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

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

Copy No. 24

Task Assignment NPG-Re2b-11-1-52

Classification CONFIDENTIAL SECURITY INFORMATION

Experimental Ballistic Test of Modified Mk 149 Nose Fuze

[redacted]

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:

Part	Desired Velocity	Target	Obliquity
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

b. 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.

Experimental Ballistic Test of Modified Mk 149 Nose Fuze

TABLE OF CONTENTS

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:dlg 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:ebt 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:

Part	Desired Velocity	Target	Obliquity
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

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. Shkolnik	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.

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.

10. RESULTS:

a. The results are summarized below:

PART I

No. Rds.	Striking Velocity	Target	Obl.	Results
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

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 butt.

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.

PART D

CONCLUSIONS

11. 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.

Experimental Ballistic Test of Modified Mk 149 Nose Fuze

The tests upon which this report is based were conducted by:
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Commander, Naval Proving Ground

E. A. RUCKNER
Captain, USN
Ordnance Officer
By direction

CONFIDENTIAL

NPG REPORT NO. 1060

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

This report is transmitted for your information and file. Additional information may be obtained by addressing:

Chief, Washington USAF Engineering Field Office
Room 4D40, Main Navy Building
Washington 25, D.C.

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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SECURITY INFORMATION

NAVORD FORM 1883 (New 3/48)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 40093

IMPACT DATE 8-20-52

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 Plate #BD277.

Reference: NPG NOL ltr. dated

Reference: BuOrd ltr. NOL Sp/ltr DB:BS:dlr 49/NOL/X1-1 dated 6 June 1952

Task Assignment No. NPG-RE26-11-1-20 of dated

NPG Report No. 1060

PLATE TARGET

Gage 3"5 Class B
Maker Carnegie
No. BL277 Group -
Dimensions 124" X 40"

OBLIQUITY 55°

PENETRATION Complete
Thickness at impact 3"5
No. of impact on plate 4
Dist. from nearest impact 0
Dist. from near edge 75" and 181"
Impact area 2-1/2" X 4"
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"

ROCKET

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 Comp. B Wt. 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-S-51

LAUNCHER 1050Ft. Rocket Launcher

ROCKET PERFORMANCE

Flight Velocity, f/s: Mean 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-51102

Signed F.W. Kasdorf

F.W.Kasdorf
ORD.ENG.

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SECURITY INFORMATION

NAVORD FORM 1883 (New 3-54)

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 5"0 Rocket Head Mk.25 vs Plate #BD277.

Reference: NPG ltr [illegible] dated
Reference: BuOrd ltr. 3430 dated of 6 June 1952
Task Assignment No. NP-Re25-1-1-52 dated
NPG Report No. 1060

PLATE TARGET

Gage 3"5 Class B
Maker Carnegie
No. BD277 Group -
Dimensions 124" X 406"

OBLIQUITY 65°

PENETRATION Complete
Thickness at impact 3"5
No. of impact on plate 5
Dist. from nearest impact 17"
Dist. from near edges T69 and L68"
Impact area 3" X 6" 4" X 4-1/2"
Spall: Front 0 Back 8" X12"-13
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: Type Cast Comp B Wt. 16#
Fuzes Mk.149 No.24

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

MOTOR: Cal. 5" Mk. 10 Mod 5
Motor temp. 86° Wt. 83.2#

COMPLETE ROUND: Mark Mod
Wt. (as fired) 140.16#
Wt. (burned)

OTHER INFORMATION
ALN: RMDA-207-S-51

LAUNCHER 1050 Ft. Rocket Launcher

ROCKET PERFORMANCE

Flight Velocity, f/s: Mean 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. [illegible]-51102

CONFIDENTIAL
SECURITY [illegible]FICATION

Signed F. W. Kasdorf

F. W. Kasdorf
ORD. ENG.

NAVORD FORM 1883 (Nov 3/48)

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 5?0 Rocket Head Mk.25 vs Plate #BD277.

Reference: NPG ltr. dated
Reference: NOL Sodity DF:HSW:dlc NP/NOL/X1-1(26 Oct 1951) letter 3438 of 6 June 1952
Task Assignment No. NPG-Re2b-11-1-52 dated
NPG Digest No. 7060

PLATE TARGET

Gage 325 Class R
Maker Carnegie
No. BD277 Group
Dimensions 124" X 406"

OBLIQUITY 90°

PENETRATION Complete
Thickness at impact 325
No. of impact on plate 6
Dist. from nearest impact 28"
Dist. from near edges 62" and 142"
Impact area 4" X 8" 2 1/2" to 4 1/2"
Spall: Front 0 Back 0-172" to 2 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 Mod 1 No. - Wt. 51.16#
Maker Houdaille Corp.
Lot No. RHC2-7-HA-52
Filler: Tyt Cast Comp B Wt. 16#
Fuzes Mk.149 No.25

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

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
AIN: BuOrd-267-S-51

LAUNCHER 1050 Ft. Rocket Launcher

ROCKET PERFORMANCE

Flight Velocity, f/s: Mean Striking 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. NP9-51102 NPG-[illegible]

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SECURITY INFORMATION

Signed F.W. Kasdorf
F.W. Kasdorf
ORD. ENG.

NAVORD FORM 1883 (New 7/40)

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

Reference: NPG ltr. (262A) Ser 3033 dated

Reference: BUORD ltr NOL Sec ltr DP:RSJ:dlg NP/[illegible]/X1-1 dated 6 June 1952

Task Assignment No. NPG-Re26-11-1-52 dated

NPG Report No. 1027

PLATE TARGET

Gage 3"5 Class B
Maker Carnegie
No. BD277 Group -
Dimensions 124" X 406"

OBLIQUITY 75°

PENETRATION
Thickness at Impact 3"5
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 Shaped Charge
Mark 25 Mod 1 No. -Wt. 51.93#
Maker Houdaille Corp.
Lot No. RHCZ-7-HA-52
Filler: Type Cast Comp B Wt. 16#
Fuzes Mk.149 No.26

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

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

Flight Velocity, f/s: Mean 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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NAVORD FORM 1883 (Nov

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

Reference: NPG ltr. dated

Reference: BuOrd ltr. NOL Spdltr Dp:HS#:dlg NF/NOL/X1-1 dated

Task Assignment No. (2628) Ser 3438 of NPG-Re2b-11-1-12 dated 6 June 1952

PLATE TARGET NPG Target No. 1060

Gage 3"5 Class B
Maker Carnegie
No. BU277 Group -
Dimensions 124" X 406"

OBLIQUITY 70°

PENETRATION Complete
Thickness at impact 3"5
No. of impact on plate 9
Dist. from nearest impact 56"
Dist. from near edges 59" and 139"
Impact area 3" X 8"
Spall: Front 0 Back 2-1/2" X 6-1/2"
Dish 0 Spur 1-1/2" X 12"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge 0
Through opening 1" X 1-3/4"

ROCKET

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. - Wt. 51.10#
Maker Houdaille Corp.
Lot No. RHCZ -7-HA-52
Filler: Type Cast Comp B. 16#
Fuzes Mk.149 No.28

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

MOTOR: Cal. 5" Mk. 10 Mod 5
Motor temp. 86° Wt. 88.45#

COMPLETE ROUND: Mark Mod
Wt. (as fired) 139.55#
Wt. (burned)

OTHER INFORMATION
ALN: RMDA-267-8-51
" - " - "
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

CONFIDENTIAL
SECURITY INFORMATION

Signed F.W.Kasdorf
F.W.Kasdorf
ORD.ENG.

NAVORD FORM 1883 (Nov 3748)

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. [illegible] dated
Reference: BuOrd ltr. (262S) Ser 3438 dated
Task Assignment No. NPG Re2h-11-1-52 dated 6 June 1952
NPG Report No. 1050

PLATE TARGET

Gage 3"5 Class B
Maker Carnegie
No. BD277 Group -
Dimensions 124" X 406"

OBLIQUITY 70°

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

ROCKET

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. - Wt. 51.02#
Maker Houdaille Corp.
Lot No. RHC2-7-HA-51
Filler: Type Cast Comp B Wt. 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 ROUND: Mark Mod
Wt. (as fired) 139.42#.
Wt. (burned)

OTHER INFORMATION
ALN: RMDA-207-S-51
" - " - " - "

LAUNCHER 1050 Ft. Rocket Launcher

ROCKET PERFORMANCE

Flight Velocity, f/s: Mean 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.

CONFIDENTIAL
SECURITY INFORMATION

Signed F. W. Kasdorf

F.W.Kasdorf
ORD.ENG.

NAVORD FORM 1883 (Nov 3/48)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 10110

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 Sndltr DP:HSW:dlr NP/NOL/X1-1 dated
Reference: BuOrd ltr. (2628) Ser 3435 of dated 6 June 1952
Task Assignment No. NPG-Re2b-11-1-12 dated
NPG Report No. 10 ??

PLATE TARGET

Gage 3"5 Class B
Maker Carnegie
No. TT695 Group C-751-322
Dimensions 113" X 284"

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 4-1/2" X 5-1/2"
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 Houdaille Corp.
Lot No. RHCZ-7-HA-51
Filler: Type Cast Comp B Wt. 16#
Fuzes Mk.149 Mk.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 Velocity, f/s: Mean 1773 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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SECURITY INFORMATION

Signed F. W. Kasdorf
F.W.Kasdorf
ORD.ENG.

NAVORD FORM 1883 (Rev 3/48)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 40111

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.BPlate.

Reference: NPG ltr. _____ dated _____
Reference: BuOrd ltr. NOL Spdltr DPKHSW:dlc NP/NOL/X1- dated _____
Task Assignment No. (2628) Ser 3438 of _____ dated 6 June 1952

NPG-Re2b-11-1-12
NP-Proj. Ltr. No. 1060

PLATE TARGET

Gage 3"5 Class B
Maker Carnegie
No. TT695 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

Measurements

ROCKET

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. - Wt. 51.46#
Maker Houdaille Corp.
Lot No. HHC4-7-HA-51
Filler: Type Cast Comp B Wt. 16#
Fuzes Mk.149 No.31

Boosters 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 -267-3-51
" - " -"-"

LAUNCHER 1050 Ft. Rocket Launcher

ROCKET PERFORMANCE

Flight _____ Velocity, f/s: Striking (Mean) 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

SECURITY INFORMATION

Photo No. _____

Signed F. W. Kusdorf

F.W.Kusdorf

ORD.END.

1

NAVORD FORM 1883 (New 3/48)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 40112

IMPACT DATE 8-21-52

NPG TEST NOT-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 Splits DPM3M-dlg NP/NOL/X1 (2628) Ser 3438 of~~ dated
Reference: ~~BuOrd~~ ltr. dated
Task Assignment No. ~~NPG ReDe 11-1-12~~ dated 6 June 1952

NPG Report No. 1060

PLATE TARGET

Gage 3"5 Class B
Maker Carnegie
No. T7695 Group C-751-322
Dimensions 113" X38½"

OBLIQUITY 75°

PENETRATION Complete
Thickness at impact 3"75
No. of impact on plate 3
Dist. from nearest impact 23"
Dist. from near edges T.7" and L70"
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"

ROCKET

HEAD: Cal. 5" Type Shaped Charge
Mark 25 Mod 1 No. - Wt. 51.13#
Maker Houdaille Corp.
Lot No. RHCZ-7-HA-51
Filler: Type cast Comp Wt. 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: ~~Measured~~ 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:

Photo No. CONFIDENTIAL SECURITY INFORMATION

Signed F W Kasdorf
F.W.Kasdorf
ORD. ENG.

Experimental Ballistic Test of Modified Mk 149 Nose Fuse

TABLE I

SUMMARY OF RESULTS

Rd. No.	Date Fired 1952	Fuze No.	Rocket Head	Velocity (ft./sec.) Desired	Velocity (ft./sec.) Obtained	Obl.	Target	Fuze Action
				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	60°	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	1832	50°	1/8" MS	Dud
6	7-24	36	Mk 6	1800	1811	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

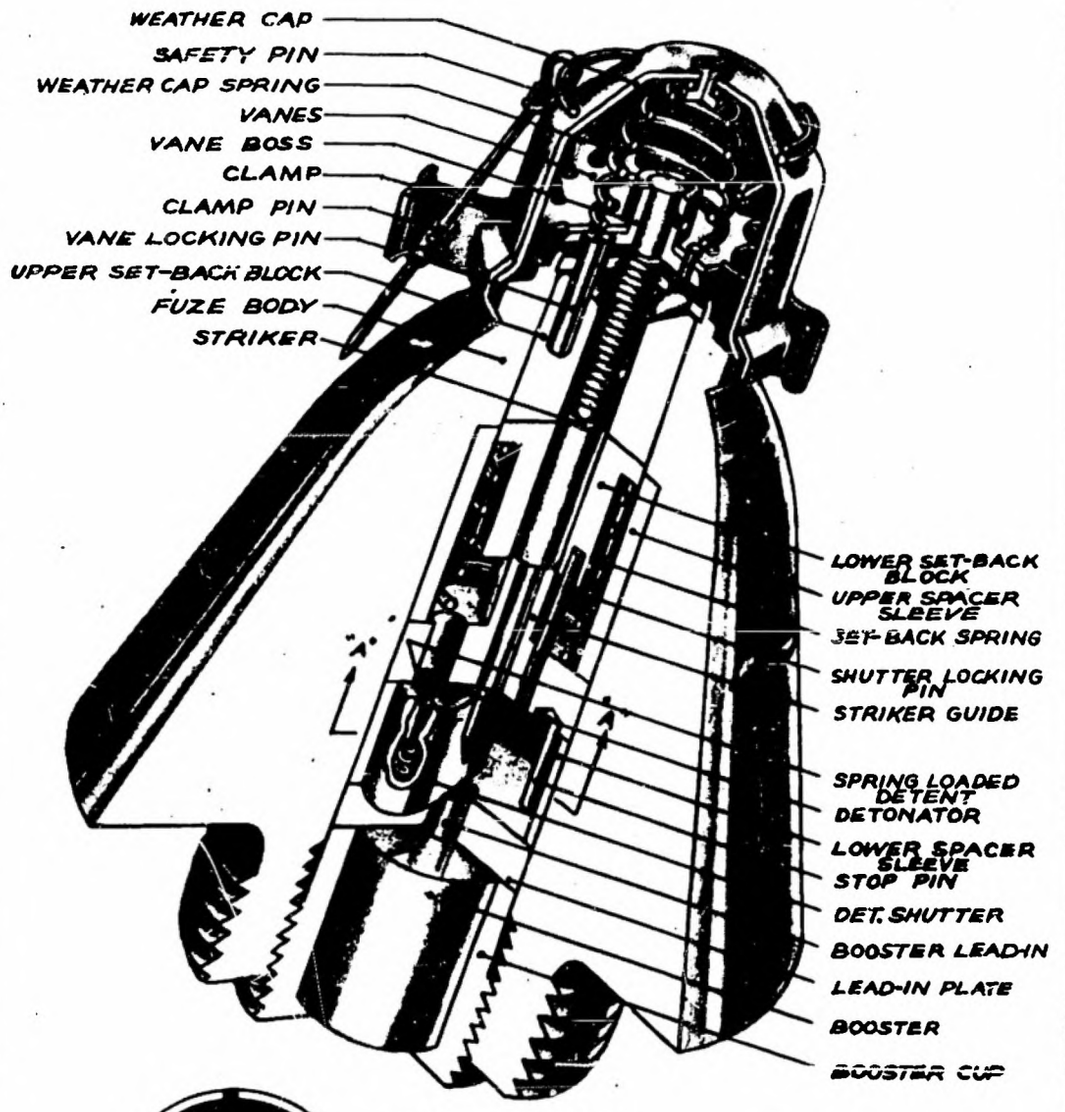
Experimental Ballistic Test of Modified Mk 149 Nose Fuze

TABLE I (Continued)

Rd. No.	Impact No.	Date Fired 1952	Fuze No.	Rocket Head	Velocity (ft./sec.) Desired	Velocity (ft./sec.) Obtained	Obl.	Target	Fuze Action
				PART III					
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

[redacted] CONFIDENTIAL

MARK 149
A.I.R. NOSE FUZE



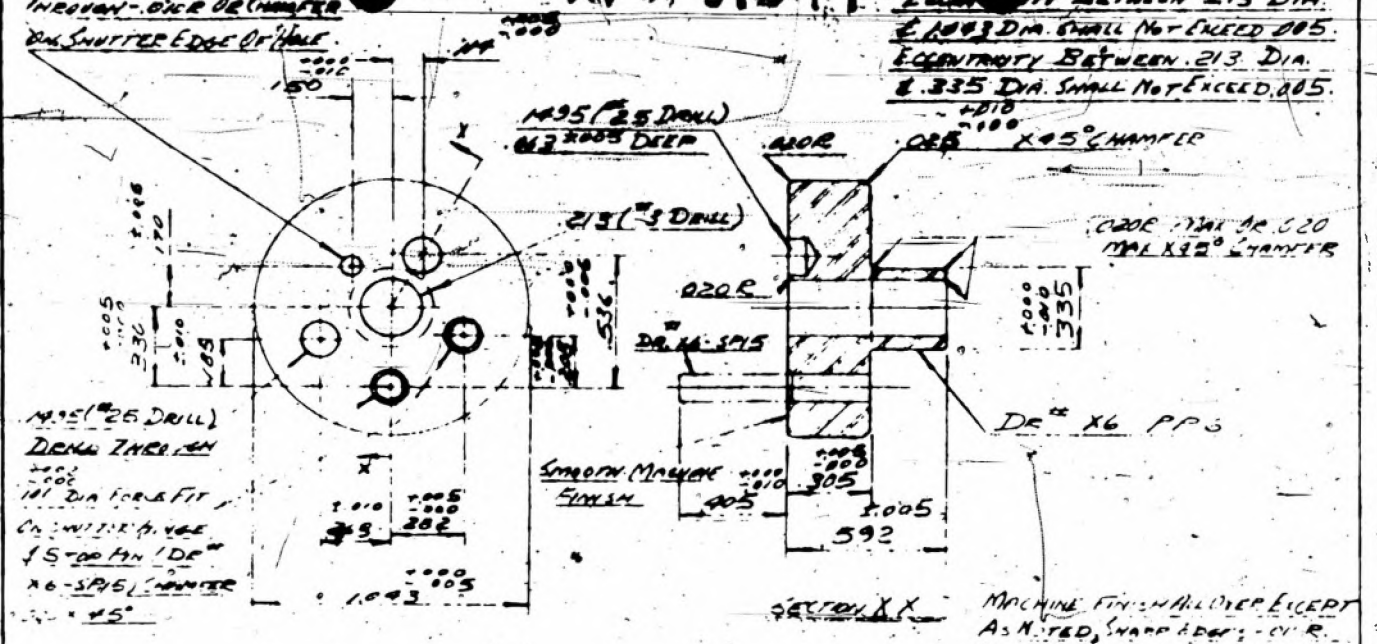
SECTION "A"—"A"

[redacted]

NP9-51099

.0785 (#41 DRILL) DRILL THROUGH - BREAK OR CHAMFER BRK SHUTTER EDGE OF HOLE

ECCENTRICITY BETWEEN .213 DIA. & .1093 DIA. SHALL NOT EXCEED .005.
ECCENTRICITY BETWEEN .213 DIA. & .335 DIA. SHALL NOT EXCEED .005.

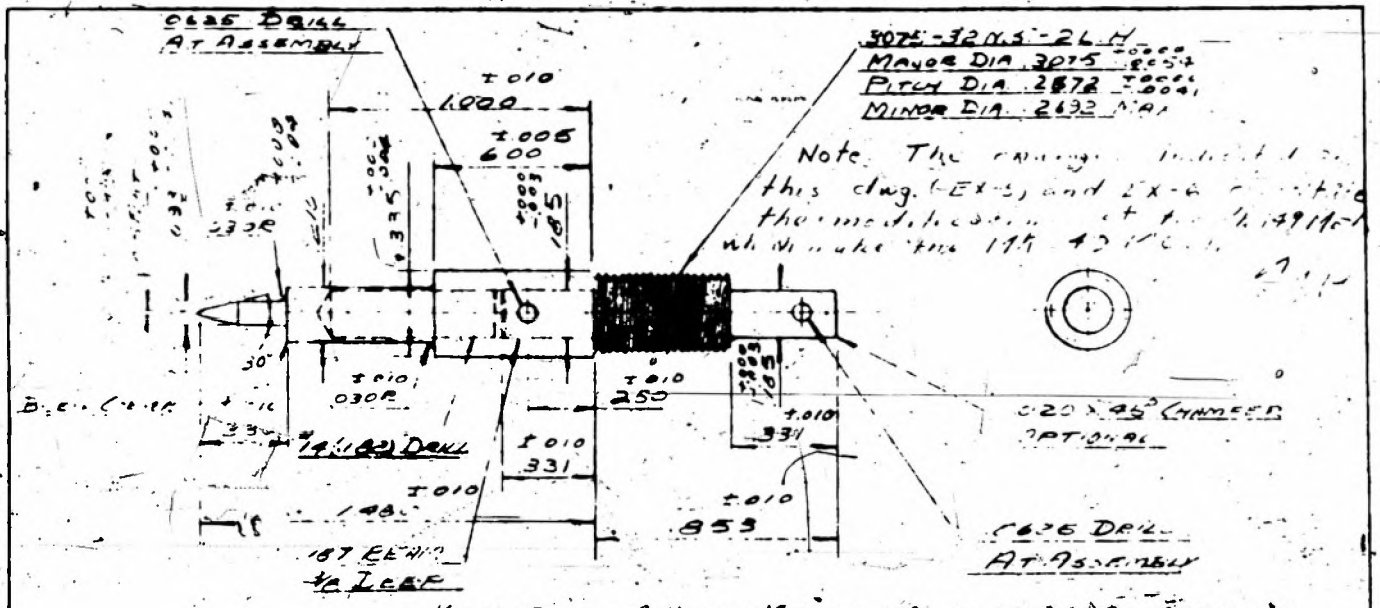


MACHINE FINISH ALL OVER EXCEPT AS NOTED, SHARP EDGES - 010 R. DIMENSIONS TO APPLY AFTER PLATING.

NOTE -
MAT'L STEEL B1112
FINISH FOR C.R. STEEL CADMIUM OR ZINC PLATE (.0005 MIN. THICKNESS)

NAME	FIRING PIN GUIDE ASS'Y (PROPOSED CHANGES)		
MAT.	SEE NOTE		
SWANK INC. ATTLEBORO, MASS.			
DRAWN BY NM	DATE 4-5-52		
CHECKED BY	DATE		
SCALE 2X	DWG. NO. EX-6		

LETTER	WAS	DATE	BY
CHANGES			



NOTE - EXCEPT AS NOTED MACHINE FINISH ALL OVER SHARP EDGES .01R.

MAT. - C.R. STEEL SAE 1035 OR SAE 1335 OR 9151 C-1137 CADMIUM PLATE .0005 MIN. THICKNESS.
ALT. - STAINLESS STEEL - SAE X51440 - NO PLATING -

FIG. 2

[redacted]

ENLARGED VIEW OF POINT

DIMENSIONS APPLY AFTER PLATING

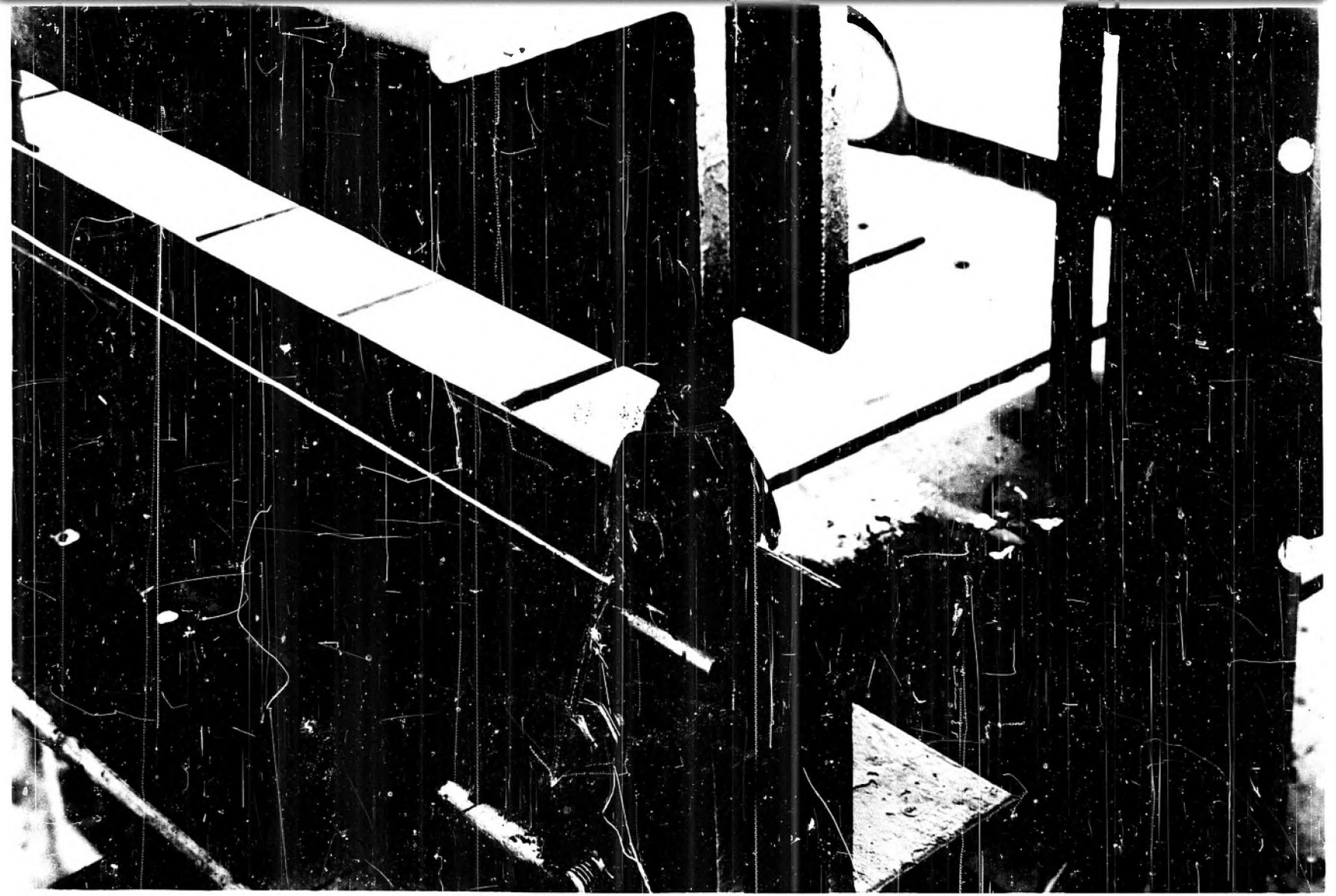
NAME	PROPOSED TWO-PIECE FIRING PIN 11/32 STOCK		
MAT.	SEE ABOVE		
SWANK INC. ATTLEBORO, MASS.			
DRAWN BY NM	DATE 5-5-52		
CHECKED BY	DATE		
SCALE 2:1	DWG. NO. EX-5		

LETTER	WAS	DATE	BY
CHANGES			

Figure 2

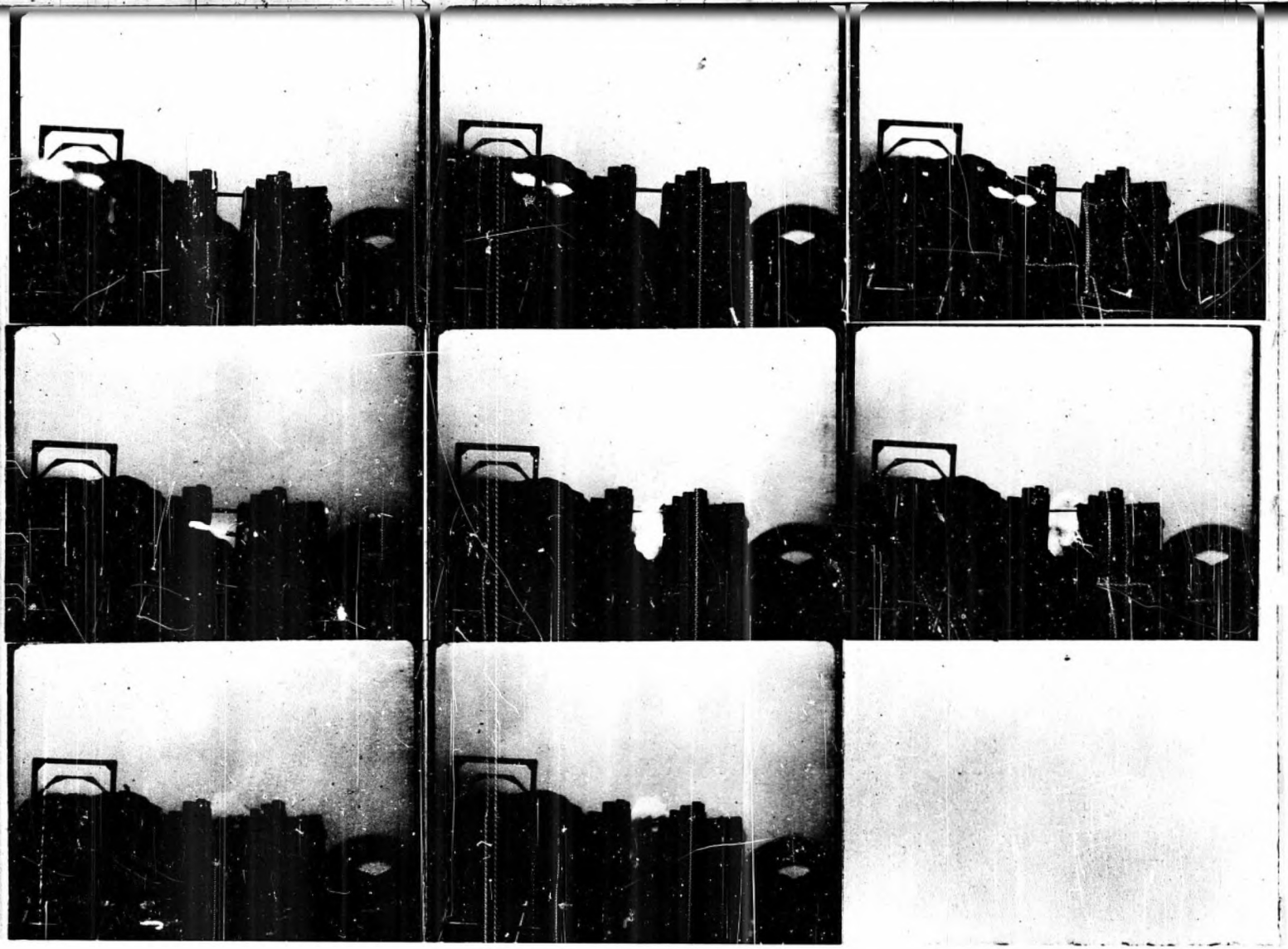
Experimental test of Modified Mk 149 Nose Fuze in 5"0 Rocket Head Mk 6 - smoke puff loaded. View: Dead catbird (weighing 1.1 ozs) suspended in rails at muzzle end of launcher to test possibility of fuze action upon impact with such an obstacle.

Figure 4



Modified Mk 149 nose fuze functioning HC upon impact with a 3/8" MS plate at 75° obliquity in 5"/0 Rocket Head Mk 6 - smoke puff loaded. Action viewed by a 35mm Mitchell Camera at 100 frames per sec. Velocity 1810 ft/sec.

Figure 5



NP9-51102 21 August 1952

View of 3".5 Class B armor after impacts with 5".0 Sha
Mk 149 nose fuze. Note bulge behind opening on rd.

Rd. No.	Target	Obl.	Striking Velocity (f/s
1	3 7/16" Class B	55°	1732
2	3 7/16" Class B	65°	1686
3	3 7/16" Class B	70°	1698

Figure 6

ped Charge Rocket Heads Mk 25 containing the Modified
2 and large spall resulting from rd. 3.

)	Penetration	Impact Dimensions Entrance	Exit
	Complete	2 1/2"x4"	2 3/4"x3"
	Complete	3"x6"	2"x2 3/4"
	Complete	4"x8"	1"x1 5/8"

NP9-51103 21 August 1952 CONFIDENTIAL - SECURITY INFORMATION

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.	Target	Obl.	Striking Velocity (f/s)	Penetration	Impact Dimensions Entrance	Impact Dimensions Exit
6	3 7/16" Class B	70°	1702	Complete	3"x8"	1"x1 3/4"

Figure 7

NP9-51104 21 August 1952 CONFIDENTIAL SECURITY INFORMATION

Experimental test of modified Mk 149 Nose Fuze in 5"0 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

NP9-51105

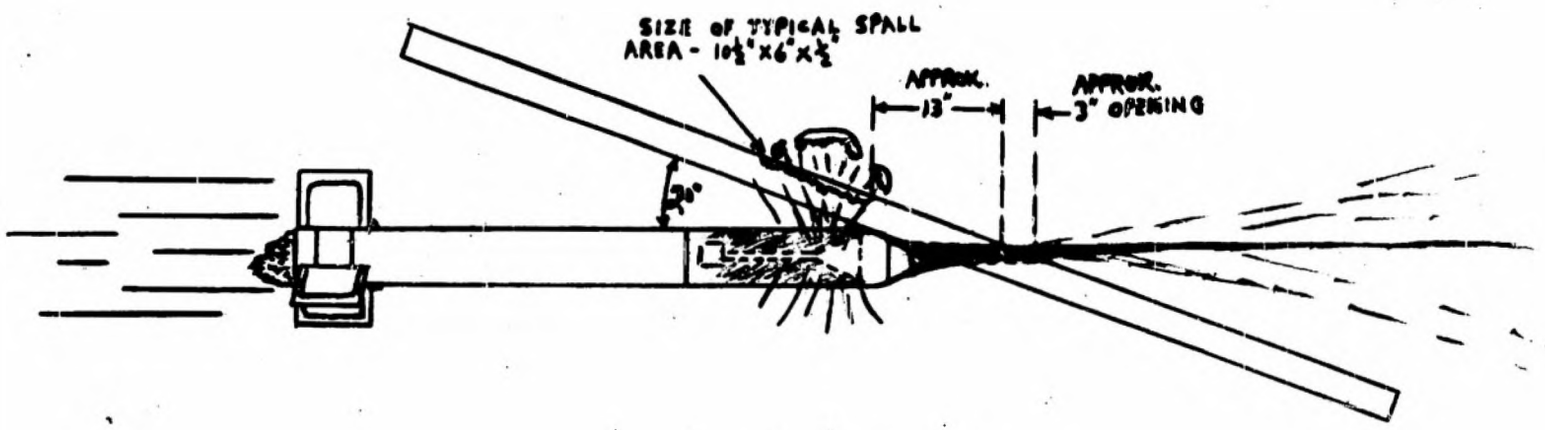


FIG. 9 - EXPERIMENTAL BALLISTIC TEST OF MODIFIED MK 149 ROCKET NOSE FUZE

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.

CONFIDENTIAL
SECURITY INFORMATION

27 AUGUST 1952
R.G.S.

Experimental Ballistic Test of Modified Mk 149 Nose Fuze

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