ Mod _____
 Wt. (as fired) 134.07*
 Wt. (burned) _____

OTHER INFORMATION MOTORS (2)
GRIN-DK-10-C
ALN-KMDA-137-H-45
 LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight _____ Velocity, f/s: Mean Striking 1747 Residual _____
 Fuze functioning _____
 Explosive action (High Order) (Low Order) (None) _____
 Distance of burst behind plate _____
 Condition of recovered round _____
 Head was in (EFFECTIVE) (INSPECTIVE) condition _____

REMARKS: Fuze Arming failure - Body off se failed in several places

Photo No. _____

Signed F. W. M. Hood

F. W. M. Hood
RD. ETS. 8-2-15

Impact Round #1

Security Information

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 99161

IMPACT DATE 23 JULY 1951

NPG TEST NO. CODE 10903

OBJECT HEAVY IMPACT TEST OF XR-51A ROCKET FUZES
FIRE FROM 1050' ROCKET LAUNCHER
Reference: NPG ltr. Report No. 971 dated _____
Reference: DAHLGREN ltr. NPINOL/XI-1(950)DF:GDB 01347 dated 28 July 1951
Task Assignment No. NPG-R-28-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 3.0 Class CL. B
Maker MIRVALE
No. 12315 Group PROT. TEST
Dimensions 120" x 240"

OBLIQUITY 0°

PENETRATION COMPLETE
Thickness at impact 3.13
No. of impact on plate 23
Dist. from nearest impact 24"
Dist. from near edges 1.6" and R-35"
Impact area 5" x 6"
Spall: Front 0 Back 0
Dish 1/4" Spur 3"
Cracks 0
Punching (thrown) (started) _____
Back Button (thrown) (started) _____
Bulge 0
Through opening 5" x 5"

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No 8232 Wt. 45.48#
Maker CSA
Lot No. 98
Filler: Type VERM. Wt. _____
Fuzes XR-51A #2 - Dural Body

Boosters
Wt. of head (as fired) 45.48#

MOTOR: Cal. 5" Mk. 2 Mod 9
Motor temp. 80° Wt. 28.95#

COMPLETE ROUND: Mark _____ Mod _____
Wt. (as fired) 13.598#
Wt. (burned) _____

OTHER INFORMATION MOTORS (2)
GRAIN. MKK-0
ALN: RMDA-137-H-45
LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight _____ Velocity, f/s: DEAN Striking 17.55 Residual _____
Fuze functioning _____
Explosive action (High Order) (Low Order) (None) _____
Distance of burst behind plate _____
Condition of recovered round _____
Head was in (EFFECTIVE) (~~INEFFECTIVE~~) INTACT condition.

REMARKS: Fuze Arming Failure - Fuze body failed in several places

Photo No. _____

Signed F. W. Reader
F. W. READER, Lt.

CRD. 7 DE. 45-12

Impact Record # 2

CONFIDENTIAL
Security Information

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39162

IMPACT DATE 23 JULY 1951

NPG TEST NO CODE 10803

OBJECT HARRY IMPACT TEST OF XR-51A ROCKET

FIRED FROM 1050' ROCKET LAUNCHER

Reference: NPG Ltr. Request No. 721 dated 28 July 1951
Reference: NAVAL Ltr. NPG-RE-24-11-1-52 dated 4 August 1951
Task Assignment No. NPG-RE-24-11-1-52

PLATE TARGET

ROCKET

Gage 3.0 Class CL. 6
Maker MIDVALE
No. 12315 Group PROJ. TEST
Dimensions 120" X 240"

OBLIQUITY 0°

PENETRATION COMPLETE
Thickness at impact 3.173
No. of impact on plate 36
Dist. from nearest impact 16"
Dist. from near edges 4.62" and 16.50"
Impact area 6" X 7"
Spall: Front 0 Back 0
Dish 1/4" Spur 2"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge 0
Through opening 5" X 3 1/4"

HEAD: Cal. 5" Type SEM-1-HP
Mark 2 Mod 3 No. 8914 Wt. 27.03#
Maker ISLE
Lot No. 33
Filler: Type VERM. Wt. -
Fuzes XR-51A #3 - 4140 STEEL BODY

Boosters
Wt. of head (as fired) 47.03#

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 80° Wt. 89.30#

COMPLETE ROUND: Mark - Mod -
Wt. (as fired) 126.33#
Wt. (burned) -

OTHER INFORMATION MOTORS (-)
EXAM: MK 18-0
FIN: RMDA-137-H-45
LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight 1740 Velocity, f/s: 1740 Residual -
Fuse functioning -
Explosive action (High Order) (Low Order) (None) -
Distance of burst behind plate -
Condition of recovered round -
Head was in (EFFECTIVE) (INEFFECTIVE) condition -

REMARKS: Fuze Arming Failure - body in good condition

Photo No. -

Signed F. W. Kasdorf
FIELD OFFICER, U. S. N.

OFFICIAL 23-12

Impact No. 2 #3

CONFIDENTIAL
Security Information

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39163

IMPACT DATE 23 JULY 1951

NPG TEST NO. CODE 10903

OBJECT HEAVY IMPACT TEST OF XR-51A ROCKET
FUZES FIRED FROM 1050' ROCKET LAUNCHER

Reference: NPG ltr. Rept. 724 921 dated

Reference: NPG ltr. NPG/No. 11-1-52 dated 28 July 1951

Task Assignment No. NPG-Re 23-11-1-52 dated 4 August 1951

PLATE TARGET

ROCKET

Gage 3.0 Class CL. B
Maker MIDVALE
No. 12315 Group PE-T. TEST
Dimensions 120" X 240"

OBLIQUITY 0°

PENETRATION COMPLETE
Thickness at impact 3.113
No. of impact on plate 21
Dist. from nearest impact 0"
Dist. from near edges 1-6" and 2-50"
Impact area 6" X 7"
Spall: Front 0 Back 0
Dish 1/4" Spur 2"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge 0
Through opening 5" X 3 1/4"

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No. 8936 Wt. 47.27*
Maker OSCA
Lot No. 38
Filler: Type VERM. Wt. -
Fuzes XR-51A #4 - 4140 Steel Body

Boosters
Wt. of head (as fired) 47.27*

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 90° Wt. 87.95*

COMPLETE ROUND: Mark Mod
Wt. (as fired) 135.22*
Wt. (burned)

OTHER INFORMATION MOTORS (2)
GRAIN: MK 18-0
ALN: RMDA-137-H-45
LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: 1775 Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was in (EFFECTIVE) (INEFFECTIVE) condition.

REMARKS: THIS ROUND KEYHoled IMPACT 39162. BASE OF HEAD BROKE OFF
BUT FUZE REMAINED INTACT. - FUZE ARMING FAILURE - FUZE DEFORMED

Photo No.

Signed F. W. KASDORF, Lt.
AKD. ETC. GS-12.

Impact Record #4

CONFIDENTIAL
Security Information

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIAIMPACT NO. 39211IMPACT DATE 8-24-51NPG TEST NO Code 10747

OBJECT RECOVERY TEST OF TWO (2) XR-51A PARTIALLY LOADED FUZES
1/5 3" CL B ARMOR PLATE
 Reference: NPG ltr. Request No. 971 dated _____
 Reference: NAVAL PROVING GROUND GDS 01347 dated 28 July 1951
 Task Assignment No. NPG-RE-28-11-1-52 dated 4 August 1951

PLATE TARGET

ROCKET

Gage 3" Class CL B
 Maker MIDVALE
 No. 12315 Group FRONT TEST
 Dimensions 120" x 240"

OBLIQUITY 0°PENETRATION COMPLETE

Thickness at impact 3.76
 No. of impact on plate 36
 Dist. from nearest impact _____
 Dist. from near edges 5.50" and 1.95"
 Impact area _____
 Spall: Front _____ Back _____
 Dish _____ Spur _____
 Cracks _____
 Punching (thrown) (started) _____
 Back Button (thrown) (started) _____
 Bulge _____
 Through opening 5" x 5"

HEAD: Cal. 5" Type 1
 Mark 2 Mod 2 No. 2891 Wt. 47.71#
 Maker C.G.C.A.
 Lot No. 3B
 Filler: Type VERM. Wt. _____
 Fuze XR-51A - NOL
M. 11 - 1137 STEEL BODY
 Boosters _____
 Wt. of head (as fired) 47.71#

MOTOR: Cal. 5" Mk. 2 Mod 3
 Motor temp. 100° Wt. 58.55#

COMPLETE ROUND: Mark _____ Mod _____
 Wt. (as fired) _____
 Wt. (burned) _____

OTHER INFORMATION Motors: (2)
ALN: RMDA-137-H-75

LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight _____ Velocity, f/s: MEAN Striking 1597 Residual _____
 Fuze functioning _____
 Explosive action (High Order) (Low Order) (None) _____
 Distance of burst behind plate _____
 Condition of recovered round _____
 Head was in (EFFECTIVE) (~~INEFFECTIVE~~) intact condition.

REMARKS: Fuze functioned - booster cup threads on body sheared at pitch

Photo No. _____

Signed R.T. CROWELLDoc. Eng. 65-9CONFIDENTIAL
Security Information

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39212

IMPACT DATE 8-24-51

NPG TEST NO. Cde. 10747

OBJECT RECOVERY TEST OF TWO (2) XR-51A PARTIALLY
LOADED FUSES 15/ 3" CL. B ARMOR PLATE

Reference: NPG ltr. Transit No. 971 dated

Reference: NOL ltr. NPNDOL(XI-1850)DE: GDB 01347 dated 28 July 1951

Task Assignment No. NPG-RE 28-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 3" Class "B"
Maker MIDVALE
No. 12315 Group PROJ. TEST
Dimensions 120" X 240"

OBLIQUITY 0°

PENETRATION COMPLETE
Thickness at impact 3.06
No. of impact on plate 37
Dist. from nearest impact —
Dist. from near edges T-36 and L-93"
Impact area —
Spall: Front — Back —
Dish — Spur —
Cracks —
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge —
Through opening 5" X 5"

ROCKET

HEAD: Cal. 5" Type
Mark 2 Mod 2 No. 5809 Wt. 47.23#
Maker C.S.C.A. BASE
Lot No. 38
Filler: Type VERM Wt. —
Fuzes XR-51A NOL
No. 12 — 437 STEEL BODY
Boosters
Wt. of head (as fired) 47.23#

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 100° Wt. 90.00#

COMPLETE ROUND: Mark — Mod —
Wt. (as fired)
Wt. (burned)

OTHER INFORMATION PILOTS: (2)
ALN: RMDA-137-H-45

LAUNCHER 1050 BUCKET LAUNCHER

ROCKET PERFORMANCE

Flight MEAN Velocity, f/s: Striking 1789 Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round Intact
Head was in (EFFECTIVE) (INEFFECTIVE) condition

REMARKS: Fuze functioned - fuze body threads sheared, adapter
threads sheared

Photo No. Signed R. T. CRANE

CRD ENG. 05-7

Impact Point H 6

File No.

Butt Firing

U. S. Naval Proving Ground

Dahlgren, Va. 8-30-51 191

39213

30 Aug. 1951

7

OBJECT 6" 5 MICROTHORRE GUN TEST OF XR-51A INERT
ROCKET FUZES VS. 6" CLASS B ARMOR AT 0' OBL.

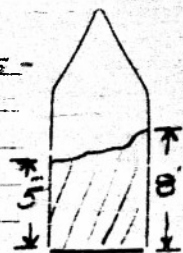
REFERENCE LETTER NP/NO4/XI-1(850) OF GDB 01347 DATED 28 July 1951

21 PB Report No 991 PLATE

PROJECTILE

Gauge 6"0
Class "B"
Maker CARNEGIE
No. TT 277 Group PROJ. TEST
Contract NORD-5282
Date received 30 AUG. 1944
Dimensions 120" X 300"
No. of impact on plate 3
Thickness at impact 6.06
OBLIQUITY 0°
Impact dimensions 9" X 9"
PENETRATION COMPLETE
Flaking front 0
Flaking back 0
Dist. from top, bottom 76"
Dist. from right, left 124"
Dist. from nearest impact 39"
Dish 0
Spur 4"
Cracks - Bulge 0
Button (Thrown) (Started)
Through Opening 8" X 8"

Caliber 6"
Maker MIDVALE
Type A.P.
Lot No. 139 Year of Specification 1943
Mark 35 Mod. 5 No. NNT186
Date received -
Capped or uncapped -
Weight (capped) -
Weight (uncapped) 98.43#
Length (uncapped) 15.17
Fuze XR-51A INERT #5 DURAL
Filler VERMILULITE
Flight by screen -
Condition after firing:-
~~EFFECTIVE~~ or INEFFECTIVE
TUBE BODY LEFT IN PLACE -
ALL INTERNAL COMPONENTS
MISSING - BODY FAILURE



BALLISTIC DATA

NOTE:	-1- Desired	-2- Oscillograph	-3- Chronograph	-4- Limit, estimated for this thickness of impact	-5- Actual adjusted to nominal range	-6- Limit, for nominal range, based on the impact only, adjusted from column 4)	-7- Limit, for nominal range, established from column 6 and previous impacts.
All limits are for this plate and this obliquity only.		MEAN					
Striking velocity (f.s.)		2878					

REMARKS

Limit shots only

c/d

F(e/d, G)

N.P.G. Photo No. NP9-46056 TARD 46060

Acceptance or Rejection recommended

Impact Record #7 F.W. D. and J. F.W. D. and J.

C.D. F.W. D. and J.

CONFIDENTIAL
Security Information

File No.

Butt Firing

39214

U. S. Naval Proving Ground

30 AUG. 1951

Dahlgren, Va. 8-30-51 191

7

OBJECT 6" SMOOTHBORE GUN TEST OF XR-51A INERT
ROCKET FUZE VS. 6" CLASS B ARMOR AT 0° CBL.

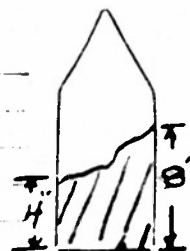
REFERENCE ^{NOL} ~~REF~~ LETTER NP/NOH/XI-1(850) OF: GVB 01347 DATED 28 JULY, 1951

7768 ~~APR 27~~ 991 PLATE

PROJECTILE

Gauge 6"0
Class "B"
Maker CARNEGIE
No. TT277 Group PROJ. TEST
Contract NORD-5272
Date received 30 AUG. 1944
Dimensions 120" X 300"
No. of impact on plate 4
Thickness at impact 6"06
OBLIQUITY 0°
Impact dimensions 9" X 9"
PENETRATION COMPLETE
Flaking front 0
Flaking back 0
Dist. from top, bottom 59"
Dist. from right, left 124"
Dist. from nearest impact 17"
Dish 0
Spur 3"
Cracks - Bulge 0
Button (Thrown) Started
Through Opening 8" X 8"

Caliber 6"
Maker MIDIALE
Type A.P.
Lot No. 139 Year of Specification 1943
Mark 35 Mod. 5 No. MM072
Date received
~~Capped or uncapped~~
~~Weight (capped)~~
Weight (uncapped) 100.20#
Length (uncapped) 15.17
Fuze XR-51A INERT #6 DRPL
Filler VERMICULITE
Flight by screen
Condition after firing:-
~~EFFECTIVE~~ OR INEFFECTIVE
FUZE BODY LEFT IN
PLACE - ALL INTERNAL
COMPONENTS MISSING
- BODY FAILURE



BALLISTIC DATA

Notes	1	2	3	4	5	6	7
All limits are for this plate and this obliquity only.	Impact	One graph	One graph	Two graphs	Two graphs	Two graphs	Two graphs
		MEAN					
Striking velocity (ft/s)		2720					

REMARKS

Limit shots only

01

1000, 100

NP4-46056 TRAC 46060

RUN: 0125 MK 11 1178

Acceptance or Rejection not needed

Impact Record #8
F. W. KASDORF, JR.

ORD. ENG. 65-121

CONFIDENTIAL
Security Information

Butt Firing

U.S. Naval Proving Ground
Dahlgren, Va. 8.30-51 1951

Project No. 39215
Project Date 30 AUG. 1951
Butt No. 7

PROJECT 6" SMOOTHBORE GUN TEST OF XR-51A INERT
ROCKET FUZES VS. 6" CLASS "B" ARMOR AT 0° OBL.

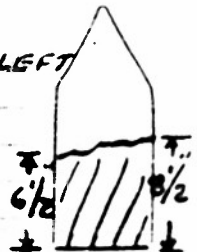
REFERENCE ~~LETTER~~ ^{NO. 4} LETTER NP/NO. 4/XI-1(850) OF: GDB 01344 DATED 28 July 1951

7. FB Report 70971 PLATE

PROJECTILE

Gauge 6" 0
Class "B"
Maker CARNEGIE
No. TT 277 Group PROJ. TEST
Contract NORD-5282
Date received 30 AUG. 1944
Dimensions 120" X 300"
No. of impact on plate 5
Thickness at impact 6.06
OBLIQUITY 0°
Impact dimensions 9" X 10"
PENETRATION COMPLETE
Flaking front 0
Flaking back 0
Dist. from top, bottom 45"
Dist. from right, left 125"
Dist. from nearest impact 14"
Dish 0
Spur 3°
Cracks - Bulge 0
Button (Thrown) (Started)
Through Opening 9" X 8 1/2"

Caliber 6"
Maker MIDYALE
Type A. P.
Lot No. 139 Year of Specification 1943
Mark 35 Mod. 5 No. LV III
Date received
Capped or uncapped
Weight (capped)
Weight (uncapped) 101.27 #
Length (uncapped) 15.17
Fuze XR-51A INERT # 7-4140
Filler VERMILULITE 3788L
Flight by screen
Condition after firing:-
~~EFFECTIVE~~ or INEFFECTIVE
MAJOR PORTION OF FUZE LEFT
INTACT - BELLONS GONE -
BASE SQUEEZED



BALLISTIC DATA

NOTE:	1	2	3	4	5	6	7
	Desired	On diagram	Chronograph	Time to impact	Velocity at impact	Time to impact	Time to impact
All limits are for this plate and this obliquity only.							
		MEAN					
Striking velocity of		2821					

REMARKS

Limit shots only

old

Production

NP-46056 - 46056

Impact No. 9

Accepted by Receiver
F. W. KASPER, Jr.
CRD. ENR. 69-12-4-200

CONFIDENTIAL
Security Information

Index No. 39220
Expt. Date 8-31-51
Bottle No. 7

U. S. Naval Proving Ground
Dahlgren, Va. 9-31-51 194

OBJECT 6" SMOOTHBORE GUNTEST OF XR-51A INERT
ROCKET FUZES VS. 6" CL B. ARMOR AT 0° OBL.

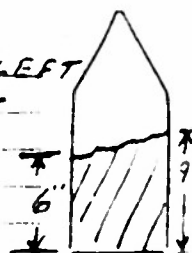
REFERENCE ~~FILE~~ ^{NOL} LETTER NP/NOL/XI-(850) OF ADB 01347 DATED 28 July 1951

112-570, 571 911 PLATE

PROJECTILE.

Gauge 6.0
Class "B"
Maker CARNEGIE
No. T. 277 Group PROJ. TEST
Contract NORD - 5282
Date received 30 AUG. 1944
Dimensions 120" X 300"
No. of impact on plate 6
Thickness at impact 6.06
OBLIQUITY 0°
Impact dimensions 9" X 9"
PENETRATION COMPLETE
Flaking front 0
Flaking back 0
Dist. from top, bottom 62"
Dist. from right, left 142"
Dist. from nearest impact 18"
Dish 0
Spur 3"
Cracks - Bulge 0
Button (Thrown) (Started)
Through Opening 8" X 8"

Caliber 6"
Maker MIDIALE
Type H. P.
Lot No. 139 Year of Specification 1943
Mark 35 Mod. 5 No. NND 30
Date received -
Capped or uncapped
Weight (capped)
Weight (uncapped) 101.92 #
Length (uncapped) 15.17
Fuze X.P. 51A INERT # 8-4140
Filler VERMICULITE STEEL
Flight by screen
Condition after firing:-
~~EFFECTIVE~~ or INEFFECTIVE
MAJOR PORTION OF FUZE LEFT
INTACT - BELLOWS GONE -
BASE OK.



BALLISTIC DATA

Notes	1	2	3	4	5	6	7
	Percent	Overall group average (except for the group of 1000)	Percent of total group	Actual (for total group)	Percent for nominal weight (based on the sample size)	Percent for nominal weight (based on the sample size)	Limit, for nominal weight, established from column 5 and previous impacts
All limits are for this plate and this frequency only.							
		MEAN					
		2978					

REMARKS

[illegible]

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Accepted for publication 15 October 2003

Impact Area #10 F.W. Roadway
F.W. RASTORF, Sr.

CONFIDENTIAL

Security Information

File No.

Butt Firing

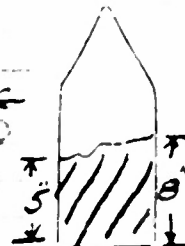
U. S. Naval Proving Ground
Dalhousie, Va. P. 31-51 19439221
2:31.51
7ORIG 6" SMOOT HAZARD TEST OF XR-51A INERT
ROCKET FUZE VS. 6" CL. B. PRIMER AT 0.661.REFERENCE ~~FILE~~ ^{NOL} LETTER AP/AC/KI-1000 OF 508 613-7 DATED 28 JUL 1951

7-5-R-1000-1 PLATE

PROJECTILE

Gauge 6.0
Class "B"
Maker CARNEGIE
No. TT 277 Group PROJ. TEST
Contract NORD-5282
Date received 30 AUG. 1944
Dimensions 130" X 300"
No. of impact on plate 7
Thickness at impact 6.13
OBLIQUITY 0°
Impact dimensions 9" X 9"
PENETRATION COMPLETE
Flaking front 0
Flaking back 0
Dist. from top, bottom 77"
Dist. from right, left 742"
Dist. from nearest impact 15"
Dish 0
Spur 2"
Cracks - Bridge 0
Button (Thrown) ~~Started~~
Through Opening 1" X 2"

Caliber 6"
Maker MIDVALE
Type A. P.
Lot No. 139 Year of Specification 1943
Mark 35 Mod. 5 No. M142314
Date received -
~~Capped or uncapped~~
~~Weight (capped)~~
Weight (uncapped) 101.72#
Length (uncapped) 15.17
Fuze XR-51A INERT #9-1137 STEEL
Filler VERMILIONITE
Flight by screen
Condition after firing:
~~EFFECTIVE or INEFFECTIVE~~
BASE PLUG THREADS
SHEARED - FUZE MISSING
FUZE BODY THREADS SHEARED



BALLISTIC DATA

Notes	1	2	3	4	5	6
Altitude (ft) at time of firing						
Distance (ft) to target						
Time of flight (sec)						
Velocity (ft/sec) at impact						
Direction of wind (ft/sec)						
Direction of current (ft/sec)						
Remarks						

LIEBK

2:150

REMARKS

Impact Record #11

-11

-11

-11

-11

F. W. PROCTOR, JR.

CHD-F. W. PROCTOR, JR.

CONFIDENTIAL
Security Information

File No.

Butt Firing

U. S. Naval Proving Ground

Dahlgren, Va. 8.31-51 191

Impact No. 39222

Impact Date 8.31-51

Butt No. 7

OBJECT 6" 57000 BORE GUN TEST OF XR-51A INERT
ROCKET FUSES VS. 6" CL. B ARMOR AT 0° OBL.

REFERENCE ~~NOT~~ LETTER NP/NOL/XI-1(850) DF:GDB 01347 DATED 28 July 1951

NPB Ref 270901 PLATE

PROJECTILE

Gauge 6.0
Class 6"
Maker CARNEGIE
No. TT277 Group PROJ. TEST
Contract NORD-5282
Date received 30 AUG. 1944
Dimensions 120" X 300"
No. of impact on plate 8
Thickness at impact 6.00
OBLIQUITY 0°
Impact dimensions 9" X 9"
PENETRATION COMPLETE
Flaking front 0
Flaking back 0
Dist. from top, bottom 47"
Dist. from right, left 142"
Dist. from nearest impact 15"
Dish 0
Spur 3"
Cracks - Bulge 0
Button (Thrown) (Started)
Through Opening 7 1/2" X 8"

Caliber 6"
Maker MIDVALE
Type A.P.
Lot No. 139 Year of Specification 1943
Mark 35 Mod. 5 No. NND-38
Date received -
Capped or uncapped -
Weight - trapped -
Weight (uncapped) 101.46 #
Length (uncapped) 15.17
Fuze XR-51A INERT #10-1132 steel
Filler VERTICILLITE
Flight by screen -
Condition after firing:
~~EFFECTIVE~~ INEFFECTIVE
BASE PLUG AND FUZE
THREADS SHEARED -
FUZE RECOVERED SEPARATELY
IN GOOD CONDITION



BALLISTIC DATA

NOTE:	1- Desired	2- Oscillograph	3- Chronograph	4- Limit, estimated for this thickness of impact	5- Actual, adjusted to correct gauge	6- Limit, for nominal gauge, based on the impact only. (Adjusted from column 4)	7- Limit, for nominal gauge established from column 6 and previous impacts
All limits are for this plate and this obliquity only.		MEAN					
Striking velocity (f.s.)		2753					

REMARKS

Limit shots only

e/d

F(e/d, e)

N.P.G. Photo. No NP7-46056 THRU 46060

Acceptance or Rejection recommended

Impact Record #12 F.W. Kasdorf
F.W. Kasdorf, Jr.

ORD. ENG. 65.12.11 Navy

CONFIDENTIAL

Security Information

6041 675 MK 16 MSEP 0 #1198

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 19254

IMPACT DATE 9-18-51

NPG TEST NO. 11382

SUBJECT IMPACT TEST OF XR-51A ROCKET FUZES
(4140 STEEL BODIES) HAVING LIVE PRIMER, DELAY & DETONATOR
Reference: ~~NR~~ NOLtr. NP(NOL)X1-1(850) OF GUG 01347 dated 28 July 1951
Reference: ~~BuOrd~~ OPG Rpt. 710.971 dated 4 August 1951
Task Assignment No. NPG-R-26-11-1-52

PLATE TARGET

Size 2.0 Class STS
Maker -
No. - Group -
Dimensions 9 1/2" x 2 1/2"
Obliquity 30°

PENETRATION COMPLETE
Thickness at impact 1.47
No. of impact on plate -
Dist. from nearest impact 26"
Dist. from near edges 7.61" and 7.54"
Impact area 6" x 7"
Spall: Front 0 Back 0
Dish 1/4" Spur 3
Cracks 0
Punching (thrown) (started) -
Back Bulge (thrown) (started) -
Bulge 0
Through opening 5" x 5 1/2"

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No. - Wt. 47.61
Maker SCA
Lot No. 38
Filler: Type VERM. Wt. -
Fuzes XR-51A FROM NOL #17
- 4140 STEEL BODIES

Boosters -
Wt. of head (as fired) 47.61#

MOTOR: Cal. 5" Mk. 10 Mod 4
Motor temp. 120° Wt. 88.00#

COMPLETE ROUND: Mark - Mod -
Wt. (as fired) 135.61#
Wt. (burned) -

OTHER INFORMATION MOTORS (2)
ALN: RTI DA-312-H-50
GRAIN: MK18-0
LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight - Velocity, f/s: MEAN 1675 Residual -
Fuze functioning -
Explosive action (High Order) (Low Order) (None) -
Distance of burst behind plate -
Condition of recovered round -
Head was in (EFFECTIVE) (INEFFECTIVE) -

REMARKS: -

Photo No. - F.U. PROTEST, SA
CR. 116, CS-12

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIAIMPACT NO. 39255IMPACT DATE 9-18-51NPG TEST NO. 11382

OBJECT IMPACT TEST OF XR-51A Rocket Fuzes
(4140 STEEL MODELS) HAVING TIME PRIMER, DELAY & DETONATOR
 Reference: ~~NSG~~ NOLtr. NP/NOL/KI-10850 DE: GDB 01347 dated 28 July 1951
 Reference: ~~PuOrd~~ tr. NPB R-1000-1-1-52 dated 9/1
 Task Assignment No. NPG-R-26-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 2.0 Class STS
 Maker -
 No. - Group -
 Dimensions 96" X 352"

OBLIQUITY 30°

PENETRATION COMPLETE
 Thickness at impact 1.97
 No. of impact on plate -
 Dist. from nearest impact 19"
 Dist. from near edges 1.39" and 1.51"
 Impact area 6" X 7"
 Spall: Front 0 Back 0
 Dish 1/4" Spur 2"
 Cracks 0
 Punching (thrown) (started)
 Back Button (thrown) (started)
 Bulge 0
 Through opening 5" X 5-3/4"

ROCKET

HEAD: Cal. 5" Type SEMI-AI
 Mark 2 Mod 2 No. - Wt. 47.70
 Maker CSCA
 Lot No. 38
 Filler: Type VERM. Wt. -
 Fuzes XR-51A FROM NOL #18
- 4142 STEEL BODY
 Boosters -
 Wt. of head (as fired) 47.70

MOTOR: Cal. 5" Mk. 10 Mod 4
 Motor temp. 120° Wt. 89.30

COMPLETE ROUND: Mark - Mod -
 Wt. (as fired) 137.00
 Wt. (burned) -

OTHER INFORMATION MOTORS (2) GRAIN
ALN: B-1100-317-H-50
" " - 315-H-50
 LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight DIAGN Velocity, f/s: Striking 1723 Residual -
 Fuze functioning -
 Explosive action (High Order) (Low Order) (None)
 Distance of burst behind plate -
 Condition of recovered round -
 Head was in (EFFECTIVE) (INEFFECTIVE) condition

REMARKS: -Photo No. - Signed E. U. KASDORF, JR.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIAIMPACT NO. 37286IMPACT DATE 9-26-51NPG TEST NO. Coda 11369

OBJECT SENSITIVITY TEST OF XR-51A FUZES
IN 5" ROCKET HEADS MK 2 SMOKE PUFF LEADED
 Reference: ~~EPD~~ No. 1 tr. NP/NoL/XI-1(850)DF:GDB 0347 dated 28 July 1951
 Reference: ~~EPD~~ No. 1 tr. NP/NoL/XI-1(850)DF:GDB 0347 dated 28 July 1951
 Task Assignment No. NPG-Re 26-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 1/8" Class M. S.
 Maker _____
 No. _____ Group _____
 Dimensions _____

OBLIQUITY 0°

PENETRATION

Thickness at impact _____
 No. of impact on plate _____
 Dist. from nearest impact _____
 Dist. from near edges _____ and _____
 Impact area _____
 Spall: Front _____ Back _____
 Dish _____ Spur _____
 Cracks _____
 Punching (thrown) (started) _____
 Back Button (thrown) (started) _____
 Bulge _____
 Through opening _____

ROCKET

HEAD: Cal. 5" Type SEM-1-AP
 Mark 2 Mod 2 No 5076 Wt. 45.25 #
 Maker CS Cal.
 Lot No. 38
 Filler: Type B. P. R. Wt. 1.0 #
 Fuzes XR-51A FROM NDL #13
SMOKE PUFF LEADED
 Boosters _____
 Wt. of head (as fired) 46.25 #

MOTOR: Cal. 5" Mk. 2 Mod 3
 Motor temp. 120° Wt. 28.65

COMPLETE ROUND: Mark _____ Mod _____
 Wt. (as fired) 134.30 #
 Wt. (burned) _____

OTHER INFORMATION MOTORS (2)
GRAIN - MK 12-0
BLK: RTMDA-226-H-45
 LAUNCHER 1450' B. LAUNCHER

ROCKET PERFORMANCE

Flight _____ Velocity, f/s: MEAN 1759 Residual _____
 Fuze functioning _____
 Explosive action (High Order) (Low Order) (None) _____
 Distance of burst behind plate _____
 Condition of recovered round _____

Head was in (EFFECTIVE) (INEFFECTIVE) condition.

REMARKS: Fuze led to function

Photo No. _____

Signed F. W. RASDORF, Jr.
C. D. ETC. 65-12

Impact Record #15
 CONFIDENTIAL
 Security Information

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39287

IMPACT DATE 7-26-51

NPG TEST NO. 11369

OBJECT SENSITIVITY TEST OF XR 51A FUZES IN 5"

ROCKET HEAD 10K 2 STUCKE FUZE LOADED

Reference: ~~NPG 1001~~ ltr. NP/101/XI 11850 DE: 000 01347 dated 28 July 1951

Reference: ~~Round ltr.~~ 2557-1001 dated 4 August 1951

Task Assignment No. NPB-Rc26-11-152 dated 4 August 1951

PLATE TARGET

Gage 1/4" Class M.S.
Maker _____
No. _____ Group _____
Dimensions _____

OBLIQUITY 0° **NO MEASUREMENTS**

PENETRATION

Thickness at impact _____
No. of impact on plate _____
Dist. from nearest impact _____
Dist. from near edges _____ and _____
Impact area _____
Spall: Front _____ Back _____
Dish _____ Spur _____
Cracks _____
Punching (thrown) (started) _____
Back Button (thrown) (started) _____
Bulge _____
Through opening _____

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No 5075 Wt. 45.00 #
Maker C.S. Co.
Lot No. 88
Filler: Type R.P.D. Wt. 0.75 #
Fuzes XR-51A FROM NCL #14
STUCKE FUZE LOADED
Boosters _____
Wt. of head (as fired) 45.75 #

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 120° Wt. 87.80

COMPLETE ROUND: Mark _____ Mod _____
Wt. (as fired) 133.55 #
Wt. (burned) _____

OTHER INFORMATION MOTORS (2)
GRAIN - 10K 18-0
REG: R100A-226-H-45
LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight _____ Velocity, f/s: Striking _____ Residual _____
Pure functioning _____
Explosive action (High Order) (Low Order) (None) _____
Distance of burst behind plate _____
Condition of recovered round _____
Head was in (EFFECTIVE) (INEFFECTIVE) condition _____

REMARKS: _____

Photo N _____ Signed _____

70.111-1001, 51
11-10-51. 25-12

CONFIDENTIAL
Security Information

Impact Record #16

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIAIMPACT NO. 39288IMPACT DATE 9-26-51NPG TEST NO. CODE 11369

OBJECT SENSITIVITY TEST OF XR-51A FUZES IN 5"
ROCKET HEADS MK 2 SMOKE PUFF LOADED
 Reference: ~~BUORD~~ ltr. NP/NO4/KI-1 (850) DE: GDR 01347 dated 28 July 1951
 Reference: ~~BUORD~~ ltr. UPE 6-1-51 No 971 dated _____
 Task Assignment No. NPG-Be 26-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 1/8" Class MD.S.
 Maker _____
 No. _____ Group _____
 Dimensions _____

OBLIQUITY 30°

PENETRATION

Thickness at impact NO
 No. of impact on plate _____
 Dist. from nearest impact _____
 Dist. from near edges _____ and _____
 Impact area _____
 Spall: Front _____ Back _____
 Dish _____ Spur _____
 Cracks _____
 Punching (thrown) (started) _____
 Back Button (thrown) (started) _____
 Bulge _____
 Through opening _____

ROCKET

HEAD: Cal. 5" Type SEMI-AP
 Mark 2 Mod 2 No 5114 Wt. 47.25#
 Maker C.S. Co.
 Lot No. 38
 Filler: Type B.P.D. Wt. 1.0#
 Fuzes XR-51A FROM NCL #15
SMOKE PUFF LOADED
 Boosters _____
 Wt. of head (as fired) 48.25#

MOTOR: Cal. 5" Mk. 2 Mod 3
 Motor temp. 120° Wt. 89.80

COMPLETE ROUND: Mark _____ Mod _____
 Wt. (as fired) 138.05#
 Wt. (burned) _____

OTHER INFORMATION MOTOR 2(2)
GRAIN-MK 18-0
ALL: RMOR-226-H-45
 LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight _____ Velocity, f/s: MEAN 1720 Residual _____
 Fuze functioning _____
 Explosive action (High Order) (Low Order) (None) _____
 Distance of burst behind plate _____
 Condition of recovered round _____
 Head was in (EFFECTIVE) (INEFFECTIVE) condition _____

REMARKS: _____

Photo No. _____

Signed _____
F. W. FREDERICK, Jr.
CDL, ETC. ES-12

CONFIDENTIAL

Security Information

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39289

IMPACT DATE 9-26-51

NPG TEST NO. CODE 11369

OBJECT SENSITIVITY TEST OF XR-51A FUSES IN 5"

ROCKET HEADS MK 2 SMOKE PUFF LOADED

Reference: ~~NO~~ NO 11 1 (850) OF GDB 01347 dated 28 July 1951

Reference: ~~NO~~ NO 11 1 (850) OF GDB 01347 dated 28 July 1951

Task Assignment No. NPG-Res-11-152 dated 4 August 1951

PLATE TARGET

ROCKET

Gage 1/4 Class M.S.
Maker _____
No. _____ Group _____
Dimensions _____

OBLIQUITY 0°

PENETRATION

Thickness at impact NO
No. of impact on plate NO
Dist. from nearest impact NO
Dist. from near edges NO
Impact area NO
Spall: Front NO Back NO
Dish NO Spur NO
Cracks NO
Punching (thrown) (started) NO
Back Button (thrown) (started) NO
Bulge NO
Through opening NO

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No. 835 Wt. 47.05 #

Maker C.S. Co.

Lot No. 38

Filler: Type B.B. Wt. 1.0 #

Fuzes XR-51A FROM NOL #16

SMOKE PUFF LOADED

Boosters

Wt. of head (as fired) 48.05 #

MOTOR: Cal. 5" Mk. 2 Mod 3

Motor temp. 120° Wt. 87.80

COMPLETE ROUND: Mark _____ Mod _____

Wt. (as fired) 135.85 #

Wt. (burned) _____

OTHER INFORMATION MOTORS (2)

GRAIN - MK 15-C

ALN: RMDA-226-H-45

LAUNCHER

ROCKET PERFORMANCE

Flight _____ Velocity, f/s: MEAN 1641 Residual _____

Fuze functioning _____

Explosive action (High Order) (Low Order) (None) _____

Distance of burst behind plate _____

Condition of recovered round _____

Head was in (EFFECTIVE) (INEFFECTIVE) _____

REMARKS: _____

Photo No. _____

Signed _____

F.W. KASPER

26-11-152

CONFIDENTIAL
Security Information

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIAIMPACT NO. 39481IMPACT DATE 11-27-51NPG TEST NO. T-22224.16

OBJECT SENSITIVITY TEST LF XR-51A FUZES
IN 5" ROCKET HEADS MK 6 SMOKE PUFF LOADED
 Reference: ~~SPC~~ ltr. NP/NOL/XI-1(850) DE GDB 01347 dated 28 July 1951
 Reference: ~~BuOrd~~ ltr. 11-6-51-210-451 dated 28 July 1951
 Task Assignment No. NPG-Re26-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 1/4" Class M.S.
 Maker _____
 No. _____ Group _____
 Dimensions _____
 OBLIQUITY 0°

PENETRATION COMPLETE
 Thickness at impact _____
 No. of impact on plate _____
 Dist. from nearest impact _____
 Dist. from near edge _____ and _____
 Impact area _____
 Spall: Front _____ Back _____
 Dish _____ Spur _____
 Cracks NO MEASURE
 Punching (thrown) (started) _____
 Back Button (thrown) (started) _____
 Bulge _____
 Through opening _____

ROCKET

HEAD: Cal. 5" Type SEMI-AP
 Mark 6 Mod 1 No. _____ Wt. 49.55
 Maker R. M.
 Lot No. 12
 Filler: Type 8.100 Wt. 1.25*
 Fuzes 4 VERT.
XR-51A NOL #28

Boosters _____
 Wt. of head (as fired) 49.80*

MOTOR: Cal. 5" Mk. 2 Mod 3
 Motor temp. 120° Wt. 89.15*

COMPLETE ROUND: Mark _____ Mod _____
 Wt. (as fired) 138.95*
 Wt. (burned) _____

OTHER INFORMATION MOTORS (2)
ALN: R200A-794-HA-45
GRAB MK 18-C
 LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight _____ Velocity, f/s: MEAS. Striking 1869 Residual _____
 Fuse functioning NO SMOKE PUFF INDICATED
 Explosive action (High Order) (Low Order) (None) _____
 Distance of burst behind plate _____
 Condition of recovered round _____
 Head was in (EFFECTIVE) (INEFFECTIVE) condition.

REMARKS: _____

Photo No. _____ Signed _____

F. W. FASLER, JR.
CRD. ENG. 1-5-12

Impact Record # 19

CONFIDENTIAL
 Security Information

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39482

IMPACT DATE 11-27-51

NPG TEST NOT 2222-1.16

OBJECT SENSITIVITY TEST OF XR-51A FUZES IN 5"
ROCKET HEADS MK 6 SMOKE PUFF LOADED
Reference: ~~NPG~~ NOLtr. NP/NOL/XI-K850 DE: GDC 01347 dated 28 July 1951
Reference: ~~BuOrd~~ itr. TYPE 214 921 dated 7 August 1951
Task Assignment No. NPG-Re 26-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 1/4" Class M. S.
Maker _____
No. _____ Group _____
Dimensions _____
OBLIQUITY 0°
PENETRATION COMPLETE
Thickness at impact _____
No. of impact on plate NTS
Dist. from nearest impact _____
Dist. from near edge _____ and _____
Impact area _____
Spall: Front MEASURE Back _____
Dish _____ Spur _____
Cracks NO
Punching (thrown) (started) _____
Back Button (thrown) (started) _____
Bulge _____
Through opening _____

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 6 Mod 1 No. Wt. 48.85#
Maker B.W.
Lot No. 12
Filler: Type P.P.R. Wt. 1.25#
Fuzes VERA
NOL XR-51A #29
Boosters _____
Wt. of head (as fired) 50.10#
MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 120° Wt. 87.50#
COMPLETE ROUND: Mark _____ Mod _____
Wt. (as fired) 137.60#
Wt. (burned) _____
OTHER INFORMATION MOTORS (2)
ALN-RMDA-794-HA-45
GRAIN-10K. 18.0
LAUNCHER 1050 ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight _____ Velocity, f/s: MEAN 1716 Residual _____
Fuze functioning NO SMOKE PUFF INDICATED
Explosive action (High Order) (Low Order) (None) _____
Distance of burst behind plate _____
Condition of recovered round _____
Head was in (EFFECTIVE) (INEFFECTIVE) condition.

REMARKS: _____

Photo No. _____

Signed F.W. RASDORF, Lt
ORD. ENG. GS-12

Impact Record # 20

CONFIDENTIAL
Security Information

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIAIMPACT NO. 39483IMPACT DATE 11-27-51NPG TEST NO. 72222-1.16

OBJECT SENSITIVITY TEST OF XR-51A FUZES IN
5" ROCKET HEADS MK 6 SNAKE PUFF LOADED
 Reference: ~~NPG~~ NO 1 ltr. NP(NOL/XI-1(850) OF: GDB 01347 dated 28 July 1951
 Reference: ~~BuOrd~~ ltr. NP(NOL/XI-1(850) OF: GDB 01347 dated 28 July 1951
 Task Assignment No. NPA-Rc26-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 1/4" Class M.S.
 Maker _____
 No. _____ Group _____
 Dimensions _____

OBLIQUITY 0°PENETRATION COMPLETE

Thickness at impact _____
 No. of impact on plate _____
 Dist. from nearest impact _____
 Dist. from near edges _____ and _____
 Impact area _____
 Spall: Front NO Back _____
 Dish _____ Spur _____
 Cracks NO
 Punching (thrown) (started) _____
 Back Button (thrown) (started) _____
 Bulge _____
 Through opening _____

ROCKET

HEAD: Cal. 5" Type SEMI-AP
 Mark 6 Mod 1 No. Wt. 48.60#
 Maker B. M.
 Lot No. 12
 Filler: Type B. P. D. Wt. 1.25#
 Fuzes VERM.
NOL XR-51A #30
 Boosters _____
 Wt. of head (as fired) 49.85#

MOTOR: Cal. 5" Mk. 2 Mod 2
 Motor temp. 120° WT. 87.15#

COMPLETE ROUND: Mark _____ Mod _____
 Wt. (as fired) 136.00#
 Wt. (burned) _____

OTHER INFORMATION MOTORS (2)
ALN: AMDA-794-HA-45
GRAIN: INK 18-6
 LAUNCHER 1050 ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight _____ Velocity, f/s: 1906 Residual _____
 Fuze functioning FUZE FUNCTIONED ON WATER IMPACT - 300'
 Explosive action (High Order) (Low Order) (None) _____
 Distance of burst behind plate _____
 Condition of recovered round _____
 Head was in (EFFECTIVE) (INEFFECTIVE) condition.

REMARKS: _____

Photo No. _____

Signed F. W. RASBORG, JR.
C.R.D. FIVE 65-12

Impact Record # 21 CONFIDENTIAL
 Security Information

File No.

Butt Firing

U. S. Naval Proving Ground

Dahlgren, Va. 11-28-51 194

 IMPACT NO. 39485
 IMPACT DATE 11-28-51
 BUTT NO. 7

 OBJECT Heavy Impact Test of Inert Rocket Fuzes in Modified
 6" AP Projectiles Mk 35-5

 REFERENCE ~~NOL~~ LETTER NP/NO4/XI-10850 OF 608 01347 DATED 28 July 1951

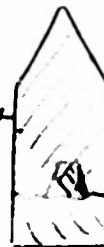
NPB Report no 991 PLATE

PROJECTILE

 Gauge 6"0
 Class B
 Maker Carnegie
 No. TT277 Group Proj. Test
 Contract Nord-5282
 Date received 30 August 1944
 Dimensions 120" x 300"
 No. of impact on plate 9
 Thickness at impact 6"13
 OBLIQUITY 0°
 Impact dimensions 11" x 11"
 PENETRATION Complete
 Flaking front 0
 Flaking back 0
 Dist. from top, ~~bottom~~ 61"
 Dist. from right, left 187"
 Dist. from nearest impact 23"
 Dish 0
 Spur 2"
 Cracks - Bulge 0
 Button (Thrown) (~~Scattered~~)
 Through Opening 6" x 6"

 Caliber 6"0
 Maker Midvale
 Type AP
 Lot No. 139 Year of Specification '43
 Mark 35 Mod. 5 No. PPL78
 Date received
 Capped or ~~uncapped~~
 Weight (capped) 131.07#
~~Weight (uncapped)~~
~~Length (uncapped)~~
 Fuze NOL XR51-A #19 4140 STEEL
 Filler Vermiculite
 Flight by screen
 Condition after firing:-

~~EFFECTIVE~~ or INEFFECTIVE

 Recovered - Body broken off
 at top of band score, but
 fuze left intact


BALLISTIC DATA

NOTE:	1- Desired	2- Oscillograph	3- Chronograph	4- Limit, estimated for this thickness of impact	5- Actual, adjusted to nominal gauge	6- Limit, for nominal gauge, based on this impact only (Adjusted from estimate 4)	7- Limit, for nominal gauge, established from previous impacts
All limits are for this plate and this obliquity only.		Mean					
Striking velocity (f.s.)		2384					

 REMARKS Fired with up and wind shield
 No evidence of band coming off
 Powder Charge - SPD 3452 wt 33.35 lbs.

Limit shots only

e/d

Frc/d. (S)

N P G Photo No

Acceptance or Rejection recommended

Impact Record # 22 F. W. Kusder, 1h

Ord. Eng. GS-12

XXXXXX

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Security Information

Guns: BTTS Gun Projectiles Mk 11-9 #1192

File No.

Butt Firing

U.S. Naval Proving Ground

Dahlgren, Va. 11-28-51 194

IMPACT No. 39486

IMPACT DATE 11-28-51

BUTT No. 7

OBJECT Heavy Impact Test of Inert Rocket Fuzes in Modified
6" AP Projectiles Mk 35-5

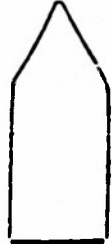
REFERENCE ^{NOL} LETTER NP/NOL/XI-1(150)DF:GOB 01347 DATED 28 July 1951

7. PG Report No. 971 PLATE

PROJECTILE

Gauge 5"0
Class B
Maker Carnegie
No. TT277 Group Proj. Test
Contract Nord-5282
Date received 30 August 1944
Dimensions 120" x 300"
No. of impact on plate 10
Thickness at impact 6"13
OBLIQUITY 0°
Impact dimensions 10" x 11"
PENETRATION Complete
Flaking front 0
Flaking back 0
Dist. from top, bottom 82"
Dist. from right, left 182"
Dist. from nearest impact 21"
Dish 0
Spur 2"
Cracks - Bulge 0
Button (Thrown) (Started)
Through Opening 5-3/4" x 6"

Caliber 6"0
Maker Midvale
Type AP
Lot No. 139 Year of Specification '43
Mark 35 Mod. 5 No. LR115
Date received
Capped or uncapped
Weight (capped) 131.14#
Weight (uncapped)
Length (uncapped)
Fuze NOL Inert #20 - 4140 STEEL
Filler Vermiculite
Flight by screen
Condition after firing:-
EFFECTIVE or INEFFECTIVE
Recovered



BALLISTIC DATA

NOTE	-1- Dev't	-2- Oscillograph	-3- Chronograph	-4- Limit, estimated for this thickness of impact.	-5- Actual adjusted to nominal gauge.	-6- Limit, for nominal gauge, based on this impact only. (Adjusted from column 4)	-7- Limit, for nominal gauge, established from column 6 and previous impacts.
All limits are for this plate and this obliquity only.		Mean					
Striking velocity (f.s.)		2448					

REMARKS

No evidence of band coming off

Powder Charge SPN 3452 - 33.8546

Limit shots only

e/d.

F(e/d, 0)

N.P.G. Photo. No.

Acceptance or Rejection recommended

F. W. Kasdorf, 1h

Ord. Eng. GS-12

U.S. Navy

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Security Information

Gun: 6"25 Smoothbore Mk. 10-0 #1198

File No.

Butt Firing

U.S. Naval Proving Ground

Dahlgren, Va. 11-28-51 194

IMPACT NO. 39487

IMPACT DATE 11-28-51

BUTT NO. 7

OBJECT Heavy Impact Test of Inert Rocket Fuzes in Modified
6" AP Projectiles Mk 35-5

REFERENCE ~~REF~~ ^{NOL} LETTER NP/NOL/XI-108)NF:GDB 01347 DATED 28 July 1951

NPB Report 305411 DATE

PROJECTILE

Gauge 670
Class B
Maker Carnegie
No. TT277 Group Proj. Test
Contract Nord-5282
Date received 30 August 1944
Dimensions 120" x 300"
No. of impact on plate 11
Thickness at impact 6.13
OBLIQUITY 0°
Impact dimensions 10" x 10"
PENETRATION Complete
Flaking front 0
Flaking back 0
Dist. from top, bottom x 44"
Dist. from right, left 183"
Dist. from nearest impact 17"
Dish 0
Spur 2"
Cracks - Bulge 0
Button (Thrown) (Started)
Through Opening 6" x 6"

Caliber 670
Maker Midvale
Type AP
Lot No. 139 Year of Specification '43
Mark 35 Mod. 5 No. LT328
Date received
Capped or uncapped
Weight (capped) 131.50#
~~Weight (uncapped)~~
~~Length (uncapped)~~
Fuze NOIS Ex-108 #1
Filler Vermiculite
Flight by screen
Condition after firing:-
EFFECTIVE or ~~INEFFECTIVE~~
- *Intact*
Recovered



BALLISTIC DATA

NOTE:	-1- Desired	-2- Oscillograph	-3- Chronograph	-4- Limit, estimated for the thickness of impact	-5- Actual, adjusted to nominal gauge	-6- Limit, for nominal gauge, based on this impact only (Adjusted from column 4)	-7- Limit, for nominal gauge, established from column 6 and previous impacts
All limits are for this plate and this obliquity only.		Mean					
Striking velocity (f.s.)		2233					

REMARKS

No evidence of band coming off

Limit shots only

e/d

F(e/d, e)

N.P.G. Photo No.

Acceptance or Rejection recommended

Impact Rec'd #24
F. W. Kusdorf, 1st
Ord. Eng. GS-12

CONFIDENTIAL
Security Information

XXXXXX

Gun: 6725 Smoothbore Mk 10-C #1198

File No.

Butt Firing

U. S. Naval Proving Ground

Dahlgren, Va. 11-28-51 194

IMPACT No. 39488

IMPACT DATE 11-28-51

BUTT No. 7

OBJECT Heavy Impact Test of Inert Rocket Fuzes in Modified
6" AP Projectiles Mk 35-5

REFERENCE ~~NOL~~ LETTER *NP/NOL/KI-11850* OF: *QDB 01347*DATED *28 July 1951*

71P Report no. 971 PLATE

PROJECTILE

Gauge 6"0
Class B
Maker Carnegie
No. TT277 Group Proj. Test
Contract Nord-5282
Date received 30 August 1944
Dimensions 120" x 300"
No. of impact on plate 12
Thickness at impact 6"13
OBLIQUITY 0°
Impact dimensions 9-1/2" x 10-1/2"
PENETRATION Complete
Flaking front 0
Flaking back 0
Dist. from top, ~~bottom~~ 50"
Dist. from ~~right~~, left 157"
Dist. from nearest impact 15"
Dish 0
Spur 2"
Cracks - Bulge 0
Button (Thrown)(*Started*)
Through Opening 6" x 6-1/4"

Caliber 6"0
Maker Midvale
Type AP
Lot No. 139 Year of Specification '43
Mark 35 Mod. 5 No. *MMU446*
Date received
Capped or ~~uncapped~~
Weight (capped) 130.63#
~~Weight (uncapped)~~
~~Length (uncapped)~~
Fuze NOL Ex-108 #2
Filler Vermiculite
Flight by screen
Condition after firing:-
EFFECTIVE or ~~INEFFECTIVE~~
Intact
Recovered



BALLISTIC DATA

NOTE:	-1- Desired	-2- Oscillograph	-3- Chronograph	-4- Limit, estimated for this thickness of impact.	-5- Actual, adjusted to nominal gauge.	-6- Limit, for nominal gauge, based on this impact only. (Adjusted from column 4)	-7- Limit, for nominal gauge, established from column 6 and previous impacts.
All limits are for this plate and this obliquity only.		Mean					
Striking velocity (f.s.)		None					

REMARKS

Fired with 2500 ft/sec. wind
No evidence of band coming off

Limit shots only

e/d.

F(e/d, e)

N.P.G. Photo. No.

Acceptance or Rejection recommended

F. W. Kasdorf, 1h

Ord. Eng. GS-12

Gun: 6"25 Smoothbore Mk 16-0 #1198

Security Information

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U.S. Navy

File No.

Butt Firing

U. S. Naval Proving Ground

Dahlgren, Va. 11-29-51 194

IMPACT NO. 39496

IMPACT DATE 11-29-51

BUTT NO. 7

OBJECT Heavy Impact Test of Inert Rocket Fuzes in Modified 6"

AP Projs. Mk 35-5

REFERENCE ~~NOL~~ LETTER NP/NOL/XI-1(150) DF: GDB 01347 DATED 28 July 1951

TYPE Report No. 977 PLATE

PROJECTILE

Gauge 4"0
 Class B
 Maker Carnegie
 No. TT205 Group Proj. Test
 Contract Nord-5282
 Date received 14 August 1944
 Dimensions 120" x 300"
 No. of impact on plate 10
 Thickness at impact 4"13
 OBLIQUITY 0°
 Impact dimensions 8" x 8"
 PENETRATION Complete
 Flaking front 0
 Flaking back 0
 Dist. from top, bottom 67"
 Dist. from right, left 187"
 Dist. from nearest impact 23"
 Dish 0
 Spur 4"
 Cracks - Bulge 0
 Button (Thrown) (Started)
 Through Opening 6-3/4" x 7"

Caliber 6"0
 Maker Midvale
 Type AP
 Lot No. 139 Year of Specification '43
 Mark 35 Mod. 5 No. JJP94
 Date received
 Capped or uncapped
 Weight (capped) 102.31#
 Weight (uncapped)
 Length (uncapped)
 Fuze NOL XR51A #21 - 4140 STEEL
 Filler Vermiculite
 Flight by screen
 Condition after firing:-
 EFFECTIVE or INEFFECTIVE
 - Rose shear off
 Recovered



BALLISTIC DATA

NOTE:	-1- Desired	-2- Oscillograph	-3- Chronograph	-4- Limit, estimated for this thickness of impact	-5- Actual, adjusted to nominal gauge.	-6- Limit for nominal gauge, based on this impact only (Adjusted from column 4)	-7- Limit, for nominal gauge, established from column 6 and previous impacts
All limits are for this plate and this obliquity only.		Mean					
Striking velocity (f.s.)		1918					

REMARKS

Copied. Windshield removed

Limit shots only

c/d

F(e/d, m)

N.P.G. Photo. No.

Gun: 6"25 Smoothbore Mk 16-0 #1198

Acceptance or Rejection recommended

F. W. Kasdorf, Jr.

Ord. Eng. GS-12

XXXXXX

CONFIDENTIAL
Security Information

File No.

Butt Firing

U.S. Naval Proving Ground

Dahlgren, Va. 11-29-51 ~~XXX~~

IMPACT No. 39497

IMPACT DATE 11-29-51

BUTT No. 7

OBJECT Heavy Impact Test of Inert Rocket Fuzes in Modified 6"

AP Projs. Mk 35-5

REFERENCE ~~REF.~~ ^{NOL} LETTER NP/NOL/XI-1(852) DE:GDB 01347 DATED 28 July 1951

PLATE

PROJECTILE

Gauge 4"0
 Class B
 Maker Carnegie
 No. TT205 Group Proj. Test
 Contract Nord-5282
 Date received 14 August 1944
 Dimensions 120" x 300"
 No. of impact on plate 11
 Thickness at impact 4"0
 OBLIQUITY 0°
 Impact dimensions 8" x 8"
 PENETRATION Complete
 Flaking front 0
 Flaking back 0
 Dist. from top, ~~bottom~~ 87"
 Dist. from ~~right~~, left 184"
 Dist. from nearest impact 20"
 Dish 0
 Spur 4"
 Cracks - Bulge 0
 Button (Thrown) ~~(Start)~~
 Through Opening 6-3/4" x 7"

Caliber 6"0
 Maker Midvale
 Type AP
 Lot No. 139 Year of Specification '43
 Mark 35 Mod. 5 No. MMT200
 Date received -
 Capped or uncapped
 Weight (capped) 102.15#
 Weight (uncapped)
 Length (uncapped)
 Fuze NOL XR-51A #22-41405 STEEL
 Filler Vermiculite
 Flight by screen
 Condition after firing:-
 EFFECTIVE or INEFFECTIVE
 - Rosecheur d'off
 Recovered



BALLISTIC DATA

NOTE:	-1- Desired	-2- Oscillograph	-3- Chronograph	-4- Limit, estimated for this thickness of impact.	-5- Actual, adjusted to nominal gauge.	-6- Limit, for nominal gauge, based on this impact only. (Adjusted from column 4)	-7- Limit, for nominal gauge, established from column 6 and previous impacts.
All limits are for this plate and this obliquity only.		Mean					
Striking velocity (f.s.)		1992					

REMARKS

Copied Windshield removed

Limit shots only

e/d

F(e/d, 0)

N.P.G. Photo. No.

Acceptance or Rejection recommended

F. W. Kasdorf
 F. W. Kasdorf / lh

Impact Record #27 Ord. Eng. G. S.-12 ~~CONFIDENTIAL~~

Can: 6425 Smoothbore Mk 16-0 #1198

Security Information

項目	単位	履修年次	履修学期	履修人数	履修率
基礎科目	1	1	1	100	100
専門科目	2	2	2	100	100
総合科目	3	3	3	100	100
選択科目	4	4	4	100	100
自由科目	5	5	5	100	100
合計	6	6	6	100	100



FIRING VIEW

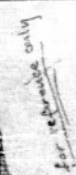


Fig. 1

100-51A
FUZE, BLIND-DETONATOR

GENERAL ARRANGEMENT

06218175

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SECURITY INFORMATION

31 August 1951

AP9-48605) heavy impact test of MR-51A fuze fired from 6.25 smooth bore gun in 6" AP modified projectile.
View: 6" AP projectile Mk 35 Mod 5 as modified for firing from 6.25 smooth bore gun, built up
with steel bands fore and aft windshield and cap removed. Note MR-51 fuze installed in base.

Figure 2



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5 September 1951

Figure 3

NP9-46058
Heavy plate test of XR-21A Rocket Fuze. Fuzes tested in modified 6" AP projectiles (minus cap and windshield) fired from 6" 25 smooth bore gun over 50 ft. range. View shows interior of shell and remains of fuze. (Over, please)



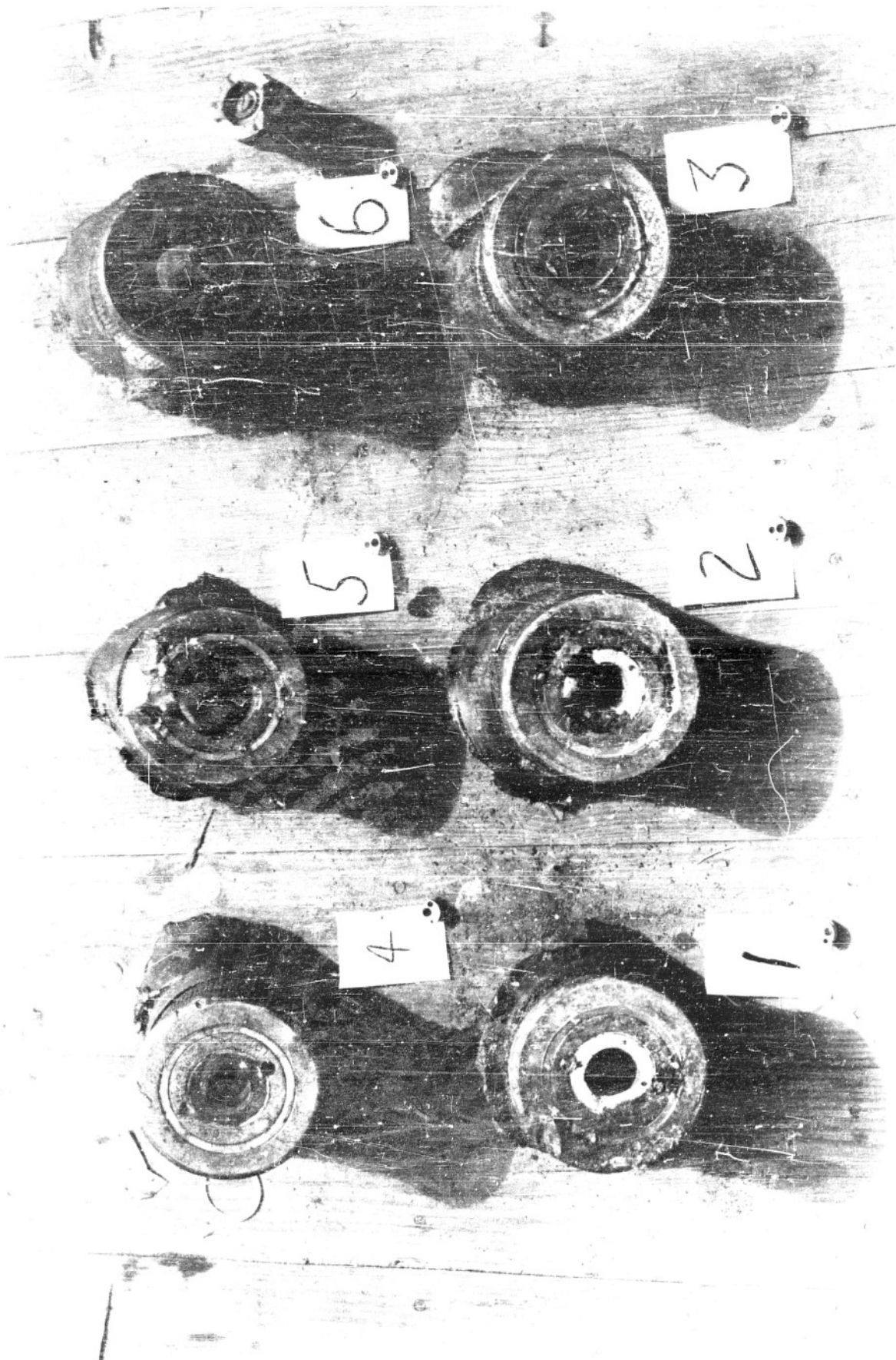
NP9-46059

Figure 4

5 September 1951

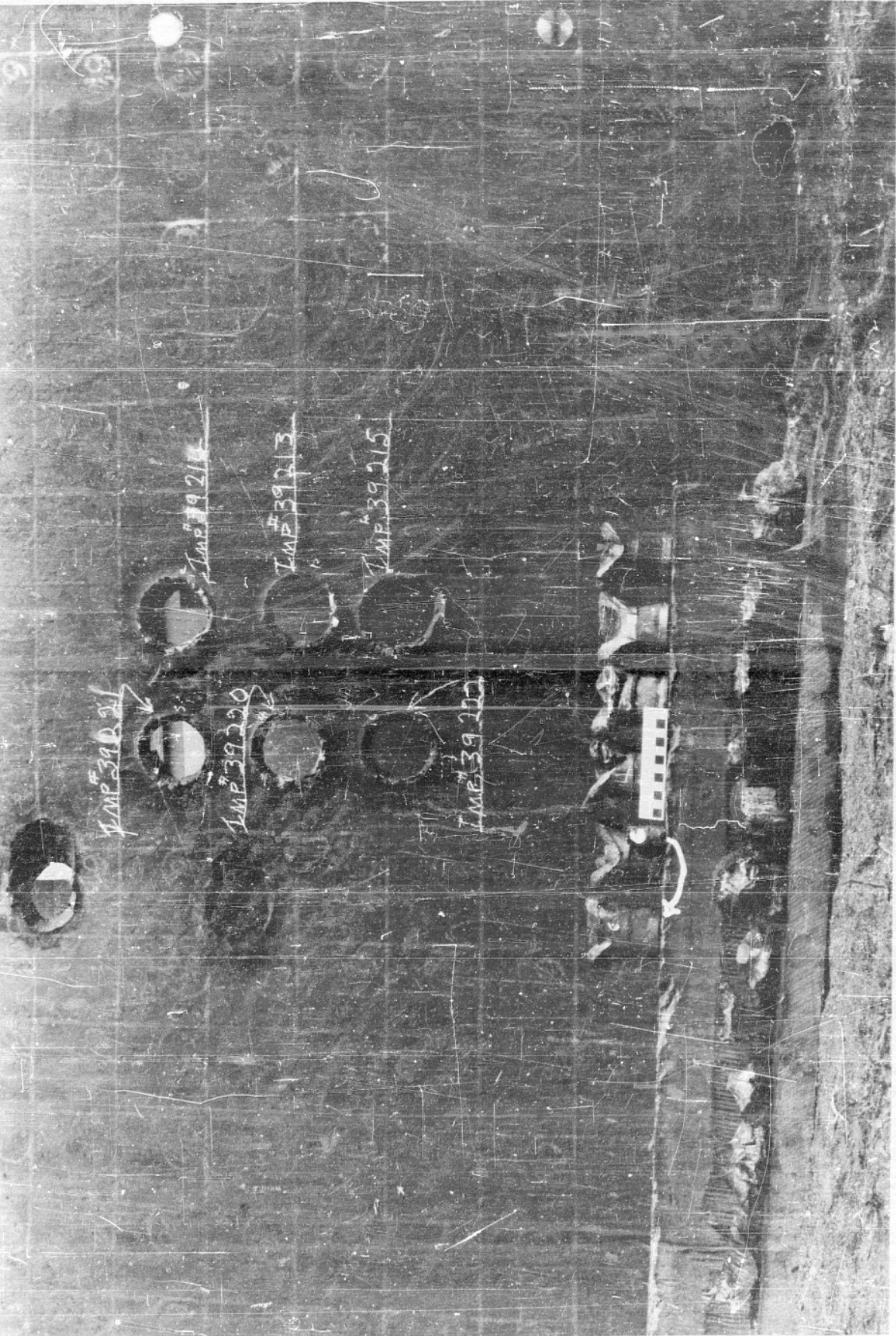
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Heavy plate test of XR-51A Rocket Fuze. Fuze tested in modified 6" AP projectiles (minus cap and windshield) fired from 6"25 smooth bore gun over 50 ft. range. View shows base end of projectiles and fuze recovered from round 6. (Over, please)



7

TP9-6057
11 August 1951
Fuzes tested in rocket
projectiles
11 August 1951
Fuzes tested in rocket
projectiles
11 August 1951
Fuzes tested in rocket
projectiles

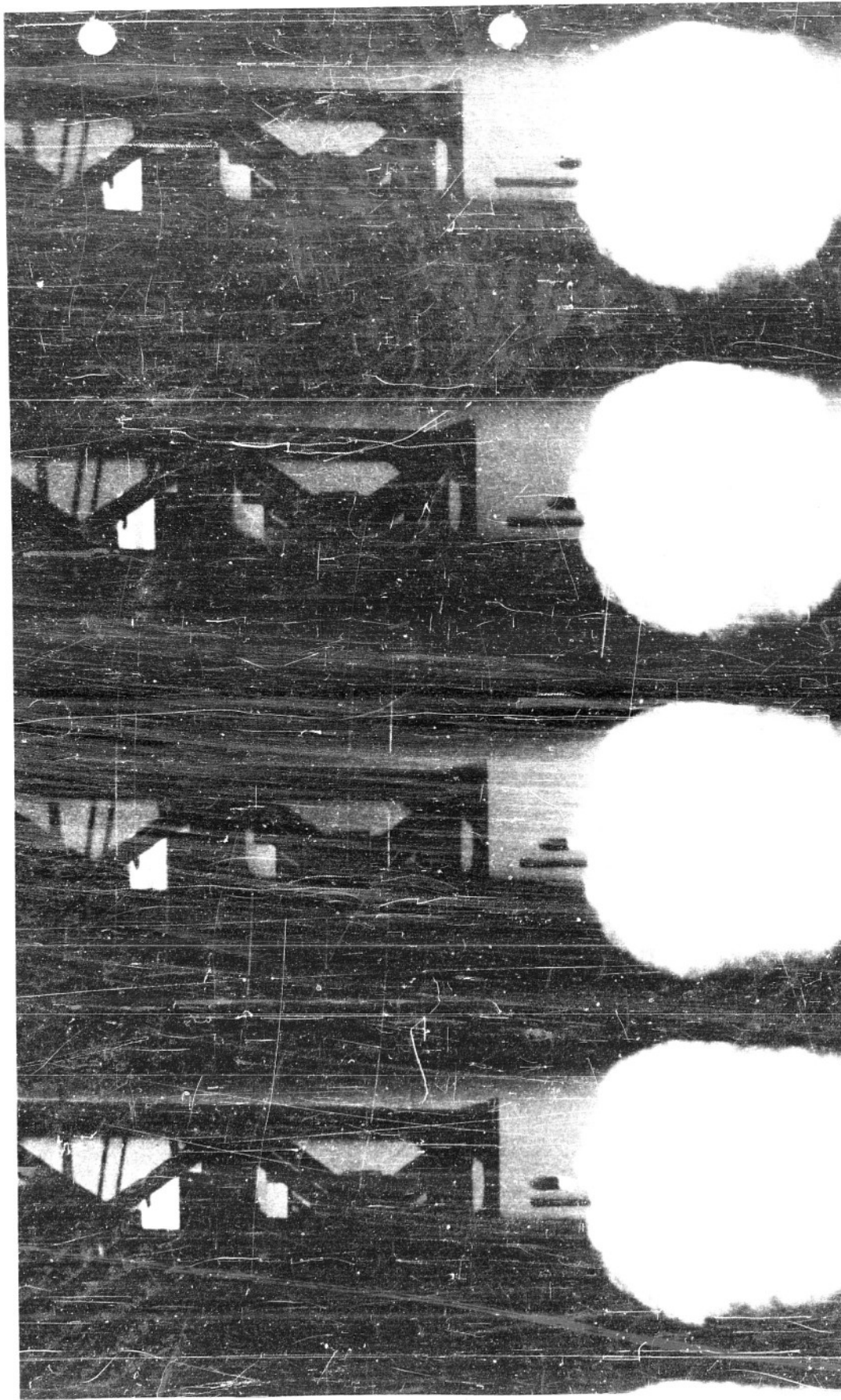


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SECURITY INFORMATION

Date Fired: 31 August 1951

NP9-48608 Heavy plate test of XR-51A rocket fuze. Fuzes tested in modified 6" AP projectiles (minus cap and windshield) fired from 6"25 smooth bore gun over 50 ft. range. View: Projectile in flight at 2800 ft/sec.

Figure 6



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SECURITY INFORMATION

Figure 7
Heavy impact test of XR-51-A and EX-108 fuzes in 6" AP (modified) projectile Mk 35 Mod 5.
Fired from 6425 smooth bore gun over 50 ft. range. View; Recovered Projectiles
(over, please)

WP-48604



NP9-48603

Figure 8

Heavy Impact Test of XR-51A and EX-108 fuzes in 6" AP (modified) projectiles Mk 35 Mod 5.
Fired from 6"25 smooth bore gun over 50 ft. range. View: Recovered projectiles
(over please)

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SECURITY INFORMATION

39487

39496

39497

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SECURITY INFORMATION

Figure 9

MP9-48542
Heavy Impact test of XR-51A and EX-108 fuzes in 6" AP modified projectiles with cap and
windshield fired from 6"25 smooth bore gun vs 6" Cl. B plate Tr-277. View: Face of plate
(over please)

IMP 39487

IMP 39488

IMP 39485

IMP 39486

NP9-48541

Figure 10

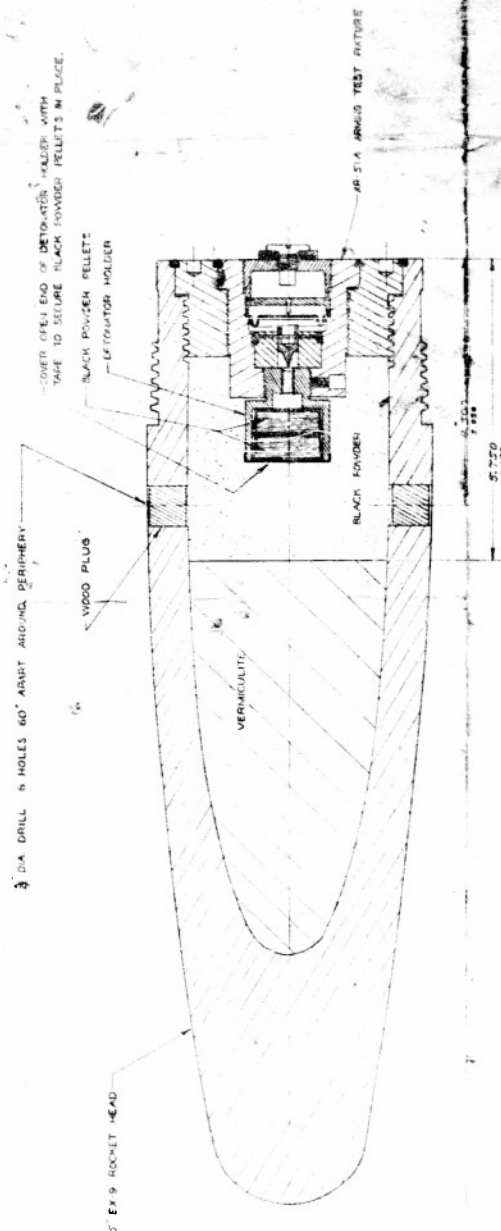
Heavy Impact Test of XR-51A fuzes in 6" AP modified projectiles (cap and windshield removed)
fired from 6"25 smooth bore gun vs 4" Cl. B plate TT-205. View: Face of plate
(over please)

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SECURITY INFORMATION



NP9-48607

FOR REFERENCE ONLY



LOADING DETAILS FOR BLACK POWDER

1. SCREW IN-51 ARMS TEST FUTURE INTO PLACE AND GAS CHECK.
2. PLUG 8 HOLES WITH WOOD PLUGS.
3. FILL CAVITY WITH FINE BLACK POWDER THROUGH 6th HOLE.
4. CLEAN TRACES OF BLACK POWDER FROM HOLE.
5. PLUG HOLE (WOOD PLUG).

RELEASED

FOR REFERENCE ONLY

RELEASED
FOR REFERENCE ONLY

3-5-71

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Security Control

CLASSIFIED

EXCLUDED FROM AUTOMATIC DOWNGRADING AND DECLASSIFICATION

EXCLUDED FROM AUTOMATIC DOWNGRADING AND DECLASSIFICATION

EXCLUDED FROM AUTOMATIC DOWNGRADING AND DECLASSIFICATION

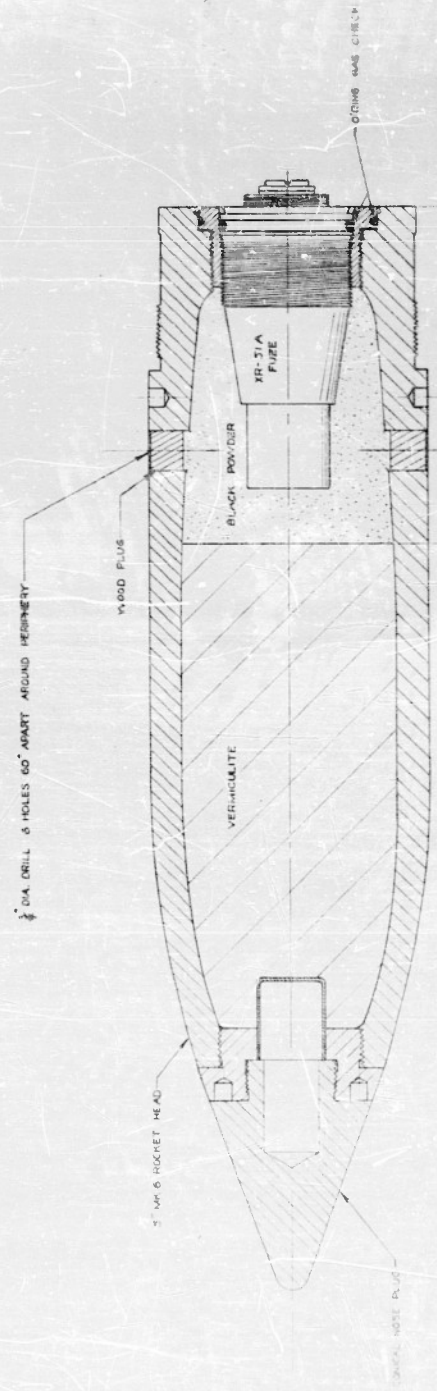
EXCLUDED FROM AUTOMATIC DOWNGRADING AND DECLASSIFICATION

311378

MP-46488

REV	DATE	BY	CHK
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

8-13-50
FOR REUSE ONLY



LOADING DETAILS FOR BLACK POWDER

1. SCREW PLUG INTO PLACE.
2. PLUS 3 HOLES WITH WOOD PLUGS.
3. FILL Cavity WITH TYPE BLACK POWDER THROUGH 6" HOLE.
4. CLEAN TRACES OF BLACK POWDER FROM HOLE.
5. PLUS HOLE (WOOD PLUG).

Figure 12

Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108;
Development of

DISTRIBUTION

Bureau of Ordnance:

Ad3	1
Re2	1
Re2b	1
Re3e	1
Chief of Ordnance, Department of the Army Attn: ORDTX-AR	2
Commanding General, Aberdeen Proving Ground Aberdeen, Maryland Attn: Technical Information Section Development and Proof Services	1
Commander, Operational Development Force, U. S. Atlantic Fleet, U. S. Naval Base, Norfolk 11, Virginia	1
Navy Research Section, Library of Congress, Washington 25, D. C. (Via BUORD Re2)	2
Bureau of Aeronautics Attn: Armament Section	2
NATC, Patuxent River, Maryland	3
Naval Liaison Officer USAPPGC, Eglin Field, Florida	1
Naval Air Development Center Johnsville, Pennsylvania	1
U. S. Air Force AMC Engineering Field Office Room 1833, Main Navy Building Navy Department, Washington, D. C.	2
Commander, Naval Ordnance Laboratory (DP)	3

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SPG 1

Aircraft Rocket Fuels, IR-51A, IR-69, and 1
Development of

DISTRIBUTION (Continued)

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Picatinny Arsenal, Dover, New Jersey

Commanding General
Air Material Armament Test Center
Eglin Air Force Base, Florida

NOTS, Inyokern, China Lake, California

NOTS, Inyokern, China Lake, California

Attn: Explosives Department

Attn: Aviation Ordnance and Test Department

Local:

OT

OTL

OV

File

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