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U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

REPORT NO. 1060

RESEARCH, DEVELOPMENT, AND TESTS OF
AIRCRAFT ROCKET FUZE SYSTEMS

22nd Partial Report

EXPERIMENTAL BALLISTIC TEST OF
MODIFIED MK 149 NOSE FUZE

FINAL Report

Task

Assignment NPG-Re2b-11-1-52

Copy No. 24

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NPG REPORT NO. 1060

Experimental Ballistic Test of Modified Mk 149 Nose Fuze

PART A

SYNOPSIS

1. Inasmuch as the Mk 149 rocket nose fuze in present service use has consistently failed the 25 ft. acceptance drop test, Swank, Inc., manufacturer of the fuze under contract from the Navy, proposed a modification which they felt would correct this failure and make the fuze safer to handle. Samples of the fuze were submitted to the Naval Proving Ground for ballistic evaluation.

2. a. This test was conducted to determine the operability of the modified fuze under the following conditions:

<u>Part</u>	<u>Desired Velocity</u>	<u>Target</u>	<u>Obliquity</u>
1	1800 ft./sec.	1/8" mild steel	0°
2	1800 ft./sec.	1/8" mild steel	Maximum for consistent operation
3	1800 ft./sec.	240 or greater homogeneous armor plate	Maximum for consistent operation

3. It is concluded that:

a. The modified Mk 149 nose fuze will function consistently in a 5"0 rocket head Mk 6 upon 1/8" MS at 0° obliquity.

b. The fuze will function consistently in a 5"0 rocket head Mk 6 upon 1/8" MS at obliquities up to and including 75°.

c. The fuze as modified will function upon 3"50 Class B armor in Mk 25 shaped charge heads up to obliquities of 70°. However, 70° seems to be the critical angle and functioning at this angle cannot be considered as consistent.

d. The modified fuze compares favorably ballistically in all respects with the present Mk 149 fuze. In addition, the Naval Ordnance Laboratory reports it will successfully pass the 25 ft. drop test.

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PART B

INTRODUCTION

1. AUTHORITY:

This test was authorized by reference (a) and conducted under Task Assignment NPG-Re2b-11-1-52.

2. REFERENCES:

- a. NOL Spdltr DP:HSW:d1g NP/NOL/X1-1(2628) Ser 3438 of 6 June 1952
- b. NPG Work Request from NOL 8003-A of 12 June 1952
- c. NPG Work Request from NOL 8003-B of 16 July 1952
- d. NOL Spdltr TF:CLP:gbt NP/NOL/X1-1(2852) Ser 4194 of 15 July 1952

3. BACKGROUND:

Inasmuch as the Mk 149 rocket nose fuze in present service use has consistently failed the 25 ft. acceptance drop test, Swank, Inc., manufacturer of the fuze under contract from the Navy, proposed a modification which they felt would correct this failure and make the fuze safer to handle. Samples of the fuze were submitted to the Naval Proving Ground for ballistic evaluation.

4. OBJECT OF TEST:

- a. This test was conducted to determine the operability of the modified fuze under the following conditions:

<u>Part</u>	<u>Desired Velocity</u>	<u>Target</u>	<u>Obliquity</u>
1	1800 ft./sec.	1/8" mild steel	0°
2	1800 ft./sec.	1/8" mild steel	Maximum for consistent operation
3	1800 ft./sec.	2"0 or greater homogeneous armor plate	Maximum for consistent operation

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Experimental Ballistic Test of Modified Mk 149 Nose Fuze

5. PERIOD OF TEST:

a. Date Project Letter	6 June 1952
b. Dates Necessary Material Received	18 June 1952
	22 July 1952
c. Date Commenced Test	23 June 1952
d. Test Completed	21 August 1952

6. REPRESENTATIVES PRESENT:

Mr. C. L. Pettingill
Mr. L. J. Shkolnik

Naval Ordnance Laboratory
Naval Ordnance Laboratory

PART C

DETAILS OF TEST

7. DESCRIPTION OF ITEM UNDER TEST:

a. The Mk 149 nose fuze was developed for use with various fin-stabilized aircraft rockets. It is a point detonating, air-arming fuze.

b. Arming is accomplished by a combination of air stream and acceleration forces acting as the rocket is launched. Figure 1 shows the general arrangement of the fuze. Acceleration retracts the setback block, releasing the firing pin propeller assembly. The propeller, acted on by the air stream, screws the firing pin out until the shutter is released. The shutter is then rotated into the armed position by the shutter spring. It is locked by a detent in such a position that the detonator in the shutter is in line with the firing pin and the lead-in to the booster.

c. The modification to the fuze consists of a redesign in the firing pin. As manufactured by Swank, Inc. of Attleboro, Mass., it is now a two piece pin with the forward section hollowed out. The diameter of the pin has been slightly increased and the firing pin guide has been changed correspondingly (see Figure 2). The shoulder on the firing pin has been altered so that slippage past the shutter has been prevented. This modification is intended to weaken the firing pin to a point where it will collapse on a drop of 25 ft. or more instead of driving through into the booster.

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Experimental Ballistic Test of Modified Mk 149 Nose Fuze

8. DESCRIPTION OF TEST EQUIPMENT:

Launcher: NPG 1050 ft.
Propulsion: 5"0 HVAR Mk 10 Mod 5 rocket motors
Camera: 35mm Mitchell
Velocity: Potter Chronograph and Oscillograph

9. PROCEDURE:

a. Part I of this test consisted of firing rounds against 1/8" mild steel plate at 0° obliquity. The fuzes were assembled in 5"0 rocket heads Mk 6 Mod 1 TNT loaded. Propulsion in all phases of the test was accomplished by two 5"0 HVAR motors in tandem, to obtain a desired velocity of 1800 ft./sec.

b. Part II of this test was conducted against 1/8" mild steel plate at obliquities ranging from 45° to 75° to determine the maximum for consistent operability. Owing to a premature detonation on the 2nd round, smoke-puff loaded heads (250-300 grams, black powder) replaced the TNT loaded heads as requested by reference (d). Reference (c), which requested the use of smoke-puff loaded heads instead of HE loaded heads, superseded reference (b) at this time. A 35mm Mitchell camera was used to record the fuze action upon impact. At the time of the premature detonation, it was believed that the cause might have been a shearing of the pin joining the two sections of the firing pin. An air jet test, as requested in reference (c), was therefore performed on four fuzes to determine the ability of this assembly pin to withstand the shearing forces which occur at the end of the firing pins forward travel. This test consisted of securing the inert rounds, containing modified, inert Mk 149 fuzes, to a table immediately in front of the Naval Proving Ground air jet. When the air jet had reached its maximum velocity (500 M.P.H.), the arming wire was removed by the use of a lanyard. When the propeller ceased to spin, indicating the end of the firing pin screw-out, the air jet was turned off.

c. Part III of the test consisted of firing modified fuzes in 5"0 shaped charge heads Mk 25 against 3"50 Class B armor to determine the maximum obliquity for consistent operation against thick armor targets. The heads were TNT loaded.

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Experimental Ballistic Test of Modified Mk 149 Nose Fuze

10. RESULTS:

a. The results are summarized below:

PART I

<u>No. Rds.</u>	<u>Striking Velocity</u>	<u>Target</u>	<u>Obl.</u>	<u>Results</u>
4	1800	1/8" MS	0°	4 HO

PART II

2	1800	1/8" MS	50°	1 HO, 1 Dud
1	1800	1/4" MS	50°	1 Dud
1	1300	1/8" MS	50°	1 HO
1	1300	1/8" MS	55°	1 HO
2	1800	1/8" MS	60°	1 HO on launcher, 1 Dud
1	1300	1/8" MS	60°	1 HO
1	1300	1/8" MS	65°	1 HO
1	1300	1/8" MS	70°	1 HO
1	1800	1/8" MS	70°	1 HO
6	1800	1/8" MS	75°	5 HO, 1 Missed Target
3	1800	1/4" MS	75°	3 HO
2	1800	3/8" MS	75°	2 HO

PART III

1	1800	3-7/16" Class B	55°	HO
2	1800	3-3/8" Class B	65°	2 HO
6	1800	3-7/16" Class B	70°	3 HO, 2 Duds, 1 LO
1	1800	3-7/16" Class B	75°	1 Dud

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Experimental Ballistic Test of Modified Mk 149 Nose Fuze

b. On round 2 of Part II, there was a premature detonation which damaged the launcher (Figure 3). It was believed at the time that this may have been caused by a shearing of the pin joining the two sections of the firing pin thus allowing the lower part of the pin to slide into the detonator. However, after the premature detonation of the smoke-puff loaded head on round 18, the remnants of a bird were found at the scene indicating that perhaps the trouble occurred as a result of the round striking such an obstacle on the rails. On round 20 a dead catbird (*Dumetella carolinensis*) weighing 1.1 oz. was secured at the launcher muzzle so that the firing pin of the nose fuze would strike it (Figure 4). The fuze detonated upon impact with the bird confirming suspicions and relieving the fuze of responsibility for the premature detonations. The test was temporarily delayed until an alarm system could be installed on the launcher to drive off the birds to prevent further fuze action on the launcher.

c. Rounds 3 through 11 of Part II did not have the acceleration setback pin in the fuzes removed. It was found that in using two motors for propulsion the head motor was still accelerating at the target, thus preventing the fuze from arming. This condition was corrected by using a single motor on rounds 6 through 11 so that acceleration was completed prior to target impact.

d. No impacts above 75° obliquity were attempted because of the poor striking accuracy at these high angles.

e. Figure 5 is a typical view of fuze detonation after impact with 3/8" MS plate at 75° obliquity.

f. The rounds that were duds on Part III deflagrated on the side wall of the putt.

g. On round 2 of Part III, a bulge 9" x 12" was produced on the back side of the plate approximately 13" behind the opening. Back spalling of the target plate occurred on rounds 3 and 6 (see Figures 6 through 9). This behavior is ascribed to the reflection and reinforcement of shock waves in the plate arising from the detonation of the rocket head in its proximity as in the case of the squash-head projectile. Figure 9 shows a sketch of the area in which spalling occurs, further indicating that consistent functioning can not be reasonably effected with this round at impact angles of 70° or greater because of the geometry of the nose.

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Experimental Ballistic Test of Modified Mk 149 Nose Fuze

PART D

CONCLUSIONS

11. It is concluded that:

a. The modified Mk 149 nose fuze will function consistently in a 540 rocket head Mk 6 upon 1/8" MS at 0° obliquity.

b. The fuze will function consistently in a 540 rocket head Mk 6 upon 1/8" MS at obliquities up to and including 75°.

c. The fuze as modified will function upon 3450 Class B armor in Mk 25 shaped charge heads up to obliquities of 70°. However, 70° seems to be the critical angle and functioning at this angle cannot be considered as consistent.

d. The modified fuze compares favorably ballistically in all respects with the present Mk 149 fuze. In addition, the Naval Ordnance Laboratory reports it will successfully pass the 25 ft. drop test.

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NPG REPORT NO. 1060

Experimental Ballistic Test of Modified Mk 149 Nose Fuze

The tests upon which this report is based were conducted by:

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NPG REPORT NO. 1060

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

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Twenty-Second Partial Report

on

**Research, Development, and Tests of
Aircraft Rocket Fuze Systems**

Final Report

on

**Experimental Ballistic Test of
Modified Mk 149 Nose Fuze**

**Project No.: NPG-Re2b-11-1-52
Copy No.: 24
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Date: DEC 3 1952

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IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 40093

IMPACT DATE 8-20-52

NPG TEST NO. 2222-1.25

OBJECT Functioning Test of Modified Mk. 149 Rocket Nose Fuze
in 570 Rocket Head Mk 25 vs Plate #BD277.

Reference: NPG NO. ltr. dated

Reference: ~~BUORD~~ ltr. NPG Spdltr. D:RSA:dlt. 42/NOL/XI-1 dated 6 June 1952

Task Assignment No. NPG-4628-11-1-950 dated

NPG Report No. 1060

PLATE TARGET

ROCKET

Gage 375 Class B
Maker Carnegie
No. BD277 Group -
Dimensions 12 1/2" X 4 1/4"

OBLIQUITY 55°

PENETRATION Complete

Thickness at impact 375

No. of impact on plate 4

Dist. from nearest impact 0

Dist. from near edges 7 1/2" and 8 1/2"

Impact area 2-1/2" X 1"

Spall: Front 0 Back 4" X 4-3/4"

Dish 0 Spur 1"

Cracks 0

Punching (thrown) (started)

Back Button (thrown) (started)

Bulge 0

Through opening 2-3/4" X 3"

HEAD: Cal. 5" Type Shaped Charge

Mark 25 Mod 1 No. - Wt. 51.35#

Maker Houdaille Corp.

Lot No. RHCZ-7-HA-52

Filler: Type 88 Comp. B. 16#

Fuzes Mk. 149 No. 23

Boosters 1

Wt. of head (as fired) 51.35#

MOTOR: Cal. 5" Mk. 10 Mod 5

Motor temp. 86° Wt. 89.30#

COMPLETE ROUND: Mark - Mod -

Wt. (as fired) 140.65#

Wt. (burned)

OTHER INFORMATION

ALN: WMDA-267-S-51

LAUNCHER 1050ft. Rocket Launcher

ROCKET PERFORMANCE

Mean

Flight Velocity, f/s: Striking 1732 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. NPG-57102

Signed F.W. Kasdorf

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F.W. Kasdorf
ORD. ENG.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIAIMPACT NO. 40094IMPACT DATE 8-20-52NPG TEST NO. T-2222-1.25OBJECT Functioning Test of Modified Mk. 149 Rocket Nose Fuze
in 570 Rocket Head Mk. 25 vs Plate #BD277.Reference: NPG ltr DP-100-1-1 (2-22-52) 5-1 dated
Reference: Bureau ltr. 3430 dated 6 June 1952
Task Assignment No. NPG-826-11-1-52 dated NPG Report No. 1060

PLATE TARGET

Gage 375 Class B
Maker Carnegie
No. BD277 Group -
Dimensions 124" X 406"OBLIQUITY 65°PENETRATION Complete
Thickness at impact 375
No. of impact on plate 5
Dist. from nearest impact 17"
Dist. from near edges 69" and 168"
Impact area 3" X 6" X 1 1/2"
Spall: Front 0 Back 2" X 1 1/2"
Dish 0 Spur 1"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge 0
Through opening 2" X 2-3/4"

ROCKET

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. - Wt. 51.46#
Maker Houdaille Corp.
Lot No. RHCZ -7-HA-52
Filler: Typecast Comp. 16#
Fuzes Mk. 149 No. 24Boosters 1
Wt. of head (as fired) 51.46#MOTOR: Cal. 5" Mk. 10 Mod 5
Motor temp. 86° Wt. 83.70#COMPLETE ROUND: Mark Mod
Wt. (as fired) 140.16#
Wt. (burned)

OTHER INFORMATION

ALN: RMDA-207-S-51LAUNCHER 1050 Ft. Rocket Launcher

ROCKET PERFORMANCE

Flight Mean Velocity, f/s: Striking 1686 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. 99-51102Signed F. W. KasdorfF. W. KasdorfORD. ENG.**CONFIDENTIAL**
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IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 40095

IMPACT DATE 8-20-52

NPG TEST NO. T-2222-1.25

OBJECT Functioning Test of Modified Mk. 149 Rocket Nose Fuze
in 570 Rocket Head Mk. 25 vs Plate #BD277.

Reference: NPG ltr. dated
Reference: BMDA ltr. SOL Sdltz DP:HSW:dls NPNOL/XI-1(248) dated 3038 of 6 June 1952
Task Assignment No. NPG-Rs2b-11-1-52 dated
NPG Report No. 7060

PLATE TARGET

Gage 355 Class R
Maker Carnegie
No. BD277 Group
Dimensions 12 1/2" X 4.065"

OBLIQUITY 70°

PENETRATION Complete

Thickness at impact 355

No. of impact on plate 6

Dist. from nearest impact 28"

Dist. from near edges 6.2" and 14.2"

Impact area 4" X 8" 1/2" X 1 1/2" X 1 1/2"

Spall: Front 0 Back 0-1 1/2" X 1 1/2"

Dish 0 Spur 1"

Cracks 0

Punching (thrown) (started)

Back Button (thrown) (started)

Bulge 0

Through opening 1" X 1-5/8"

ROCKET

HEAD: Cal. 5" Type Shaped Charge

Mark 25 No. 1 No. 51.164

Maker Houdaille Corp.

Lot No. RHC2-7-HA-52

Filler: Tyneat Comp. Wt. 164

Fuzes Mk. 149 No. 25

Boosters 1

Wt. of head (as fired) 51.164

MOTOR: Cal. 5" Mk. 10 Mod 5

Motor temp. 86° Wt. 88.354

COMPLETE ROUND: Mark Mod

Wt. (as fired) 139.514

Wt. (burned)

OTHER INFORMATION

ALN: BMDA-267-S-51

LAUNCHER 1050 Rocket Launcher

ROCKET PERFORMANCE

Mean

Flight Velocity, f/s: 1698 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. NPG-51102 NPG-51103

Signed F.W. Headorf

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ORD. ENG.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIAIMPACT NO. 40106IMPACT DATE 8-21-52NPG TEST NO. T-2222-1.25OBJECT Functioning Test of Modified Mk. 149 Rocket Nose Fuze
in 570 Rocket Head Mk. 25 vs Cl. B Plate.

Reference: NPG ltr. (2622) Ser 3432 dated _____

Reference: BUONF ltr. NO. 5617r DPASJdl: RP/101/XI-1 dated 6 June 1952Task Assignment No. NPG-8-26-11-1-52 dated _____NPG Report No. 1060

PLATE TARGET

ROCKET

Gage 375 Class BMaker CarnegieNo. BD277 Group -Dimensions 124" X 106"OBLIQUITY 75°

PENETRATION

Thickness at impact 375No. of impact on plate 1Dist. from nearest impact NO NEAREST IMPACTDist. from near edges andImpact area NO NEAREST IMPACTSpall: Front BackDish SpurCracks NO NEAREST IMPACTPunching (thrown) (started) NO NEAREST IMPACTBack Button (thrown) (started) NO NEAREST IMPACTBulge NO NEAREST IMPACTThrough opening NO NEAREST IMPACTHEAD: Cal. 5" Type Shaped ChargeMark 25 Mod 1 No. - Wt. 51.93#Maker Houdaille Corp.Lot No. RHCZ-7-HA-52Filler: Typical Comp Wt. 16#Fuzes Mk. 149 No. 26Boosters 1Wt. of head (as fired) 51.93#MOTOR: Cal. 5" Mk. 10 Mod 5Motor temp. 80° Wt. 89.30#COMPLETE ROUND: Mark - Mod -Wt. (as fired) 141.23#Wt. (burned) -

OTHER INFORMATION

ALM:RMDA-267-S-51LAUNCHER 1050Ft. Rocket Launcher

ROCKET PERFORMANCE

Mean

Flight - Velocity, f/s: 1693 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. KassdorfF. W. Kassdorf
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IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIAIMPACT NO. 40108IMPACT DATE 8-21-52NPG TEST NO. T-2-22-1.25OBJECT Fuzing Test of Modified Mk. 149 Rocket Nose Fuze
in 500 Rocket Head Mk. 25 vs Cl. B Plate.

Reference: NPG ltr. dated

Reference: BuOrd ltr. NOL Splitr DP:HSS:dl: WF/NOL/XI-1 dated

Task Assignment No. (2628) Ser 3438 of dated 6 June 1952

NPG-Res2b-11-1-12

PLATE TARGET NPG Report No. 1060

ROCKET

Gage 375 Class BMaker CarnegieNo. BU277 Group -Dimensions 124" X 406"OBLIQUITY 70°PENETRATION CompleteThickness at impact 385No. of impact on plate 9Dist. from nearest impact 56"Dist. from near edges 59" and 139"Impact area 3" X 8" 2 1/2" X 1 1/2"Spall: Front 0 Back 2 1/2" X 1 1/2"Dish 0 Spur 1-1/2"Cracks 0

Punching (thrown) (started)

Back Button (thrown) (started)

Bulge 0Through opening 1" X 1-3/4"HEAD: Cal. 5" Type Shaped ChargeMark 25 Mod 1 No. - Wt. 51.10#Maker Houdaille Corp.Lot No. BHCZ -7-HA-52Filler: Type Cast Comp. 16#Fuzes Mk. 149 No. 28Boosters 1Wt. of head (as fired) 51.10#MOTOR: Cal. 5" Mk. 10 Mod 5Motor temp. 86° Wt. 88.45#COMPOSITE ROUND: Mark - Mod -Wt. (as fired) 139.55#

Wt. (burned)

OTHER INFORMATION

AIN: BMMA-267-S-51LAUNCHER 1050 Ft. Rocket Launcher

ROCKET PERFORMANCE

Flight Mean Velocity, f/s: striking 1702 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. NPG-51103**CONFIDENTIAL**
SECURITY INFORMATIONSigned F. W. Kasdorf

F. W. Kasdorf

ORD. ENG.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 40109

IMPACT DATE 8-21-52

NPG TEST NO. T-2222-1.25

OBJECT Functioning Test of Modified Mk. 149 Rocket Nose Fuze
in 570 Rocket Head Mk. 25 vs C.I.B. Plate.

Reference: NPG ltr. NOL Spdltr. D-MSX-414 NP/NOL/x1 dated
Reference: NPG ltr. (2628) Ser 2438 42 dated
Task Assignment No. NPG Ser 11-1-52 dated 6 June 1952

PLATE TARGET

Cage 385 Class B
Maker Carnegie
No. BD277 Group -
Dimensions 124" X 406"

OBLIQUITY 70°

PENETRATION

Thickness at impact C
No. of impact on plate K
Dist. from nearest impact 8
Dist. from rear edges and 8
Impact area E
Spall: Front Back 2
Dish Spur 2
Cracks 2
Punching (thrown) (started) 2
Back Button (thrown) (started) 2
Bulge
Through opening

ROCKET

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. - Wt. 51.02#
Maker Houdaille Corp.
Lot No. RHC2-7-RA-51
Filler: Typecast Comp. 10#
Fuzes Mk. 149 No. 29

Boosters 1
Wt. of head (as fired) 51.02#

MOTOR: Cal. 5" Mk. 25 Mod 1
Motor temp. 86° Wt. 88.40#

COMPLETE BURN: Mark Mod
Wt. (as fired) 139.42#
Wt. (burned)

OTHER INFORMATION

ALN: RMDA-267-S-51

LAUNCHER 1050 Ft. Rocket Launcher

ROCKET PERFORMANCE

Mean

Flight Velocity, f/s: 1750 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.

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Signed

F. W. Kasdorf

F. W. Kasdorf
ORD. ENG.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 40110

IMPACT DATE 8-21-52

NPG TEST NO. T-2222-1.25

OBJECT Functioning Test of Modified Mk. 149 Rocket Nose Fuze
in 5"0 Rocket Head Mk. 25 vs Cl. B Plate.

Reference: NPG ltr. NOL Snd ltr DP:HSW:dje NP/NOL/XI-1 dated

Reference: ~~NAOPC~~ ltr. (2628) Ser 3435 of dated 6 June 1952

Task Assignment No. NPG-Re2b-11-1-12 dated

NPG Report No. 10-1

PLATE TARGET

Gage 375 Class A
Maker Carnegie
No. TT695 Group C-751-322
Dimensions 113" X 384"

OBLIQUITY 70°

PENETRATION Complete
Thickness at impact 375
No. of impact on plate 1
Dist. from nearest impact 0
Dist. from near edges 166" and 161"
Impact area 3-3/4" X 7-1/2"
Spall: Front 0 Back 1-1/2"
Dish 0 Spur 2"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge 0
Through opening 1-1/2" X 2-1/2"

ROCKET

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. - Wt. 51.42#
Maker Hondaille Corp.
Lot No. RHC4-7-HA-51
Filler: Typeast Comp Wt. 16#
Fuzes Mk. 149 No. 30

Boosters 1
Wt. of head (as fired) 51.42#

MOTOR: Cal. 5" Mk. 10 Mod 5
Motor temp. 86° Wt. 89.25#

5-COMPLETE ROUND: Mark - Mod -
Wt. (as fired) 140.67#
Wt. (burned) -

OTHER INFORMATION
ALN: RMDA-267-S-51
" " " " " "

LAUNCHER 1050 Ft. Rocket Launcher

ROCKET PERFORMANCE

Flight Mean Velocity, f/s: 3000 Residual 1773
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. Kasdorf

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F. W. Kasdorf
ORD. ENG.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIAIMPACT NO. 4011IMPACT DATE 8-21-52NPG TEST NO. T-2222-1.25OBJECT Functioning Test of Modified Mk. 149 Rocket Nose Fuze
in 540 Rocket Head Mk. 25 vs Cl. B Plate.Reference: NPG ltr. _____ dated _____
Reference: BuOrd ltr. NOL Splitter DEKHSW:dlr NP/NOL/XI dated _____
Task Assignment No. (2628) Ser 3428 of dated 6 June 1952

PLATE TARGET

EPG-Re2b-11-1-12
NOL Splitter + No. 1000

ROCKET

Gage 3"5 Class B
Maker Carnegie
No. TP695 Group C-751-322
Dimensions 113" X 384"OBLIQUITY 70°

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 _____HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. - Wt. 51.46#
Maker Houdaille Corp.
Lot No. RHC4-7-H4-51
Filler: Typcast Comp Wt. 16#
Fuzes Mk. 149 No. 31Boosters 1
Wt. of head (as fired) 51.46#MOTOR: Cal. 5" Mk. 10 Mod 5
Motor temp. 80° Wt. 89.45#COMPLETE ROUND: Mark _____ Mod _____
Wt. (as fired) 140.91#
Wt. (burned) _____

OTHER INFORMATION

ALN: RMDA -267-6-51LAUNCHER 1050 Ft. Rocket Launcher

ROCKET PERFORMANCE

Mean
Flight _____ Velocity, f/s: Striking 1779 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:

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Photo No. _____

SECURITY INFORMATION

Signed

F. W. KasdorfF. W. Kasdorf

ORD. END.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLOREN, VIRGINIA

IMPACT NO. 40112

IMPACT DATE 8-21-52

NPG TEST HOT-2222-1.25

OBJECT Functioning Test of Modified Mk. 149 Rocket Nose Fuze
in 5"0 Rocket Head Mk.25 vs Cl.B Plate.

Reference: NPG ltr. ~~W.L. Spitz~~ ~~DAHLOREN~~ ~~11-1-12~~ dated ~~6 June 1952~~
Reference: ~~DAHLOREN~~ ltr. ~~(2628)~~ ~~Ser 3438~~ dated ~~6 June 1952~~
Task Assignment No. ~~NPG Test 11-1-12~~ dated ~~6 June 1952~~

PLATE TARGET

NPG Report No. 1060

ROCKET

Gage 375 Class B
Maker Carnagie
No. T1695 Group C-751-222
Dimensions 113" X 384"

OBLIQUITY 75°

PENETRATION Complete
Thickness at impact 375
No. of impact on plate 3
Dist. from nearest impact 23"
Dist. from near edges 17" and 170"
Impact area 2-1/4" X 7-1/2"
Spall: Front 0 Back 3" X 4"
Dish 0 Spur 1"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge 0
Through opening 1-1/2" X 2-1/4"

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. - Wt. 51.13#
Maker Houdaille Corp.
Lot No. RHC2-7-HA-51
Filler: Typecast Comp. 16#
Fuzes Mk.149 No.32

Boosters 1
Wt. of head (as fired) 51.13#

MOTOR: Cal. 5" Mk. 10 Mod 5
Motor temp. 86° Wt. 88.80#

COMPLETE ROUND: Mark Mod
Wt. (as fired) 139.93#
Wt. (burned)

OTHER INFORMATION
ALN: RMDA-267-3-51
" " " "

LAUNCHER 1050Ft. Rocket Launcher

ROCKET PERFORMANCE

Flight Velocity, f/s: Mean 1768 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:

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Signed F. W. Kascorf

F. W. Kascorf
ORD. ENG.

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NPG REPORT NO. 1080

Experimental Ballistic Test of Modified Mk 149 Nose Fuse

TABLE I

SUMMARY OF RESULTS

Rd. No.	Date Fired 1952	Fuse No.	Rocket Head	Velocity (ft./sec.)		Obl.	Target	Fuse Action
	Desired			Obtained				
PART I								
1	6-23	5	Mk 6	1800	1874	0°	1/8" MS	HO on Impact
2	6-23	6	Mk 6	1800	1836	0°	1/8" MS	HO on Impact
3	6-23	7	Mk 6	1800	1837	0°	1/8" MS	HO on Impact
4	6-23	8	Mk 6	1800	1863	0°	1/8" MS	HO on Impact
PART II								
1	6-23	9	Mk 6	1800	1858	50°	1/8" MS	HO on Impact
2	6-23	10	Mk 6	1800	----	60°	1/8" MS	HO on Launcher at 1012' point
3	7-24	33	Mk 6	1800	1896	60°	1/8" MS	Dud
4	7-24	34	Mk 6	1800	1791	50°	1/8" MS	Dud
5	7-24	35	Mk 6	1800	1882	50°	1/4" MS	Dud
6	7-24	36	Mk 6	1800	1311	50°	1/8" MS	HO on Impact
7	7-25	37	Mk 6	1300	1297	55°	1/8" MS	HO on Impact
8	7-25	38	Mk 6	1300	1292	60°	1/8" MS	HO on Impact
9	7-25	39	Mk 6	1300	1296	65°	1/8" MS	HO on Impact
10	7-25	40	Mk 6	1300	1295	70°	1/8" MS	HO on Impact
11	7-25	11	Mk 6	1800	1923	70°	1/8" MS	HO on Impact
12	7-28	12	Mk 6	1800	1794	75°	1/8" MS	HO on Impact
13	7-28	13	Mk 6	1800	1795	75°	1/8" MS	HO on Impact
14	7-28	14	Mk 6	1800	1833	75°	1/8" MS	Missed Target
15	7-28	15	Mk 6	1800	1791	75°	1/8" MS	HO on Impact
16	7-28	16	Mk 6	1800	1769	75°	1/8" MS	HO on Impact
17	7-28	17	Mk 6	1800	1789	75°	1/8" MS	HO on Impact
18	7-29	18	Mk 6	1800	1818	75°	1/4" MS	HO on Launcher at 800' point
19	7-29	19	Mk 6	1800	1826	75°	1/4" MS	HO on Impact
20	7-29	20	Mk 6	1800	1776	75°	1/4" MS	HO on Impact
21	7-29	21	Mk 6	1800	1818	75°	3/8" MS	HO on Impact
22	7-30	22	Mk 6	1800	1772	75°	3/8" MS	HO at Launcher Muzzle

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NPD REPORT NO. 1060

Experimental Ballistic Test of Modified Mk 149 Nose Fuse

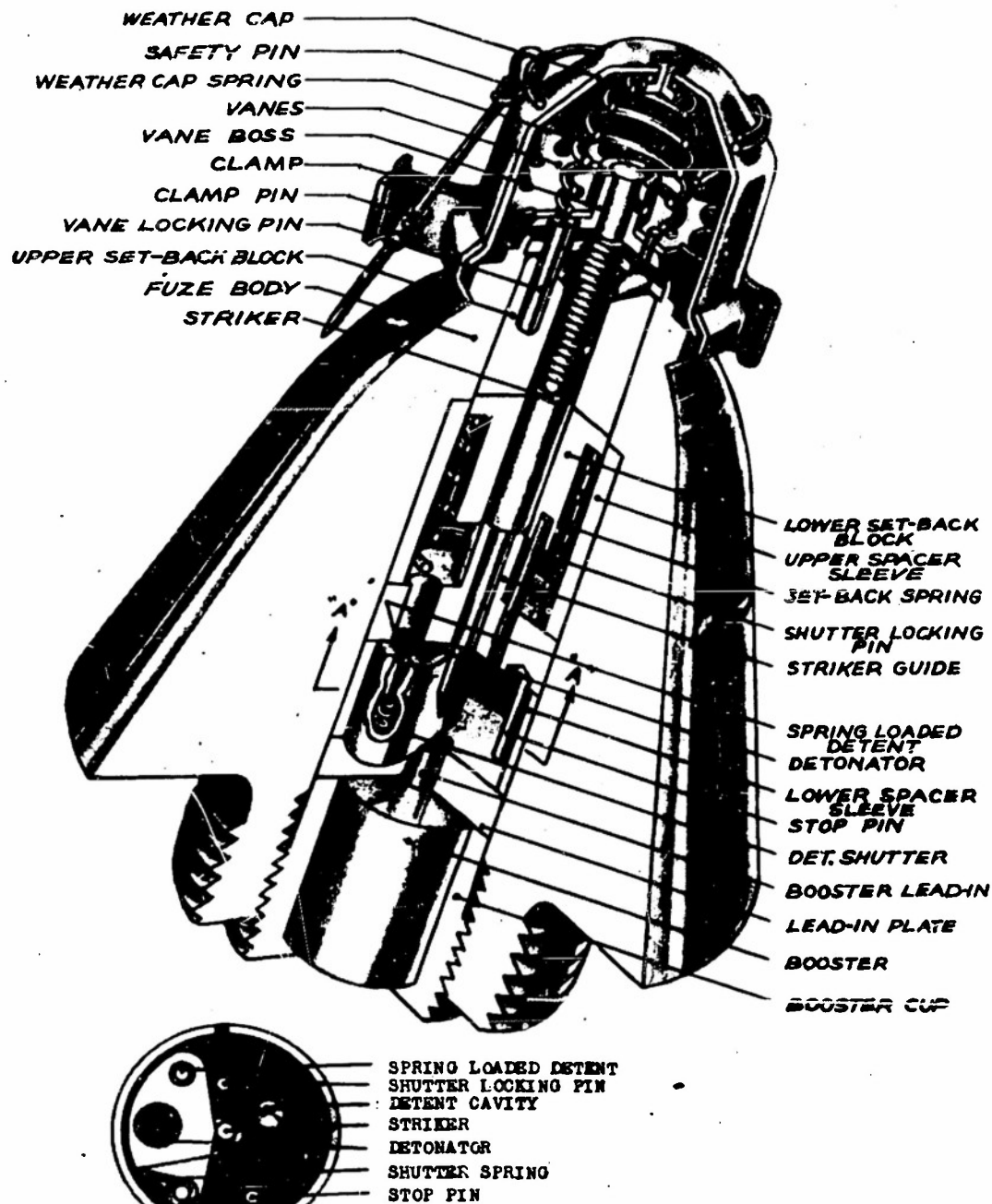
TABLE I (Continued)

<u>Rd.</u> <u>No.</u>	<u>Impact</u> <u>No.</u>	<u>Date</u> <u>Fired</u> <u>1952</u>	<u>Fuse</u> <u>No.</u>	<u>Rocket</u> <u>Head</u>	<u>Velocity (ft./sec.)</u>		<u>Obl.</u>	<u>Target</u>	<u>Fuse</u> <u>Action</u>
					<u>Desired</u>	<u>Obtained</u>			
<u>PART III</u>									
1	40093	8-20	23	Mk 25	1800	1732	55°	3 7/16" Class B	HO
2	40094	8-20	24	Mk 25	1800	1686	65°	3 7/16" Class B	HO
3	40095	8-20	25	Mk 25	1800	1698	70°	3 7/16" Class B	HO
4	40106	8-21	26	Mk 25	1800	1693	75°	3 7/16" Class B	Dud
5	40107	8-21	27	Mk 25	1800	1696	70°	3 7/16" Class B	Dud
6	40108	8-21	28	Mk 25	1800	1702	70°	3 7/16" Class B	HO
7	40109	8-21	29	Mk 25	1800	1750	70°	3 7/16" Class B	Dud
8	40110	8-21	30	Mk 25	1800	1773	70°	3 3/8" Class B	HO
9	40111	8-21	31	Mk 25	1800	1779	70°	3 3/8" Class B	LO
10	40112	8-21	32	Mk 25	1800	1768	65°	3 3/8" Class B	HO

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MARK 149 A.I.R. NOSE FUZE



NP9-51100

30 July 1952

Experimental test of Modified Mk 149 Nose Fuze in 5"0 Rocket Head Mk 6 - smoke puff loaded.
View: Dead catbird (weighing 1.1 ozs) suspended in rails at muzzle end of launcher to test possibility of fuze action upon impact with such an obstacle.

Figure 4

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WFO-51101

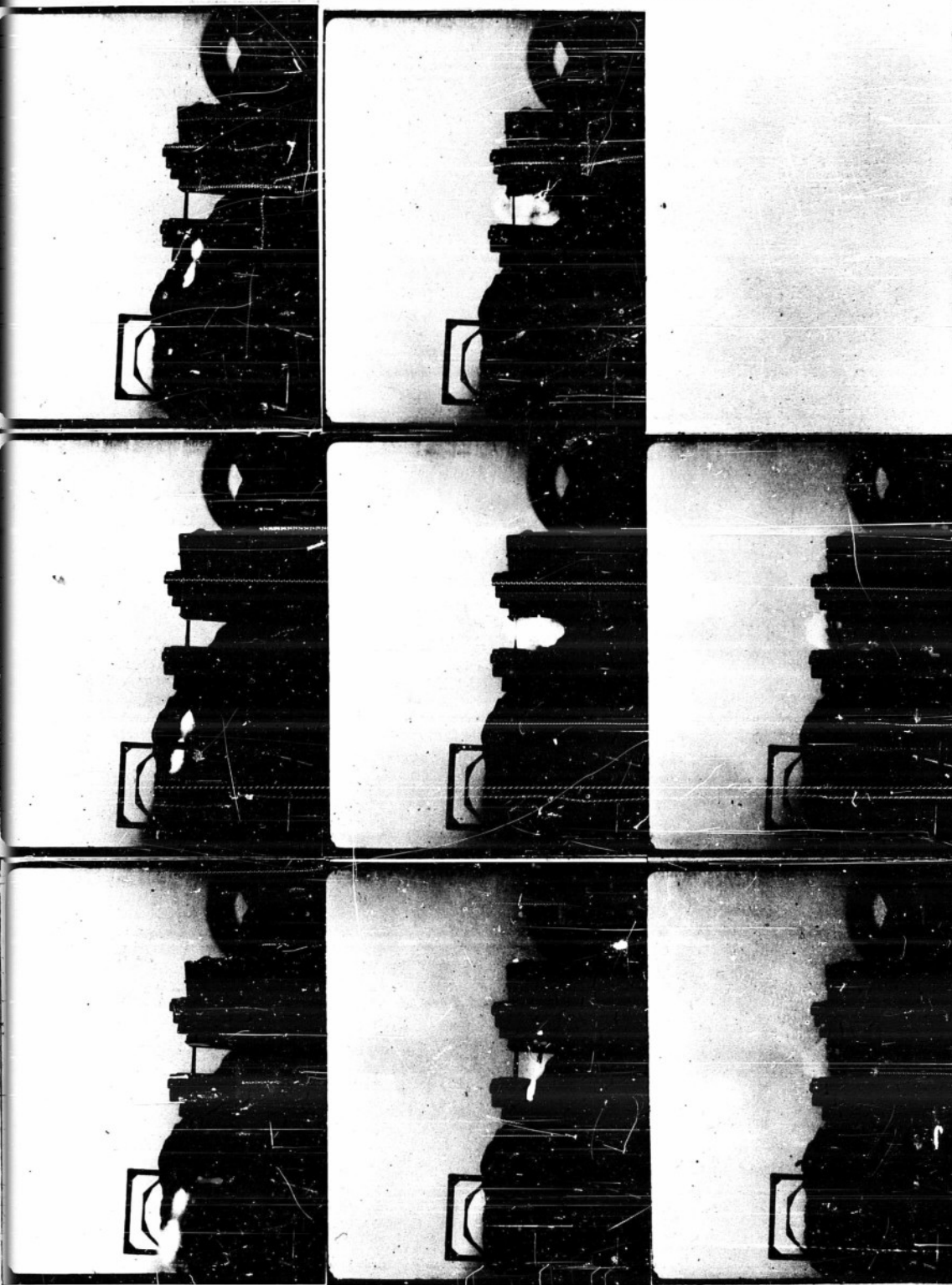
29 July 1953

Modified Mk 149 nose fuze functioning HOI upon impact with a 3/8" MS plate at 75° obliquity in WFO Rocket Head Mk 6 - smoke buff loaded. Action viewed by a 35mm Mitchell Camera at 100 frames per sec. Velocity 1818 ft/sec.

Figure 5

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21 August 1952

MP9-51102

View of 3.5 Class B armor after impacts with 540 Shaped Charge Rocket Heads Mk 25 containing the Modified Mk 149 nose fuze. Note bulge behind opening on rd. 2 and large spall resulting from rd. 3.

Rd. No.	Target	Obl.	Striking Velocity (f/s)	Impact Dimensions	
				Entrance	Exit
1	3 7/16" Class B	55°	1732	2 1/2" x 4"	2 3/4" x 3"
2	3 7/16" Class B	65°	1686	3" x 6"	2" x 2 3/4"
3	3 7/16" Class B	70°	1698	4" x 8"	1" x 1 5/8"

Figure 6



NP9-51103

21 August 1952

View of 3.5 Class B armor plate after impact of 5.0 Shaped Charge Rocket Head Mk 25 containing Modified Mk 149 nose fuze. Note large spall area behind opening.

Rd. No. 6 Target 3 7/16" Class B Obl. 70°

Striking
Velocity (f/s)
1702

Penetration
Complete

Impact Dimensions
Entrance 3"x8" Exit 1"x1 3/4"

Figure 7



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NP9-51104

21 August 1952

Experimental test of modified Mk 149 Nose Fuze in F.O. Shaped Charge Head Mk 25.
View: Fragment resulting from spall on the backside of a 3.5 Class B Armor Plate
on rd. 3. This piece measured 6"x5 1/2"x1/4".

Figure 1

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U.S.N.P.G. DAHLGREN, VIRGINIA

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NP9-51105

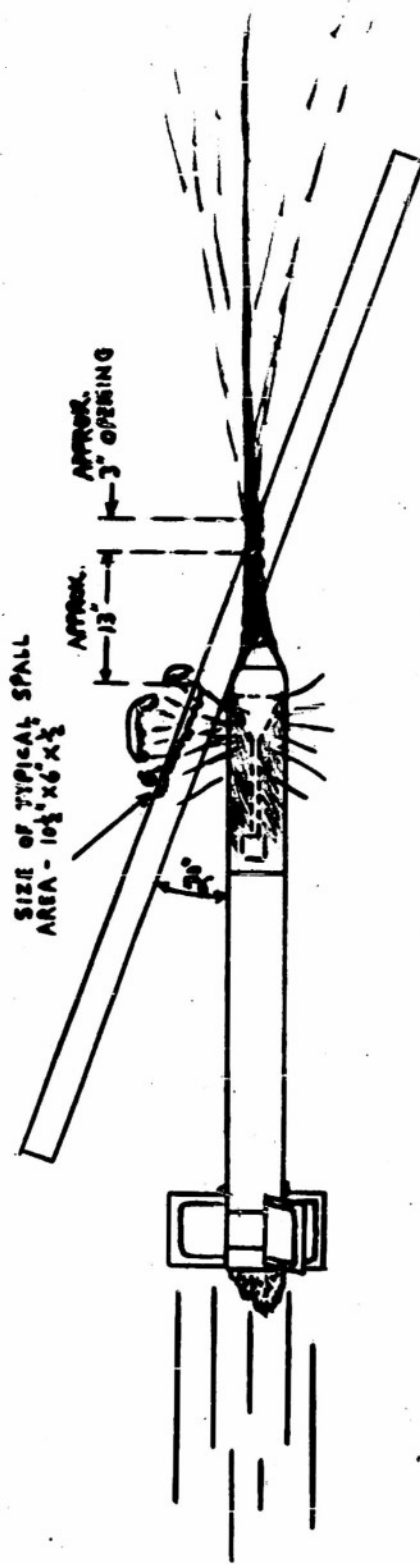


FIG. 9- EXPERIMENTAL BALLISTIC TEST OF MODIFIED MK 149
ROCKET NOSE FUZE

VIEW: MOD. MK 149 FUZE IN 5.0 ROCKET HEAD MK 25 (SHAPED
CHARGE) WITH 5" HVAR MOTOR VS. 3.5 CLASS B ARMOR
PLATE AT 70° OBLIQUITY. NOTE SPALL THROWN FROM BACK
FACE DUE TO EXPLOSIVE WAVES TRANSMITTED THROUGH
PLATE ON IMPACTS ABOVE 65° OBLIQUITY.

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27 AUGUST 1952
R.G.S.

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NPG REPORT NO. 1000

Experimental Ballistic Test of Modified Mk 149 Nose Fuze

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Experimental Ballistic Test of Modified Mk 149 Nose

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