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31 Dec 1964, DoDD 5200.10; USNSWC ltr dtd 29 Jan 1976

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U. S. NAVAL PROVING GROUND DAHLGREN, VIRGINIA	
REPORT NO. 1060	
RESEARCH, DEVELOPMENT, AND TESTS OF AIRCRAFT ROCKET FUZE SYSTEMS	
<u>22nd</u> Partial Report	

EXPERIMENTAL BALLISTIC TEST OF MODIFIED MK 149 NOSE FUZE	
<u>FINAL</u> Report	Task
Copy No. <u>24</u>	Assignment <u>NPG-Re2b-11-1-52</u>
	Classification <u>CONFIDENTIAL</u> <u>SECURITY INFORMATION</u>

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SECURITY INFORMATION

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Experimental Ballistic Test of Modified Mk 149 Nose Fuze

DATA

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 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.

Experimental Ballistic Test of Modified Mk 149 Nose Fuze

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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	Naval Ordnance Laboratory
Mr. L. J. Skolnik	Naval Ordnance Laboratory

PART CDETAILS 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.

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.

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

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 re-enforcement 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.

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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**Chief, Washington USAF Engineering Field Office
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**The telephone extension is 62471 or 65568 on the
Department of Defense Exchange.**

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
No. of Pages: 9**

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. NOL-2222-1.25

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

Reference: NPG NOL ltr. dated

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

Task Assignment No. NPG H628-11-1-8, 9 dated

PLATE TARGET

NPG Report No. 1060

ROCKET

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

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: Tygsat 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: RMDA-267-3-51

LAUNCHER 1050ft. Rocket Launcher

ROCKET PERFORMANCE

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

Signed F. W. Kasdorf

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F. W. Kasdorf
ORD. ENG.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 40094

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 S. ltr. 3430 dated 6 June 1952
 Reference: BUO ltr. 3430 dated 6 June 1952
 Task Assignment No. NPG-826-11-1-52 dated

NPG Report No. 1060

PLATE TARGET

ROCKET

Gage 315 Class B
 Maker Garneis
 No. BD277 Group -
 Dimensions 124" X 406"

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. B-16#
 Fuzes Mk. 149 No. 24

OBLIQUITY 65°

Boosters 1
 Wt. of head (as fired) 51.46#

PENETRATION Complete
 Thickness at impact 315
 No. of impact on plate 5
 Dist. from nearest impact 17"
 Dist. from near edges 69" and 168"
 Impact area 3" X 6"
 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"

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-207-3-51

LAUNCHER 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. 82-51102

Signed F. W. Kasdorf

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F. W. Kasdorf
 ORD. ENG.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DARLTON, 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: BD277 ltr. dated

Task Assignment No. NPG-Res2b-11-1-52 dated 3438 of 6 June 1952

PLATE TARGET

ROCKET

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

HEAD: Cal. 5" Type Shaped Charge
Mark 25 No. 1 No. Wt. 51.16#
Maker Houdaille Corp.
Lot No. RHC2-7-HA-52
Filler: Tybest Comp Wt. 16#
Fuzes Mk. 149 No. 25

OBLIQUITY 70°

Boosters 1
Wt. of head (as fired) 51.16#

PENETRATION Complete
Thickness at impact 355
No. of impact on plate 6
Dist. from nearest impact 28"
Dist. from near edges 6.2" and 1.42"
Impact area 1" X 8" 1/2" X 1 1/2" X 1 1/2"
Spall: Front 0 Back 0-1/2" X 0-1/2"
Dish 0 Spur 1"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge 0
Through opening 1" X 1-5/8"

MOTOR: Cal. 5" Mk. 10 Mod 5
Motor temp. 86° Wt. 88.35#
COMPLETE ROUND: Mark Mod
Wt. (as fired) 139.51#
Wt. (burned)

OTHER INFORMATION
ALN: BMDA-267-S-51
LAUNCHER 1050 Rocket Launcher

ROCKET PERFORMANCE
Mean

Flight striking 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

Signed F.W. Headorf

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IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 40106

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 Cl. B Plate.

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

Reference: BUONF ltr. NO. 56317 DPASJdl: RP/101/XI-1 dated 6 June 1952

Task Assignment No. NPG-Be26-11-1-52 dated _____

PLATE TARGET NPG Report No. 1060

ROCKET

Gage 3x5 Class B
Maker Carnegie
No. BD277 Group _____
Dimensions 12 1/2" X 1.06"

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. _____ Wt. 51.93#
Maker Houdaille Corp.
Lot No. RHCZ-7-HA-52
Filler: Tyrast Comp Wt. 16#
Fuzes Mk. 149 No. 26

OBLIQUITY 75°

Boosters 1
Wt. of head (as fired) 51.93#

PENETRATION
Thickness at impact 3x5
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 _____

MOTOR: Cal. 5" Mk. 10 Mod 5
Motor temp. 80° Wt. 89.30#

COMPLETE ROUND: Mark _____ Mod _____
Wt. (as fired) 141.23#
Wt. (burned) _____

OTHER INFORMATION
ALM:RMDA-267-S-51

LAUNCHER 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. Kasdorf

F. W. Kasdorf
ORD. ENG.

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IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 40108

IMPACT DATE 8-21-52

NPG TEST NO. T-2-22-1.25

OBJECT 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 DE:HSW:dLg NF/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 385 Class B
Maker Carnegie
No. BU277 Group -
Dimensions 124" X 406"

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod I No. - Wt. 51.10#
Maker Houdaille Corp.
Lot No. BHCZ -7-HA-52
Filler: Type Cast Comp B No. 16#
Fuzes Mk. 149 No. 28

OBLIQUITY 70°

Boosters 1
Wt. of head (as fired) 51.10#

PENETRATION Complete
Thickness at impact 385
No. of impact on plate 9
Dist. from nearest impact 56"
Dist. from near edges 59" and 39"
Impact area 3" X 8" and 1 1/2" X 1 1/2"
Spall: Front 0 Back 3 1/2" X 1 1/2"
Dish 0 Spur 1-1/2"
Cracks 0
Punching (thrown) (started) _____
Back Button (thrown) (started) _____
Bulge 0
Through opening 1" X 1-3/4"

MOTOR: Cal. 5" Mk. 10 Mod 5
Motor temp. 86° Wt. 88.45#
COMPOSITE ROUND: Mark _____ Mod _____
Wt. (as fired) 139.55#
Wt. (burned) _____

OTHER INFORMATION

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

ROCKET PERFORMANCE

Flight Velocity, f/s: Mean 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
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Signed F. W. Kasdorf
F. W. Kasdorf

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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 5"0 Rocket Head Mk. 25 vs Cl. B Plate.

Reference: NPG ltr. NOL Spdltr DE:MS:112 NP/NOI/X1 dated _____
 Reference: EMSTEX ltr. (2628) Ser 7438 dated _____
 Task Assignment No. NPG Ser 11-1-52 dated 6 June 1952

PLATE TARGET

ROCKET

Cage 385 Class B
 Maker Carnegie
 No. BD277 Group _____
 Dimensions 12 1/2" X 1.06"

HEAD: Cal. 5" Type Shaped Charge
 Mark 25 Mod 1 No. _____ Wt. 51.02#
 Maker Houdaille Corp.
 Lot No. RHC2-7-NA-51
 Filler: Typeast Comp B lb# _____
 Fuzes Mk. 149 No. 29

OBLIQUITY 70°

PENETRATION

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

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

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

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

OTHER INFORMATION

ALN: RMDA-207-S-51

LAUNCHER 1050 Ft. Rocket Launcher

ROCKET PERFORMANCE

Mean
 Flight Velocity, f/s: SWERING 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 Part of Modified Mk. 149 Rocket Nose Fuze
in 5"O Rocket Head Mk. 25 vs Cl. B Plate.

Reference: NPG ltr. NOL Snd ltr DP:HSW:dje NP/ROL/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. 10-17

PLATE TARGET

ROCKET

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

OBLIQUITY 70°

PENETRATION Complete
Thickness at impact 3"75
No. of impact on plate 1
Dist. from nearest impact 0
Dist. from near edges 66" and 61"
Impact area 3-3/4" X 7-1/2"
Spall: Front 0 Back 1-1/2" X 5-
Dish 0 Spur 2"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge 0
Through opening 1-1/2" X 2-1/2"

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. - Wt. 51.42#
Maker Houdaille Corp.
Lot No. RHC4-7-HA-51
Filler: Typeast Comp W. 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#

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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ORD. ENG.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 4011

IMPACT DATE 8-21-52

NPG TEST NO. T-2222-1.25

OBJECT 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 Splitr DPKSH:dlr EP/NOL/XI dated _____

Task Assignment No. (2628) Ser 428 of dated 6 June 1952

PLATE TARGET

EPG-Ro2b-11-1-12
NPG Ser 7 No. 1000

ROCKET

Gage 305 Class B
Maker Carnegie
No. TP695 Group C-751-322
Dimensions 113" X 384"

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. - Wt. 51.46#
Maker Houdaille Corp.
Lot No. HC4-7-H6-51
Filler: Typlast Comp VB 16#
Fuzes Mk. 149 No. 31

OBLIQUITY 70°

Boosters 1
Wt. of head (as fired) 51.46#

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 _____

MOTOR: Cal. 5" Mk. 10 Mod 5
Motor temp. 80° Wt. 89.45#

COMPLETE ROUNDS: Mark _____ Mod _____
Wt. (as fired) 140.91#
Wt. (burned) _____

OTHER INFORMATION
ALN: RMDA -267-6-51

LAUNCHER 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: **CONFIDENTIAL**

Photo No. _____
SECURITY INFORMATION

Signed F. W. Kasdorf
F. W. Kasdorf

ORD. END.

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, 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. NPG Report No. 11-1-12 dated 6 June 1952
Reference: 2628 Ser 238 of 11-1-12 dated 6 June 1952
Task Assignment No. NPG Report No. 11-1-12 dated 6 June 1952

PLATE TARGET

NPG Report No. 1060

ROCKET

Gage 375 Class B
Maker Carnegie
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) 0
Back Button (thrown) (started) 0
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: Typeast 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 Mean Velocity, f/s: 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: -

Photo No. - **CONFIDENTIAL** Signed F. W. Kasdorf
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F. W. Kasdorf
ORD. ENG.

Experimental Ballistic Test of Modified Mk 149 Nose Fuse

TABLE I

SUMMARY OF RESULTS

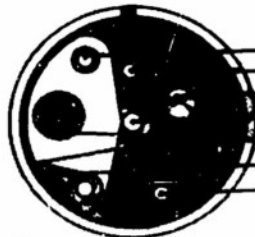
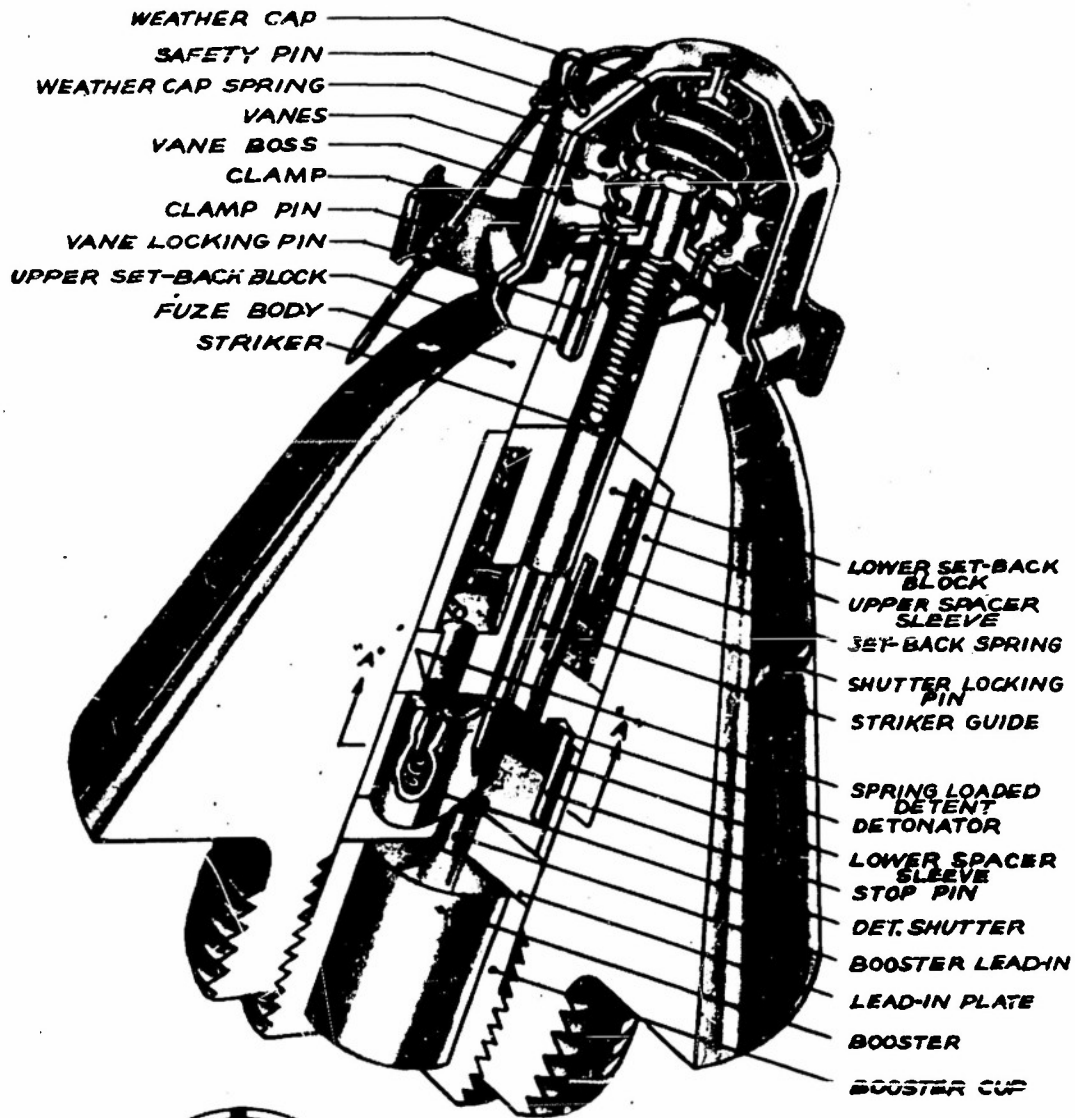
Rd. No.	Date Fired 1952	Fuse No.	Rocket Head	Velocity (ft./sec.)		Obl.	Target	Fuse Action
				Desired	Obtained			
<u>PART I</u>								
1	6-23	5	Mk 6	1800	1874	0°	1/8" MS	HO on Impact
2	6-23	6	Mk 6	1800	1836	0°	1/8" MS	HO on Impact
3	6-23	7	Mk 6	1800	1837	0°	1/8" MS	HO on Impact
4	6-23	8	Mk 6	1800	1863	0°	1/8" MS	HO on Impact
<u>PART II</u>								
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

Experimental Ballistic Test of Modified Mk 149 Nose Fuse

TABLE I (Continued)

<u>Rd. No.</u>	<u>Impact No.</u>	<u>Date Fired 1952</u>	<u>Fuse No.</u>	<u>Rocket Head</u>	<u>Velocity (ft./sec.)</u>		<u>Obl.</u>	<u>Target</u>	<u>Fuse 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	1386	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	LC
10	40112	8-21	32	Mk 25	1800	1768	65°	3 3/8" Class B	HO

MARK 149 A.I.R. NOSE FUZE



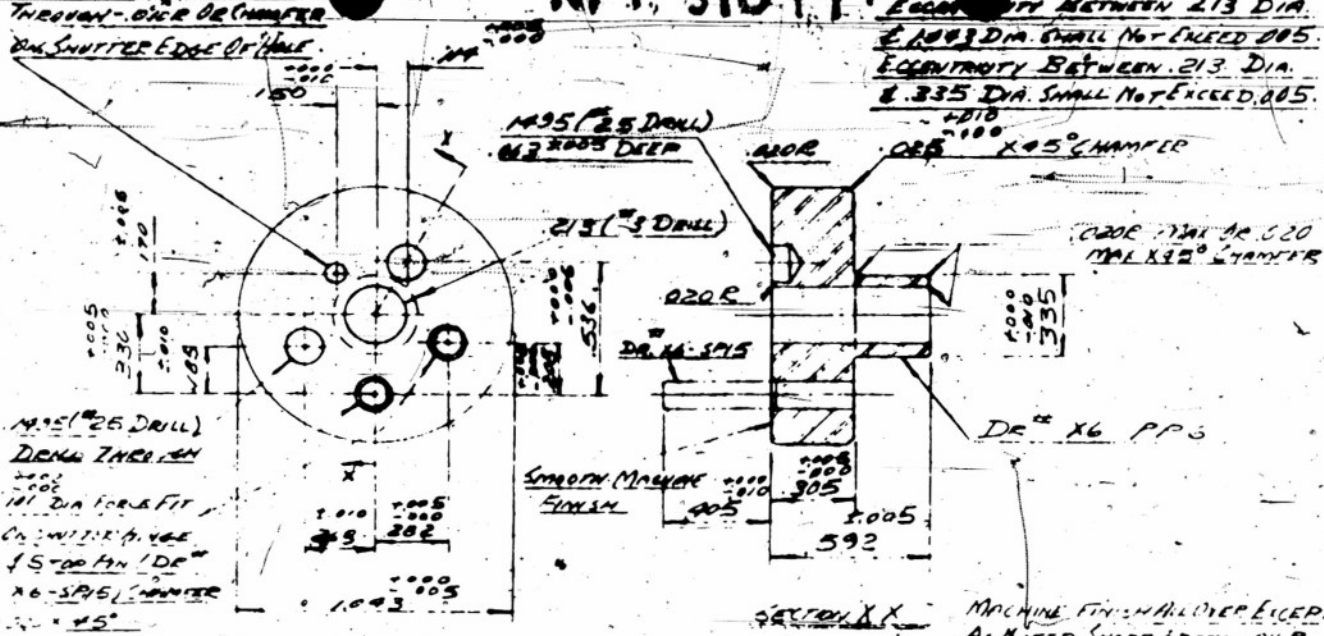
SPRING LOADED DETENT
 SHUTTER LOCKING PIN
 DETENT CAVITY
 STRIKER
 DETONATOR
 SHUTTER SPRING
 STOP PIN

SECTION "A"-"A"

0.005 (25 DRILL) DRILL

NP9-51099

ECCENTRICITY BETWEEN .213 DIA. & .1003 DIA. SHALL NOT EXCEED .005
ECCENTRICITY BETWEEN .213 DIA. & .335 DIA. SHALL NOT EXCEED .005



0.005 (25 DRILL) DRILL THROUGH
1.01 DIA FOR A FIT
CHAMFER 45 DEG
1.5 TOP FIN 1 DEG
X6-SP15L CHAMFER
45

0.005 (25 DRILL) DRILL
0.213 (25) DRILL

0.200 X 45 CHAMFER

0.200 X 45 CHAMFER

DE X6 PPS

SECTION X-X

MACHINE FINISH ALL OVER EXCEPT AS NOTED, SHARP EDGES - O.R. DIMENSIONS TO APPLY AFTER PLATING

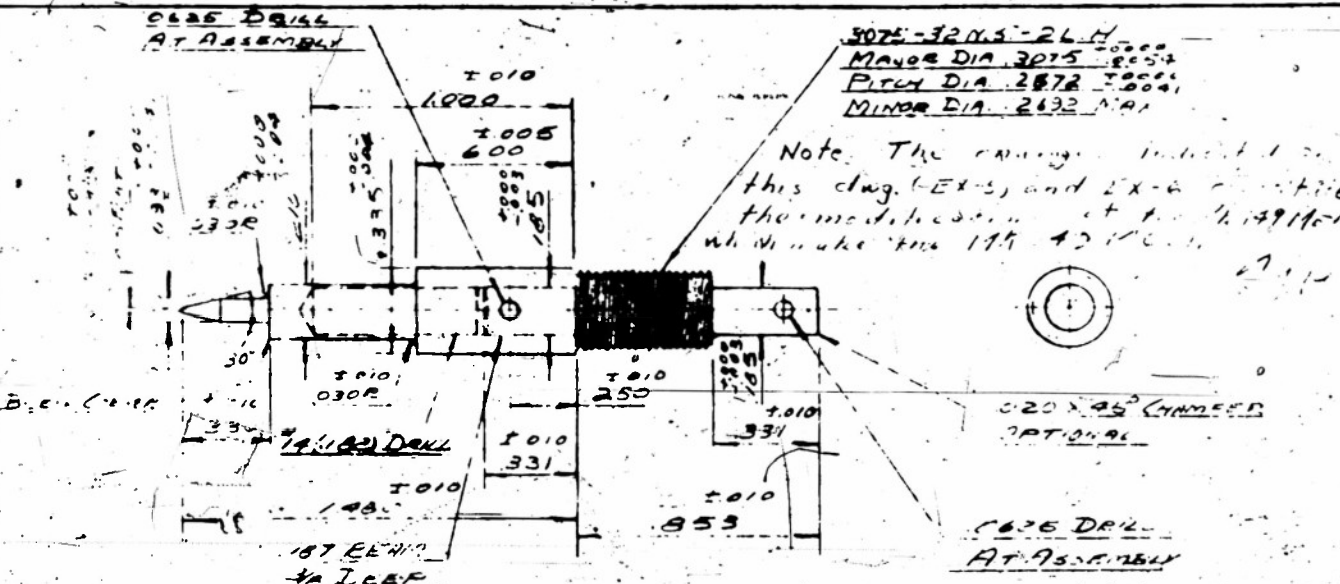
NOTE -
MATERIAL - STEEL 8112
FINISH - FOR C.R. STEEL CADMIUM OR ZINC PLATE (0.005 MIN. THICKNESS)

NAME		FIRING PIN GUIDE ASSY	
		(PROPOSED MAY 1952)	
MATERIAL		SEE NOTE	
COMPANY		SWANK INC. ATTLEBORO, MASS.	
DRAWN BY		NM	
DATE		5-5-52	
CHECKED BY			
DATE			
SCALE	2X		DWG. NO. EX-6

0.005 DRILL AT ASSEMBLY

3075-3215-26.4
MAJOR DIA. 3015
PITCH DIA. 2878
MINOR DIA. 2632

Note: The changes indicated in this drawing (EX-5) and EX-6 are for the modification of the 114-42100-11 which make the 114-42100-11.



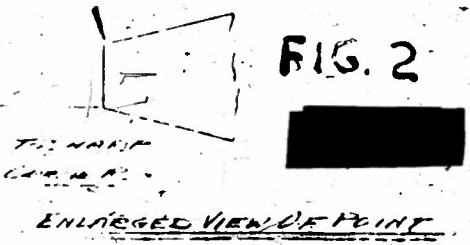
B.C. (1.1)

0.005 DRILL

0.005 DRILL AT ASSEMBLY

NOTE: EXCEPT AS NOTED MACHINE FINISH ALL OVER SHARP EDGES O.R.

MATERIAL - C.R. STEEL SAE 1035 OR SAE 1335 OR 915
C-1137 CADMIUM PLATE
0.005 MIN. THICKNESS
ALT. - STAINLESS STEEL SAE 316
NO PLATING



DIMENSIONS APPLY AFTER PLATING

NAME		PROPOSED TWO-PIECE FIRING PIN 1/32 STOCK	
MATERIAL		SEE ABOVE	
COMPANY		SWANK INC. ATTLEBORO, MASS.	
DRAWN BY		NM	
DATE		5-5-52	
CHECKED BY			
DATE			
SCALE	2.1		DWG. NO. EX-5

24 June 1953
325 slantmeter at 10K point result from iterative subtraction of
mod. 149 nosd face in 5°C fully loaded head.
Figure 3



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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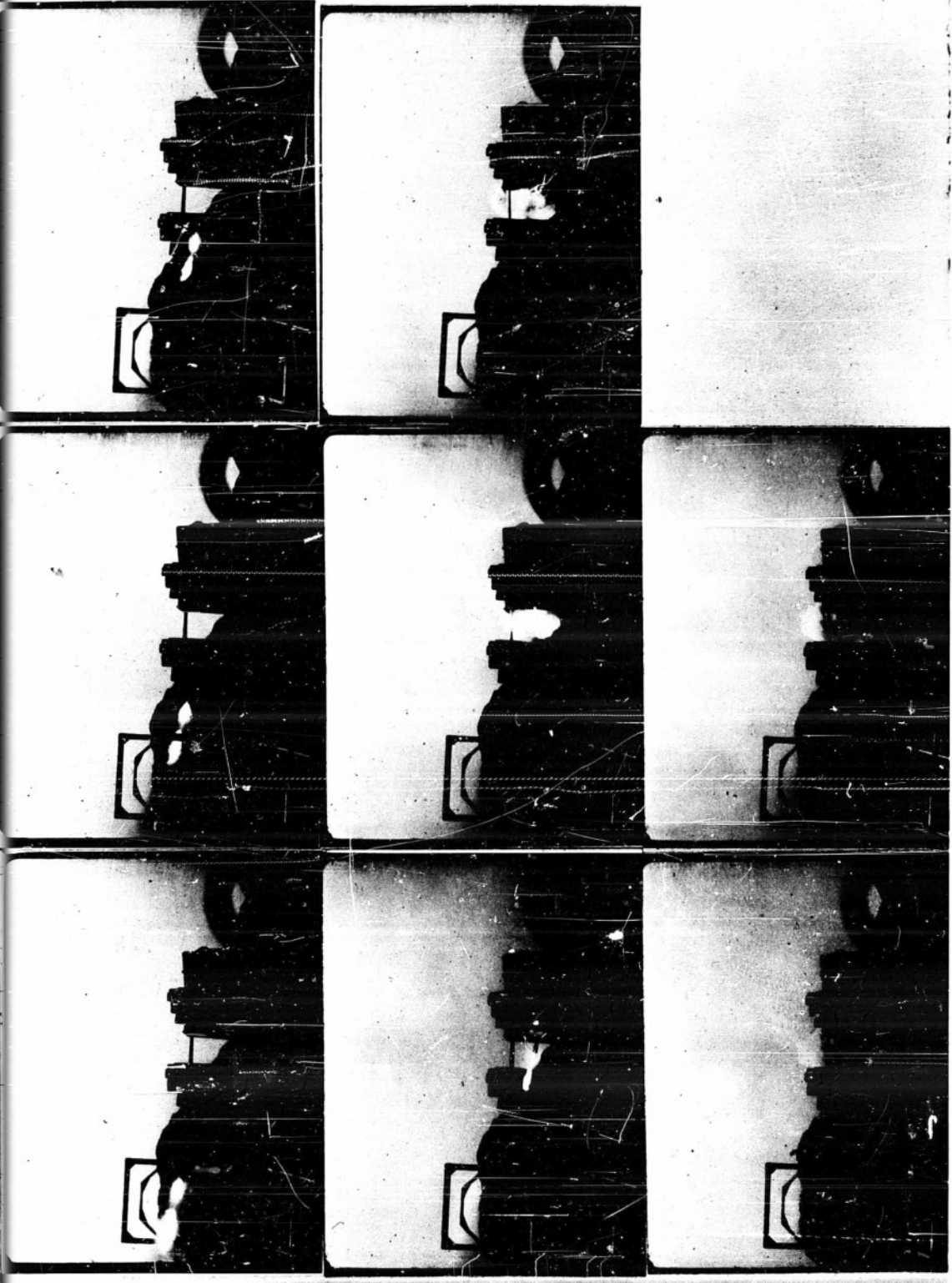


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49 July 1953

Modified Mk 149 nose fuze functioning HOI upon impact with a 3/8" MS plate at 75°
obliquity in M70 Rocket Head Mk 6 - smoke buff loaded. Action viewed by a 35mm
Mitchell Camera at 100 frames per sec. Velocity 1800 ft/sec.

Figure 5



21 August 1952

MP9-51102

View of 3.5 Class B armor after impacts with 570 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		Penetration	Impact Dimensions	
			Velocity (f/s)			Entrance	Exit
1	3 7/16" Class B	55°	1732		Complete	2 1/2" x 4"	2 3/4" x 3"
2	3 7/16" Class B	65°	1686		Complete	3" x 6"	2" x 2 3/4"
3	3 7/16" Class B	70°	1698		Complete	4" x 8"	1" x 1 5/8"

Figure 6



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21 August 1952

NP9-51103

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.

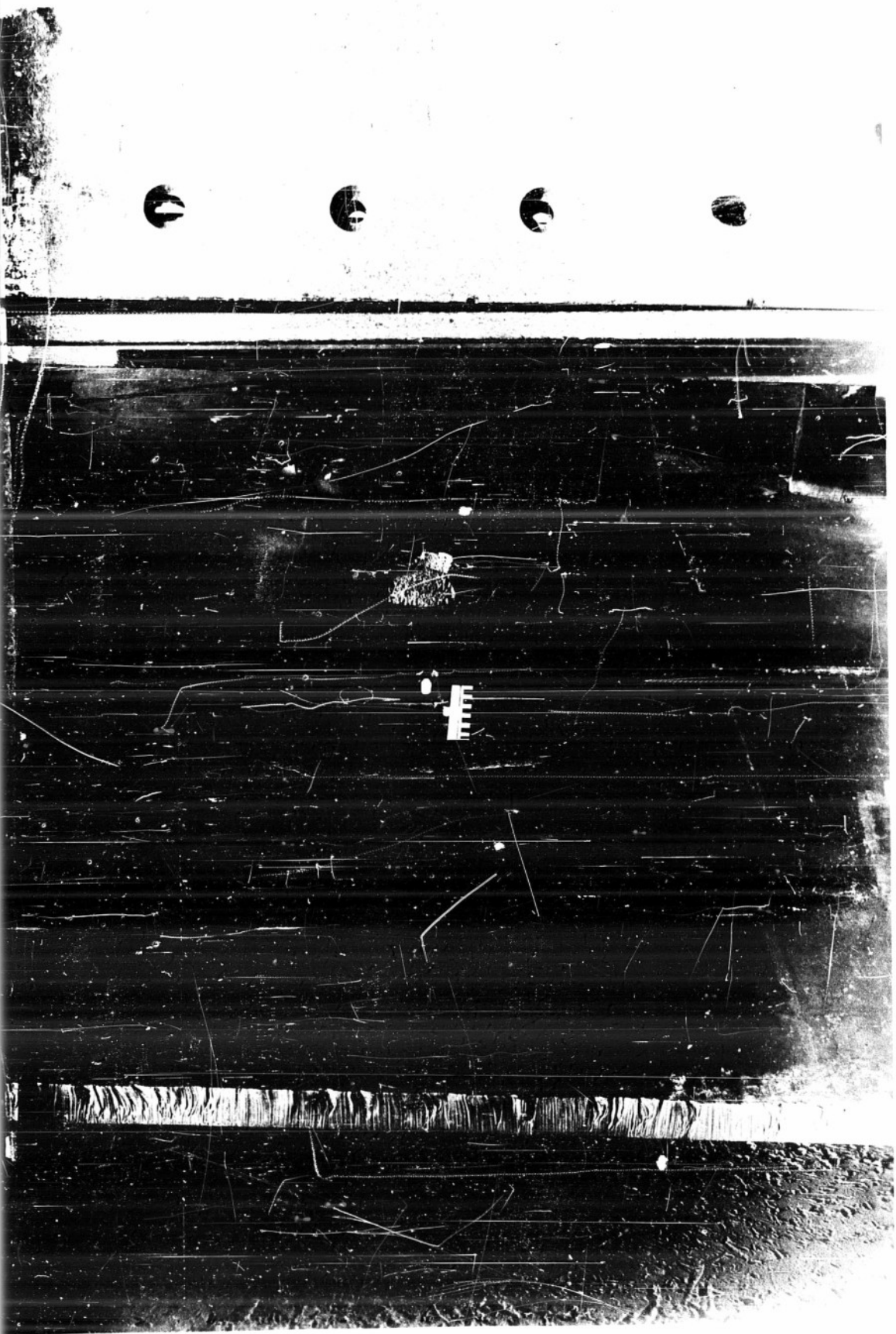
Rd. No. 6 Target 3 7/16" Class B Obl. 70°

Striking Velocity (f/s) 1702

Penetration Complete

Impact Dimensions Entrance 3" x 3/8" Exit 1" x 1 3/4"

Figure 7



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 4

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

← 6 INCHES →



NP9-51105

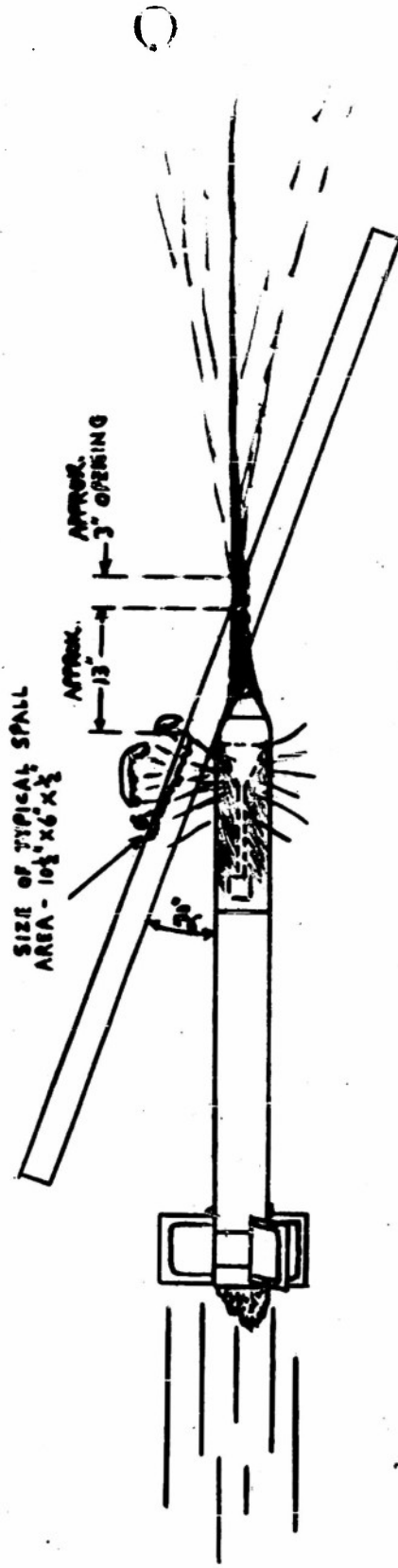


FIG. 9 - EXPERIMENTAL BALLISTIC TEST OF MODIFIED MK 149
ROCKET NOSE FUZE
VIEW: MOD. MK 149 FUZE IN 5.0 ROCKET HEAD MK 25 (SHAPED
CHARGE) WITH 5" HVAR MOTOR VS. 3.5 CLASS B ARMOR
PLATE AT 70° OBLIQUITY. NOTE SPALL THROWN FROM BACK
FACE DUE TO EXPLOSIVE WAVES TRANSMITTED THROUGH
PLATE ON IMPACTS ABOVE 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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NPG REPORT

Experimental Ballistic Test of Modified Mk 149 Nose

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