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U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

REPORT NO. 1035

WARHEADS FOR AIR TARGET GUIDED MISSILES;
TESTING OF

th Partial Report

TERRIER WARHEAD MK 5 MOD 0;
FRAGMENTATION AND DROP TEST OF

HAL Report

oy No. 2

Task

Assignment NPG-Ra3f-607-1-52

Classification CONFIDENTIAL
SECURITY INFORMATION

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FORMERLY
(NAVY RESEARCH SECTION)

SEP 24 1952

54AA-23797

SECURITY INFORMATION

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of
-----PART ASYNOPSIS

1. This test was conducted to determine the fragmentation and drop characteristics of the Composition B loaded Terrier Warhead Mk 5 Mod 0 for guided missiles at -65°F. and at ambient temperatures.
2. a. No significant differences were observed in the fragmentation characteristics of the Terrier Warhead Mk 5 Mod 0 when detonated at -65°F. and ambient temperatures.
b. All five warheads that were dropped from 40 feet suffered some distortion. The central conduit tubes were not damaged.

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Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE OF CONTENTS

	<u>Page</u>
SYNOPSIS	1
TABLE OF CONTENTS.	2
AUTHORITY.	3
REFERENCES	3
BACKGROUND	3
OBJECT OF TEST	3
PERIOD OF TEST	3
REPRESENTATIVES PRESENT.	3
DESCRIPTION OF ITEM UNDER TEST	4
PROCEDURE.	5
RESULTS AND DISCUSSION	6
CONCLUSIONS.	7
APPENDIX A - WARHEAD DRAWINGS, PHOTOGRAPHS	FIGURES 1-2 (Incl)
APPENDIX B - MASS DISTRIBUTION, PHOTOGRAPHS.	FIGURES 3-4 (Incl)
APPENDIX C - SPACE DISTRIBUTION DATA	TABLE I 1 (Only) TABLE II 1 (Only)
APPENDIX D - FRAGMENT VELOCITY DATA.	TABLE III 1-2 (Incl) TABLE IV 1-2 (Incl) TABLE V 1-3 (Incl) TABLE VI 1-3 (Incl) TABLE VII 1-3 (Incl) TABLE VIII 1-3 (Incl) TABLE IX 1-2 (Incl)
APPENDIX E - DROP TEST PHOTOGRAPH.	FIGURE 5
DROP TEST DATA.	1 (Only)
APPENDIX F - DISTRIBUTION.	1-2 (Incl)

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Terrier Warhead Mk 5 Mod O; Fragmentation and Drop Test of
-----PART BINTRODUCTION

1. AUTHORITY:

This test was authorized by reference (a) and conducted under Task Assignment NPG-Re3f-607-1-52, reference (b).

2. REFERENCES:

- a. NOL Conf ltr NP/NOL/X11(546) TF:RHS:mew Ser 0326 of 12 February 1952
- b. BUORD Conf ltr NP9 Re3f-EJHL:edb Ser 25777 of 18 September 1951
- c. NPG Conf Report No. 911 of 28 January 1952
- d. NPG Conf Report No. 339 of 15 December 1951

3. BACKGROUND:

a. Reference (b) authorized the Naval Proving Ground to work directly with the Naval Ordnance Laboratory in the development and fragmentation tests of guided missile warheads.

b. The standard construction and fragment characteristics of the Terrier Warhead Type F were reported in references (c) and (d). Fragmentation and drop tests of the Terrier Warhead Mk 5 Mod O (the production model of Terrier Warhead Type F) at both ambient and -65°F. temperatures are reported herein.

4. OBJECT OF TEST:

This test was conducted to determine the fragmentation and drop characteristics of the Composition B loaded Terrier Warhead Mk 5 Mod O for guided missiles at -65°F. and ambient temperatures.

5. PERIOD OF TEST:

- | | |
|-------------------------------------|------------------|
| a. Date of Project Letter | 12 February 1952 |
| b. Date Necessary Material Received | 18 March 1952 |
| c. Date Commenced Test | 26 March 1952 |
| d. Date Test Completed | 14 May 1952 |

6. REPRESENTATIVES PRESENT:

This test was witnessed by Messrs. R. H. Suessle and D. W. Johnson representing the Naval Ordnance Laboratory.

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Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

PART CDETAILS OF TEST

7. DESCRIPTION OF ITEM UNDER TEST:

a. Terrier Warhead Mk 5 Mod 0 is a production model of the Terrier Warhead Type F, reference (c). It is constructed according to Bureau of Ordnance Confidential Sk 318051, Figure 1, 214835 in length, tapered from 104412 O.D. at the nose to 134500 O.D. at the base, and 04409 wall thickness. The warhead contained a 149 diameter central conduit tube. The outer shell consisted of 54 notched rings which were copper-hydrogen brazed together.

b. For rings 1 through 12, the notches were spaced 04718 $\pm$ 04025 on centers entirely around each ring. For rings 13 through 54, the notches were spaced 04390 $\pm$ 04025 on centers entirely around each ring. The rings 1 through 12 were designed to produce 536 fragments weighing approximately 13.3 grams each and rings 13 through 54 were designed to produce 4056 fragments approximately 7.0 grams each. A sketch of ring details is shown in Figure 2. Each ring was 04375 thick and had a notch depth of 04218. Four rows of tack weld held the rings together during brazing.

c. The warheads were loaded with Composition B-1 at the Naval Mine Depot, Yorktown, Virginia. The weights and test conditions are as follows:

Rd. No.	Ser. No.	Temp. (°F.)	Test	Empty Wt. (lbs.)	Hot Melt (lbs.)	Filler Wt. (lbs.)	Total Wt. (lbs.)
1	13	-65°	Space	100.50	2.78	114.77	218.05
2	28	-65°	Space	99.50	3.90	113.66	216.06
1	16	*Ambient	Space	98.97	3.01	113.67	215.65
2	35	*Ambient	Space	100.33	3.15	114.08	217.56
3	46	**Ambient	Space	100.06	3.14	113.67	216.87
4	41	**Ambient	Space	99.40	3.13	113.49	216.02
5	43	**Ambient	Space	100.52	2.78	114.56	217.76
1	56		Drop	99.84	3.27	113.73	216.84
2	47		Drop	100.78	3.25	113.11	217.14
3	61		Drop	99.36	3.26	113.97	216.59
4	54		Drop	100.95	3.22	113.47	217.64
5	44		Drop	100.73	2.85	113.97	217.55

*Ambient 49°

**Ambient 60°

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Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

8. PROCEDURE:

a. Initiation was accomplished by using a 129 gram tetryl booster EX 2 Mod 0, 1.25 diameter by 4.50 long, and a special engineer's blasting cap. The booster was placed 7-3/8" from the forward end of the central conduit tube and initiated from the rear. The booster position for the warheads reported in reference (d) was 8-7/8" from the extreme front end of the warhead. The change in booster positions had some effect on the fragment space distribution.

b. Space distribution data were obtained in a 60' radius semicircular arena having 1/8" mild steel panels 5' high and marked off into 5° polar angle zones about the axis of the warhead with the nose end pointing toward 0°.

c. Velocity determinations were obtained by using three 35mm Fastax Cameras; Camera #1 covering the polar angle zone 55° to 120°, Camera #2 covering the zone from 0° to 55°, and Camera #3 covering the zone from 120° to 180°.

d. Sample fragment mass distribution determinations were made in a 4' x 8' cane fiberboard pack placed in the beamspray (80° to 87-1/2°) at a radius of 60'.

e. Drop damage assessment tests were conducted on five rounds of unfuzed warheads at ambient temperatures by dropping them from a forty (40) foot tower onto a two inch thick steel armor plate. The orientation of these drops was as follows: one nose up drop, one nose down drop, one side drop, one drop 45° from nose up, and one drop 45° from nose down.

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

c. Approximately 1/4 of the fragments of design size (in groups of two rounds) or larger were double cubes bonded by the brazed joint. Sample beam spray fragments which were recovered in zone 80°-87 1/2° are shown in Figures 3 and 4. One recovered fragment was of a double cube size with no visible notch. Radiographic data supplied by the Naval Ordnance Laboratory indicated that some notches were missing in rings Nos. 13 to 54. The average weights of the recovered fragments in the 5-10 gram group of the -65°F. and ambient temperature warheads were 6.9 and 7.0 grams respectively.

d. A drop test photograph is shown in Figure 5 and data are detailed in Appendix (E). In no case was there damage more serious than slight distortion of the shape of the warhead.

PART DCONCLUSIONS

10. a. No significant differences were observed in the fragmentation characteristics of the Terrier Warhead Mk 5 Mod 0 when detonated at -65°F. and ambient temperatures.

b. All five warheads that were dropped from 40 feet suffered some distortion. The central conduit tubes were not damaged.

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

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

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U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

Forty-Ninth Partial Report
on
Warheads for Air Target Guided Missiles;
Testing of

Final Report
on
Terrier Warhead Mk 5 Mod 0;
Fragmentation and Drop Test of

Project No.: NPG-Re3f-607-1-52
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SEP 15 1952

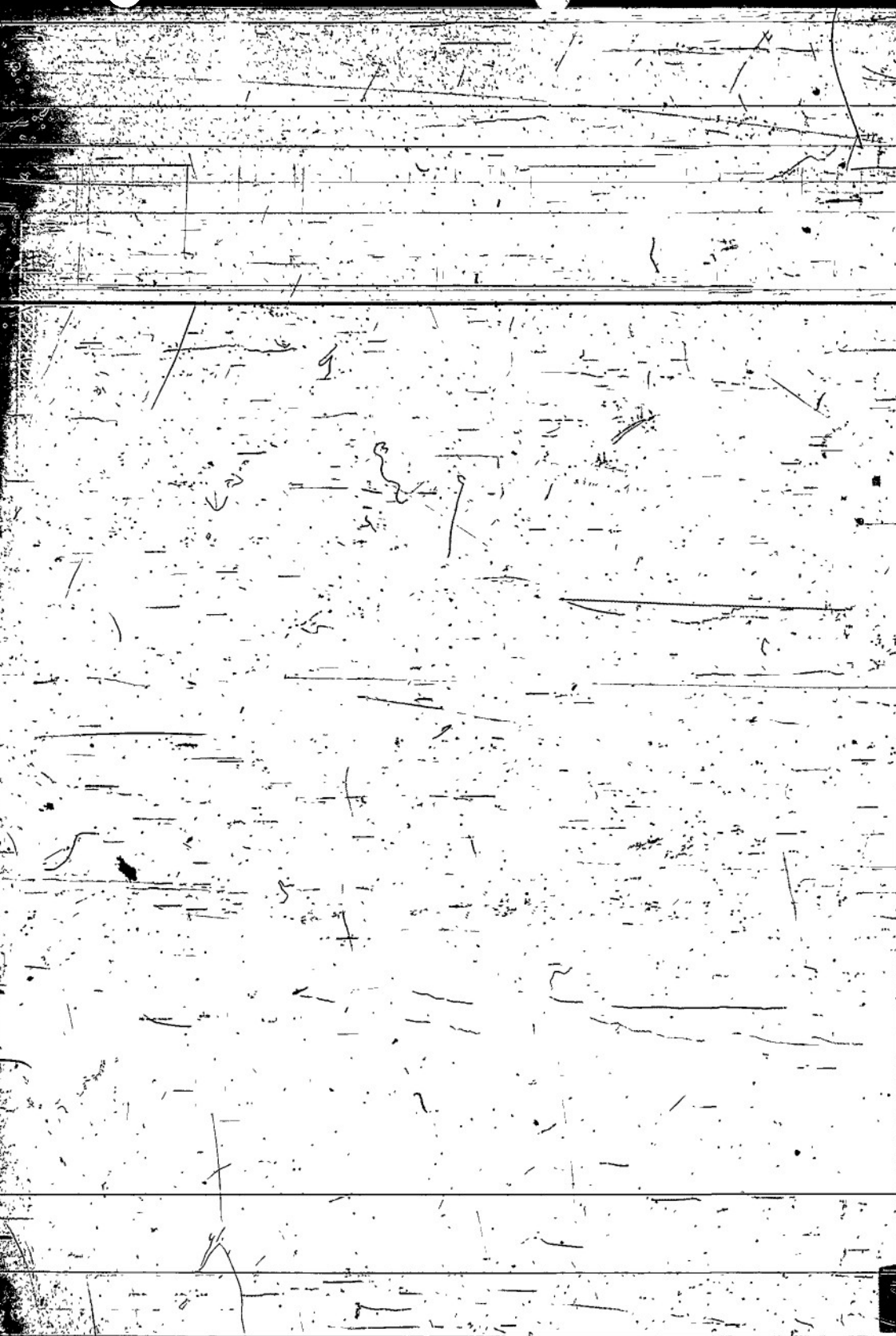
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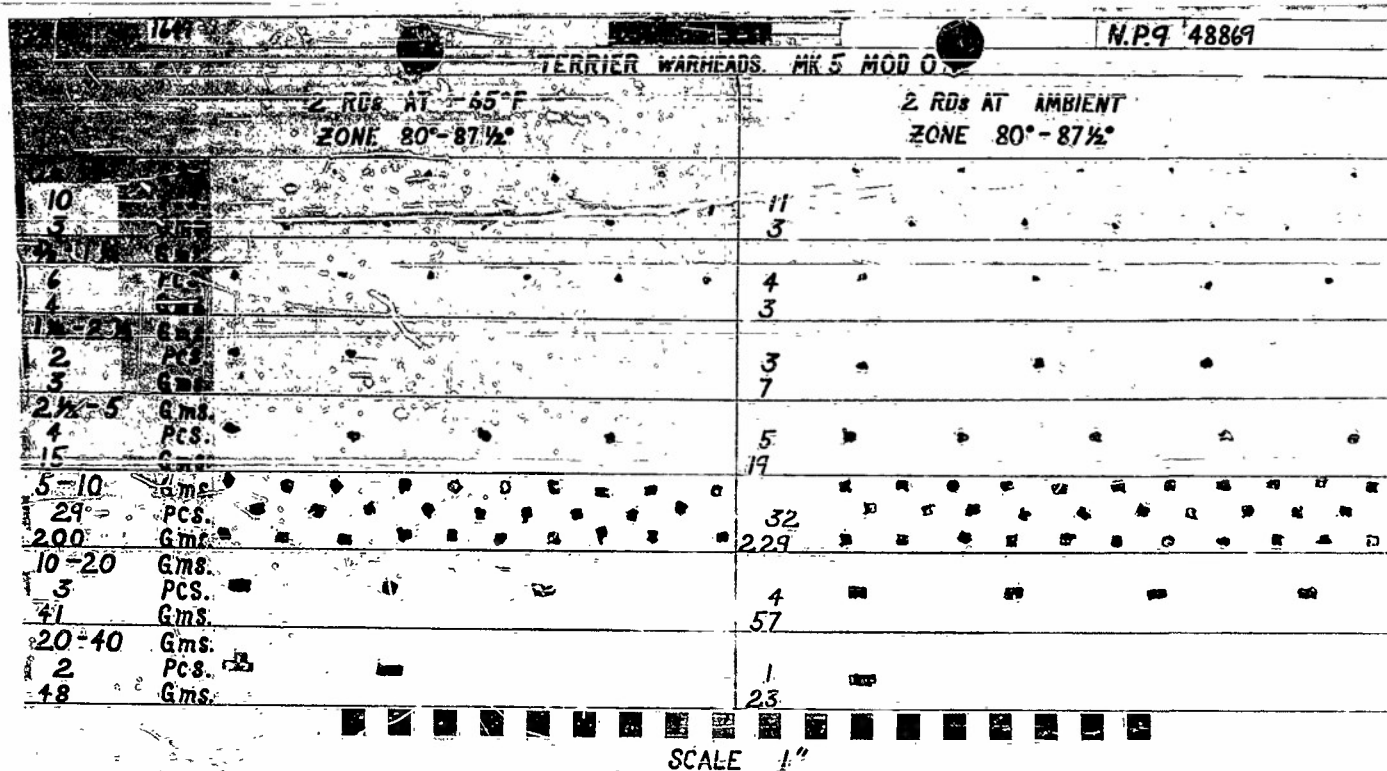
NP9-45754

112 June 1951

Terrier Warhead Type F, BUORD Confidential Sketch 348051.
Figure 1

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NP9-48869

27 MARCH 1952

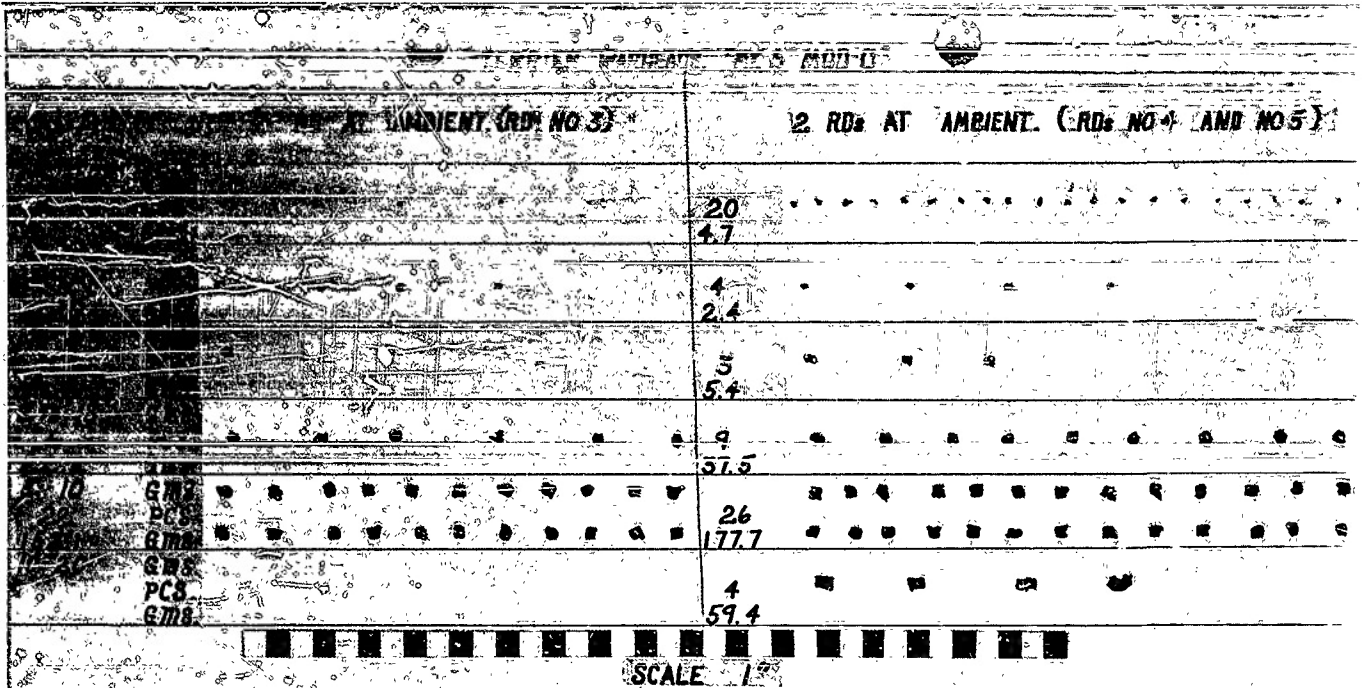
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Sample beamspray fragments (80° - 87½°) from the Terrier Warhead

Mk 5, Mod 0 (rounds 1 and 2) at ambient and -65°F. temperatures

FIGURE 2



NP9-49230

14 MAY 1952.

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Sample beamspray fragments (80° - 87-1/2°) from the Terrier Warhead
Mk 5 Mod 0 (Rounds 3-5) at ambient temperature.

FIGURE 4

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NPG REPORT NO. 1035

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE 1

SPACE DISTRIBUTION DATA

Terrier Warheads, Mk 5 Mod 0, Composition B loaded at -65°F.,
 60° Radius Space Arana
 1/8" MS panels 5' high

	27 March 1952		Total	Average Impacts Per		
	Rd. 1	Rd. 2		5° Zone on Panels	Total 5° Zone	Unit Solid Angle
0-5	40	48	88	44	148	6200
5-10	7	28	35	17.5	169	2360
10-15		1	1	0.5	8	70
15-20		3	3	1.5	34	210
20-25	3	2	5	2.5	72	340
25-30						
30-35						
35-40	2		2	1	50	140
40-45						
45-50	4		4	2	110	300
50-55						
55-60						
60-65	2		2	1	70	140
65-70	1		1	0.5	30	70
70-75	8	6	14	7	500	1000
75-80	21	22	43	21.5	1580	2960
80-85	23	23	46	23	1720	3200
85-90	13	12	25	12.5	941	1720
90-95	11	10	21	10.5	792	1450
95-100	6	6	12	6	400	800
100-105	3	4	7	3.5	250	480
105-110	4	1	5	2.5	180	340
110-115		4	4	2	140	280
115-120						
120-125						
125-130		3	3	1.5	90	210
130-135		1	1	0.5	30	70
135-140						
140-145						
145-150		1	1	0.5	20	70
150-155	1	3	4	2	70	300
155-160						
160-165	1	1	2	1	20	140
165-170	19	9	28	14	230	1910
170-175	32	34	66	33	320	4500
175-180	88	109	197	98.5	332	13900

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APPENDIX C

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NPG REPORT NO. 1035

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE II

SPACE DISTRIBUTION DATA

Terrier Warheads, Mk 5 Mod 0, Composition B loaded
at ambient temperature. 60' Radius Space Arena
1/8" MS panels 5' high

	26 March 1952		14 May 1952			Total	Average Impacts Per		
	Rd. 1	Rd. 2	Rd. 3	Rd. 4	Rd. 5		5° Zone on Panels	Total 5° Zone	Unit Solid Angle
0-5	28	16	25	21	15	105	21	71	3000
5-10	18	12	10	2	7	49	9.8	94	1320
10-15	1	1				2	0.4	5	50
15-20					1	1	0.2	5	30
20-25									
25-30									
30-35	2			3	1	6	1.2	49	165
35-40					2	2	0.4	20	55
40-45									
45-50	1			1		2	0.4	20	55
50-55			1			1	0.2	10	30
55-60		1				1	0.2	10	30
60-65	1	2		2	1	6	1.2	80	165
65-70		3		3		6	1.2	84	165
70-75	9	9	6	6	6	36	7.2	520	980
75-80	19	22	27	21	18	107	21.4	1580	2940
80-85	16	13	18	18	10	75	15	1120	2100
85-90	13	6	14	15	9	57	11.4	858	1570
90-95	12	12	13	6	13	56	11.2	843	1540
95-100	5	5	7	3	3	23	4.6	340	630
100-105	5	2	1	3	3	14	2.8	210	390
105-110	2	2	1			5	1	70	140
110-115	1	4		2		7	1.4	98	193
115-120	1			1		2	0.4	30	55
120-125		1	3			4	0.8	50	1100
125-130	2			1	1	4	0.8	50	1100
130-135									
135-140		1		1		2	0.4	20	55
140-145			2			2	0.4	20	55
145-150		1				1	0.2	8	30
150-155	3	1	1			5	1	30	140
155-160	1		5			6	1.2	30	160
160-165	3	1	6	2	6	18	3.6	81	490
165-170	25	11	9	12	15	72	14.4	234	1970
170-175	43	61	30	12	33	179	55.8	538	7550
175-180	60	56	81	59	82	328	65.6	221	9250

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APPENDIX C

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of
-----TABLE IIIFRAGMENT VELOCITY DATA

60' Arena Space Test

35mm Fastax Camera #2

2970 frames per sec.

Rd. 1, Terrier Warhead Mk 5 Mod 0
Serial No. 13 at -65°F.

Comp. B

Total Weight 218.05 Lbs.

Filler Weight 114.77 Lbs.

<u>Frame in Which Hit Occurred</u>	<u>No. Nose Fragments</u>	<u>Velocity (f/s)</u>
9	1	19,800
10	1	17,820
11	2	16,200
12	3	14,850
13	2	13,710
14	2	12,730
15	2	11,880
16	5	11,140
18	2	9,900
19	1	9,380
Median		13,250
Average		13,150

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE III (Continued)

60° Arena Space Test

35mm Fastax Camera #3

2850 frames per sec.

Rd. 1, Terrier Warhead Mk 5 Mod 0
Serial No. 13 at -65°F.

Comp. B

Total Weight 218.05 Lbs.

Filler Weight 114.77 Lbs.

<u>Frame in Which Hit Occurred</u>	<u>No. Base Fragments</u>	<u>Velocity (f/s)</u>
15	2	11,400
16	5	10,690
17	4	10,060
18	5	9,500
19	3	9,000
20	6	8,550
21	4	8,140
22	3	7,770
23	4	7,430
24	5	7,130
25	1	6,840
26	1	6,580
28	1	6,110
29	2	5,900
30	4	5,700
31	1	5,520
32	1	5,340
33	2	5,180
34	1	5,030
Median		8,200
Average		8,070
CONFIDENTIAL SECURITY INFORMATION	2	APPENDIX D

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Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE IV

FRAGMENT VELOCITY DATA

60' Arena Space Test

35mm Fastax Camera #2

3000 frames per sec.

Rd. 2, Terrier Warhead Mk 5 Mod 0
Serial No. 28 at -65°F.

Comp. B

Total Weight 216.06 Lbs.

Filler Weight 113.66 Lbs.

<u>Frame in Which Hit Occurred</u>	<u>No. Nose Fragments</u>	<u>Velocity (f/s)</u>
9	1	20,000
11	3	16,360
12	3	15,000
13	1	13,850
14	2	12,860
15	2	12,000
16	1	11,250
17	4	10,590
18	3	10,000
19	7	9,470
20	4	9,000
21	3	8,570
22	4	8,180
Median		10,350
Average		11,100

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Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE IV (Continued)

60° Arena Space Test

35mm Fastax Camera #2

2820 frames per sec.

Rd. 2, Terrier Warhead Mk 5 Mod 0
Serial No. 28 at -65°F.

Comp. B

Total Weight 216.06 Lbs.

Filler Weight 113.66 Lbs.

<u>Frame in Which Hit Occurred</u>	<u>No. Base Fragments</u>	<u>Velocity (f/s)</u>
15	1	11,280
16	1	10,580
17	8	9,950
18	5	9,400
19	6	8,910
20	4	8,460
22	4	7,690
23	5	7,360
24	3	7,050
25	1	6,770
26	2	6,510
27	2	6,270
28	2	6,040
29	2	5,830
30	1	5,640
31	2	5,460
32	3	5,290
Median		8,280
Average		7,940

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NPG REPORT NO. 1035

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE V

FRAGMENT VELOCITY DATA

60° Arena Space Test

35mm Fastax Camera #1

2850 frames per sec.

Rd. 1, Terrier Warhead Mk 5 Mod 0
Serial No. 16 at Ambient Temp.

Comp. B

Total Weight 215.65 Lbs.

Filler Weight 113.67 Lbs.

<u>Zone</u>	<u>Frame in Which Hit Occurred</u>	<u>No. Beam Fragments</u>	<u>Velocity (f/s)</u>
75°-80°	28	6	6,110
80°-85°	28	3	6,110
75°-80°	29	7	5,900
80°-85°	29	3	5,900
85°-90°	29	3	5,900
75°-80°	30	2	5,700
90°-95°	30	2	5,700
90°-95°	31	2	5,520
75°-80°	32	1	5,340
70°-75°	34	2	5,030
75°-80°	36	2	4,750
65°-70°	39	1	4,380
70°-75°	41	1	4,170
60°-65°	43	1	3,980
65°-70°	43	1	3,980
70°-75°	43	1	3,980
Median			5,900
Average			5,550

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Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE V (Continued)

60° Arena Space Test

35mm Fastax Camera #2

2820 frames per sec.

Rd. 1, Terrier Warhead Mk 5 Mod 0
Serial No. 16 at Ambient Temp.

Comp. B

Total Weight 215.65 Lbs.

Filler Weight 113.67 Lbs.

<u>Zone</u>	<u>Frame in Which Hit Occurred</u>	<u>No. Nose Fragments</u>	<u>Velocity (f/s)</u>
0°-5°	16	2	10,580
0°-5°	18	1	9,400
5°-10°	19	1	8,910
0°-5°	19	4	8,910
0°-5°	20	1	8,460
5°-10°	20	2	8,460
5°-10°	21	1	8,060
5°-10°	22	1	7,690
5°-10°	23	1	7,360
10°-15°	24	1	7,050
5°-10°	24	1	7,050
5°-10°	26	2	6,510
0°-5°	26	1	6,510
5°-10°	27	1	6,270
0°-5°	29	1	5,830
0°-5°	30	2	5,640
Median			8,110
Average			7,850

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE V (Continued)

60' Arena Space Test

35mm Fastax Camera #3

2940 frames per sec.

Rd. 1, Terrier Warhead Mk 5 Mod 0

Comp. B

Serial No. 16 a Ambient Temp.

Total Weight 215.65 Lbs.

Filler Weight 113.67 Lbs.

Frame in Which
Hit OccurredNo. Base FragmentsVelocity (f/s)

18	6	9,800
19	4	9,280
20	9	8,820
21	6	8,400
22	4	8,020
23	2	7,670
24	6	7,350
25	5	7,060
26	2	6,780
27	4	6,530
28	5	6,300
29	3	6,080
30	6	5,880
31	1	5,690
32	3	5,510
33	2	5,350
34	4	5,190
35	2	5,040
36	4	4,900

Median

7,170

Average

7,190

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3

APPENDIX D

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE VI (Continued)

60' Arena Space Test

35mm Eastax Camera #2

2850 frames per sec.

Rd. 2, Terrier Warhead Mk 5 Mod 0
 Serial No. 35 at Ambient Temp.

Comp. B

Total Weight 217.56 Lbs.

Filler Weight 114.08 Lbs.

<u>Frame in Which Hit Occurred</u>	<u>No. Nose Fragments</u>	<u>Velocity (f/s)</u>
10	2	17,100 (
11	2	15,550
12	3	14,250
13	3	13,150
14	1	12,210
15	3	11,400
16	2	10,690
17	4	10,060
18	2	9,500
19	1	9,000
20	1	8,550
21	1	8,140
22	1	7,770
Median		11,700
Average		11,850

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NPG REPORT NO. 1035

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE VI (Continued)

60° Arena Space Test

35mm Fastax Camera #3

2970 frames per sec.

Rd. 2, Terrier Warhead Mk 5 Mod 0

Comp. B

Serial No. 35 at Ambient Temp.

Total Weight 217.56 Lbs.

Filler Weight 114.08 Lbs.

<u>Frame in Which Hit Occurred</u>	<u>No. Base Fragments</u>	<u>Velocity (f/s)</u>
15	2	11,880
16	1	11,140
17	1	10,480
18	1	9,900
19	5	9,380
20	5	8,910
21	6	8,490
22	5	8,100
23	4	7,750
24	5	7,430
25	6	7,130
26	4	6,850
27	4	6,600
28	2	6,360
33	3	5,400
34	1	5,240
35	2	5,090
36	4	4,950
Median		7,790
Average		7,660

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SECURITY INFORMATION

3

APPENDIX D

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE VII

FRAGMENT VELOCITY DATA

60' Arena Space Test

35mm Fastax Camera #1

2550 frames per sec.

Rd. 3, Terrier Warhead Mk 5 Mod 0
Serial No. 46 at Ambient Temp.

Comp. B

Total Weight 216.87 Lbs.

Filler Weight 113.67 Lbs.

<u>Zone</u>	<u>Frame in Which Hit Occurred</u>	<u>No. Beam Fragments</u>	<u>Velocity (f/s)</u>
80°-85°	25	1	6,120
75°-80°	26	8	5,880
80°-85°	26	6	5,880
85°-90°	26	4	5,880
75°-80°	27	5	5,670
85°-90°	27	3	5,670
90°-95°	27	6	5,670
75°-80°	28	3	5,460
80°-85°	28	1	5,460
85°-90°	28	2	5,460
90°-95°	28	3	5,460
70°-75°	29	2	5,280
75°-80°	29	1	5,280
85°-90°	29	2	5,280
90°-95°	29	2	5,280
70°-75°	30	3	5,100
Median			5,740
Average			5,630

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SECURITY INFORMATION

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE VII (Continued)

60° Arena Space Test

35mm Fastax Camera #3

2640 frames per sec.

Rd. 3, Terrier Warhead Mk 5 Mod 0
Serial No. 46 at Ambient Temp.

Comp. B

Total Weight 216.87 Lbs.

Filler Weight 113.67 Lbs.

<u>Zone</u>	<u>Frame in Which Hit Occurred</u>	<u>No. Base Fragments</u>	<u>Velocity (f/s)</u>
175°-180°	15	1	10,600
175°-180°	16	3	9,900
170°-175°	17	4	9,320
175°-180°	17	5	9,320
170°-175°	18	2	8,800
175°-180°	18	4	8,800
165°-170°	19	4	8,340
170°-175°	19	1	8,340
175°-180°	19	3	8,340
175°-180°	20	5	7,920
170°-175°	21	1	7,540
175°-180°		4	7,540
170°-175°	22	2	7,200
175°-180°	22	3	7,200
170°-175°	23	3	6,890
Median			8,600
Average			8,390

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE VII (Continued)

60° Arena Space Test

35mm Fastax Camera #2

2550 frames per sec.

Rd. 3, Terrier Warhead Mk 5 Mod 0
Serial No. 46 at Ambient Temp.

Comp. B

Total Weight 216.87 Lbs.

Filler Weight 113.67 Lbs.

<u>Zone</u>	<u>Frame in Which Hit Occurred</u>	<u>No. Nose Fragments</u>	<u>Velocity (f/s)</u>
5°-10°	16	1	9,560
0°-5°	17	3	9,000
5°-10°	17	1	9,000
0°-5°	18	2	8,500
5°-10°		2	8,500
0°-5°	19	1	8,050
5°-10°		2	8,050
0°-5°	20	2	7,600
5°-10°		1	7,600
0°-5°	21	2	7,290
5°-10°	21	1	7,290
Median			8,450
Average			8,240

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE VIII

FRAGMENT VELOCITY DATA

60' Arena Space Test

35mm Fastax Camera #1

2550 frames per sec.

Rd. 4, Terrier Warhead Mk 5 Mod 0
Serial No. 41 at Ambient Temp.

Comp. B

Total Weight 216.02 lbs.

Filler Weight 113.49 Lbs.

<u>Zone</u>	<u>Frame in Which Hit Occurred</u>	<u>No. Beam Spray Fragments</u>	<u>Velocity (f/s)</u>
75°-80°	25	2	6,120
80°-85°	25	4	6,120
85°-90°	25	2	6,120
75°-80°	26	4	5,880
80°-85°	26	7	5,880
85°-90°	26	3	5,880
75°-80°	27	4	5,670
80°-85°	27	2	5,670
85°-90°	27	1	5,670
75°-80°	29	2	5,280
80°-85°		1	5,280
75°-80°	30	1	5,100
75°-80°	31	3	4,940
Median			5,860
Average			5,740

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SECURITY INFORMATION

1

APPENDIX D

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Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE VIII (Continued)

60' Arena Space Test

35mm Fastax Camera #3

Rd. 4, Terrier Warhead Mk 5 Mod 0
Serial No. 4i at Ambient Temp.

Total Weight 216.02 Lbs.

2640 frames per sec.

Comp. B

Filler Weight 113.49 Lbs.

<u>Zone</u>	<u>Frame in Which Hit Occurred</u>	<u>No. Base Fragments</u>	<u>Velocity (f/s)</u>
		1	10,600
175°-180°	15	2	9,900
165°-170°	16	1	9,900
175°-180°	16	2	9,320
165°-170°	17	4	9,320
170°-175°	17	3	9,320
175°-180°	17	4	8,800
165°-170°	18	1	8,800
170°-175°	18	3	8,800
175°-180°	18	2	8,340
170°-175°	19	1	7,920
170°-175°	20	2	7,920
175°-180°	20	2	7,540
170°-175°	21	4	7,540
175°-180°	21	2	7,200
165°-170°	22	2	7,200
170°-175°	22	3	7,200
175°-180°	22	1	6,890
170°-175°	23	3	6,890
175°-180°	23	4	6,600
175°-180°	24		6,400
Median			8,180

Average

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SECURITY INFORMATION

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE VIII (Continued)

60' Arena Space Test

35mm Fastax Camera #2

2580 frames per sec.

Rd. 4, Terrier Warhead Mk 5 Mod 0
Serial No. 41 at Ambient Temp.

Comp. B

Total Weight 216.02 Lbs.

Filler Weight 113.49 Lbs.

<u>Zone</u>	<u>Frame in Which Hit Occurred</u>	<u>No. Nose Fragments</u>	<u>Velocity (f/s)</u>
0°-5°	16	3	9,680
0°-5°	17	1	9,110
5°-10°	18	1	8,600
5°-10°	19	1	8,150
5°-10°	20	1	7,740
0°-5°	22	2	7,040
Median			8,860
Average			8,520

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE IXFRAGMENT VELOCITY DATA

60' Arena Space Test

35mm Fastax Camera #1

2730 frames per sec.

Rd. 5, Terrier Warhead Mk 5 Mod 0
Serial No. 43 at Ambient Temp.

Comp. B

Total Weight 217.76 Lbs.

Filler Weight 114.56 Lbs.

<u>Zone</u>	<u>Frame in Which Hit Occurred</u>	<u>No. Beam Spray Fragments</u>	<u>Velocity (f/s)</u>
75°-80°	26	5	6,300
80°-85°	26	3	6,300
85°-90°	26	2	6,300
75°-80°	27	4	6,070
75°-80°	28	3	5,850
75°-80°	29	4	5,650
75°-80°	30	2	5,460
75°-80°	31	2	5,280
75°-80°	33	1	4,960
Median			6,100
Average			5,920

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

TABLE IX (Continued)

60° Arena Space Test

35mm Fastax Camera #2

2670 frames per sec.

Rd. 5, Terrier Warhead Mk 5 Mod 0
Serial No. 43 at Ambient Temp.

Comp. B

Total Weight 217.76 Lbs.

Filler Weight 114.56 Lbs.

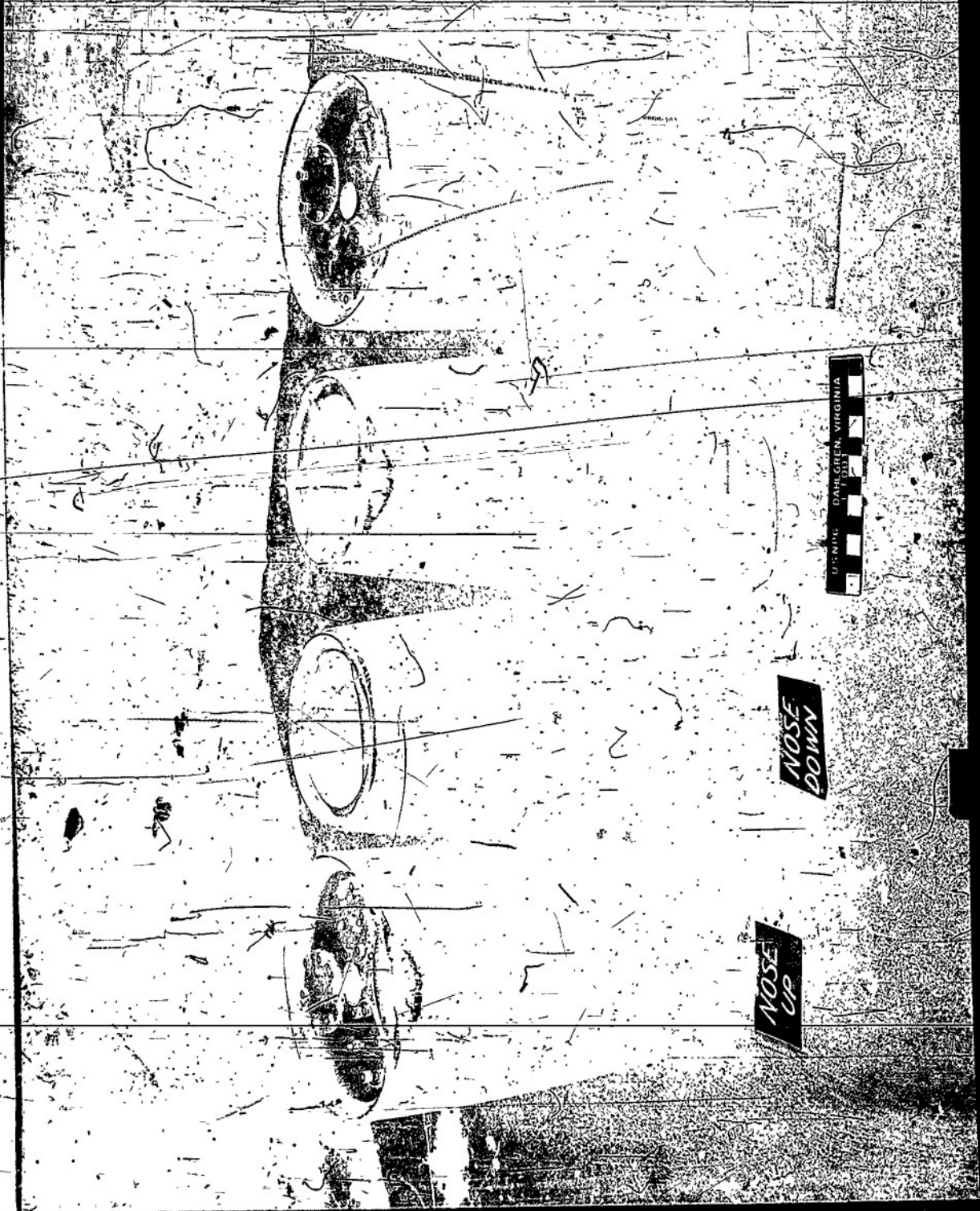
<u>Zone</u>	<u>Frame in Which Hit Occurred</u>	<u>No. Nose Fragments</u>	<u>Velocity (f/s)</u>
0°-5°	16	1	10,000
0°-5°	17	2	9,420
0°-5°	19	1	8,430
0°-5°	20	1	8,010
0°-5°	21	3	7,630
0°-5°	22	1	7,280
0°-5°	23	1	6,970
0°-5°	24	1	6,680
0°-5°	25	1	6,410
Median			8,200
Average			7,960

NOSE UP

Terrier Harbors 1/5 Mon. 7.40er height projected to drops from 40 foot tower.

11 April 1962

QUALITY INFORMATION



NOSE UP

NOSE DOWN

USING DAHLGREN, VIRGINIA

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of
-----DROP TEST DATA

1. All warheads were dropped from a 40' tower onto a 2" thick steel plate. The detailed damage data are as follows:

a. Side Drop, Serial No. 44 - The nose ring and side of the warhead was dented inward 1". The base was bulged and dented 1/4" from the normal circumference of the round. Two of the bolts securing the small loading plates were slightly bent. The central conduit was undamaged.

b. Nose Up Drop, Serial No. 54 - The side was dented inward 1-1/4" and the base ring of the round was flattened at the impact area. The central conduit was not damaged.

c. Nose Down Drop, Serial No. 47 - The nose ring was pushed into the central cone for 1/4 of its circumference and received a dent 1-1/4" deep. The base was dented slightly. The central conduit was not damaged.

d. Drop 45° from Nose Up, Serial No. 56 - The base ring was dented 1-1/2" deep for 1/4 of the circumference of the round. In addition there was a small dent at the nose. The central conduit was not damaged.

e. Drop 45° from Nose Down - The side was dented approximately 1-1/2" in depth and extended 7" around the warhead. The nose cone received a 1" deep dent. The central conduit was not damaged.

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NPG REPORT NO. 1035

Terrier Warhead Mk 5 Mod 0; Fragmentation and Drop Test of

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