

UNCLASSIFIED

AD NUMBER	
AD040375	
CLASSIFICATION CHANGES	
TO:	unclassified
FROM:	confidential
LIMITATION CHANGES	
TO: Approved for public release; distribution is unlimited.	
FROM: Controlling DoD Organization: Naval Proving Ground, Dahlgren, VA.	
AUTHORITY	
USNSWC Notice dtd 14 Aug 1975; USNSWC Notice dtd 14 Aug 1975	

THIS PAGE IS UNCLASSIFIED

UNCLASSIFIED

AD 40.375

DEFENSE DOCUMENTATION CENTER

FOR

SCIENTIFIC AND TECHNICAL INFORMATION

CAMERON STATION ALEXANDRIA. VIRGINIA

CLASSIFICATION CHANGED

TO: Unclassified

FROM: Confidential

AUTHORITY: USNSWC notice, 14 Aug 75



UNCLASSIFIED

AD No. 42375
STIA FILE COPY

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

REPORT NO. 948

WARHEADS FOR AIR TARGET GUIDED MISSILES;
TESTING OF

40th Partial Report

AAP ROD-PRODUCING WARHEAD AND
ROCKET MOTOR; FRAGMENTATION OF

FINAL Report

Copy No. 11

Task

Assignment NPG-Re3f-607-1-52

Classification CONFIDENTIAL
SECURITY INFORMATION

AAP Rod-Producing Warhead and Rocket Motor, Fragmentation of

PART A

SYNOPSIS

1. This test was conducted to determine the fragmentation characteristics of AAP rod-producing warheads. These warheads were made from NE 8737 steel tubing, internally grooved, heat treated to Rockwell "C" 40-44, and Composition C-3 loaded.
2. The AAP warhead expelled rod-like fragments up to 8" in length evenly about the warhead circumference at an average velocity of 4160 ft./sec.

AAP Rod-Producing Warhead and Rocket Motor, Fragmentation 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	4
REPRESENTATIVES PRESENT.	4
DESCRIPTION OF ITEM UNDER TEST	4
PROCEDURE.	5
RESULTS AND DISCUSSION	5
CONCLUSIONS.	6
APPENDIX A - AAP WARHEAD DRAWINGS.	FIGURES 1-3 (Incl)
APPENDIX B - FRAGMENT DISTRIBUTION DATA. . .	TABLE I
APPENDIX C - FRAGMENT VELOCITY DATA.	TABLES II-III (Incl)
APPENDIX D - MASS DISTRIBUTION DATA.	TABLE IV FIGURES 4-7 (Incl)
APPENDIX E - DISTRIBUTION.	1-2 (Incl)

NOTICE: THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECTIONS 793 and 794. THE TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

CONFIDENTIAL

NPG REPORT NO. 948

AAP Rod-Producing Warhead and Rocket Motor, Fragmentation of

PART II

INTRODUCTION

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(270) WG:SW:mbw Ser 01569 of 6 September 1951
- b. BUORD Conf ltr NP9 Re3f-EJHL:edb Ser 25777 of 18 September 1951
- c. NPG Conf Report No. 858 of 13 October 1951
- d. NPG Conf Report No. 854 of 1 September 1951

3. BACKGROUND:

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

b. Reference (d) reported the fragmentation characteristics of the notched ring AAP warhead. Reference (c) reported the fragment mass distribution of two types of AAP rod-producing warheads, Type 4. Four additional AAP rod-producing warheads, were delivered to the Proving Ground for fragmentation tests.

4. OBJECT OF TEST:

This test was conducted to determine the fragmentation characteristics of AAP rod-producing warheads. These warheads were made from NE 8737 steel tubing, internally grooved, heat treated to Rockwell "C" 40-44, and Composition C-3 loaded.

CONFIDENTIAL
SECURITY INFORMATION

CONFIDENTIAL

NPG REPORT NO. 948

AAP Rod-Producing Warhead and Rocket Motor, Fragmentation of

5. PERIOD OF TEST:

a. Date Project Letter	6 September 1951
b. Date Necessary Material Received	27 September 1951
c. Date Commenced Test	5 December 1951
d. Date Test Completed	7 December 1951

6. REPRESENTATIVES PRESENT:

This test was witnessed by Messrs. S. Wolf and J. R. Burton representing the Naval Ordnance Laboratory.

PART C

DETAILS OF TEST

7. DESCRIPTION OF ITEM UNDER TEST:

Four rounds of AAP rod-producing warheads were assembled with inert AAP rocket motors. Detailed assemblies are shown in Figures 1, 2, and 3. The warheads were made from NE 8737 steel tubing, internally grooved to produce 24 rod-like fragments and heat treated to Rockwell "C" 40-44. The warheads were assembled with mock-up VT fuzes modified for static detonation and then loaded with Composition C-3 at the Proving Ground. The weights of the components were as follows:

<u>Rd.</u> <u>No.</u>	<u>Serial</u> <u>No.</u>	<u>Motor Wt.</u> <u>lbs.</u>	<u>Head Wt.</u> <u>with Fuze</u> <u>lbs.</u>	<u>Filler</u> <u>Wt. lbs.</u>	<u>Total Wt.</u> <u>lbs.</u>
1	505-1	38.85	17.10	4.60	60.55
2	505-2	38.75	17.10	4.61	60.46
3	505-3	38.80	17.32	4.46	60.58
4	505-4	38.80	17.15	4.50	60.45

CONFIDENTIAL
SECURITY INFORMATION

CONFIDENTIAL

NPG REPORT NO. 948

AAF Rod-Producing Warhead and Rocket Motor, Fragmentation of

8. PROCEDURE:

a. Round No. 1, Serial No. 505-1, was detonated in a sawdust filled chamber for mass distribution data. After the detonation, the sawdust was sifted and the fragments recovered by the use of sieves and a magnetic separator.

b. Rounds Nos. 2, 3, and 4, Serials Nos. 505-2, 505-3, and 505-4, were detonated in a 30.6 foot radius velocity arena. The arena consisted of 15 foot high 1" thick steel panels in longitude zones 350°-55° and 125°-190°. A cane fiberboard pack 4' high 8' wide, and 4' thick was placed with its center 5 feet off the ground, in the 90° longitudinal plane, and 30.6 feet from the center of the arena for recovery of sample rod-like fragments. The velocity determinations were obtained by high speed photographic technique. Angular fragment distribution and fragment lengths were recorded from impacts on the panels. All rounds were placed vertically with the warhead up on a wooden stand in the center of the arena and detonated statically.

9. RESULTS AND DISCUSSION:

a. Mass Distribution

Detailed mass distribution data of Round No. 1, Serial No. 505-1 are listed in Table IV and shown in Figure 4. The number and lengths of the rod-like fragments are as follows:

<u>No.</u>	<u>Approx. Size</u>	<u>No.</u>	<u>Approx. Size</u>
10	8"	6	4 1/2"
2	6"	27	2" - 4"

The motor fragmented satisfactorily, considering that it contained no propellant.

CONFIDENTIAL
SECURITY INFORMATION

CONFIDENTIAL

NPG REPORT NO. 948

AAP Rod-Producing Warhead and Rocket Motor, Fragmentation of

b. Fragment Space Distribution

One of the three warheads detonated for space distribution and velocity detonated low order. The warhead is shown in Figure 6. The other two detonated high order producing rod-like fragments. The fragments were distributed evenly, approximately 15° apart about the circumference of the warhead at approximately 93° of latitude measured from the forward end of the missile. The rocket motor is the forward end of this missile with the warhead the base end. The rod-like fragments had a tendency to remain about 6" to 8" in length with some breaking into two lengths. Detailed fragment length and angular distribution data are listed in Table I. Sample warhead and motor fragments recovered are shown in Figures 5 and 7.

c. Fragment Velocities

The rod-like fragment velocity from the warheads 505-2 and 505-3 averaged 4160 ft./sec. The motor fragments which hit in latitude zone 75°-78° averaged 2500 ft./sec. These fragments were from the rear section of the motor nearest the warhead. The major portion of the motor fragments were found within 400 feet of the arena center and their velocity is estimated to be 200-500 ft./sec. Detailed fragment velocity data are listed in Tables II and III.

PART D

CONCLUSIONS

10. The AAP warhead expelled rod-like fragments up to 8" in length evenly about the warhead circumference at an average velocity of 4160 ft./sec.

CONFIDENTIAL
SECURITY INFORMATION

CONFIDENTIAL

NPG REPORT NO. 948

AAP Rod-Producing Warhead and Rocket Motor, Fragmentation of

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

**V. PHILIPCHUK, Fragmentation Battery Officer,
Fragmentation Division,
Terminal Ballistics Department**

This report was prepared by:

**V. PHILIPCHUK, Fragmentation Battery Officer,
Fragmentation Division
Terminal Ballistics Department**

This report was reviewed by:

**R. H. LYDDANE, Director of Research
Terminal Ballistics Department**

**W. B. ROBERTSON, Lieutenant Commander, USN,
Terminal Ballistics Batteries Officer,
Terminal Ballistics Department**

**R. T. RUBLE, Lieutenant Commander, USN,
Terminal Ballistics Officer,
Terminal Ballistics Department**

C. C. BRAMBLE, Director of Research, Ordnance Group

**APPROVED: IRVING T. DUKE
Rear Admiral, USN
Commander, Naval Proving Ground**

C. T. Mauro

**C. T. MAURO
Captain, USN
Ordnance Officer
By direction**

**CONFIDENTIAL
SECURITY INFORMATION**

54723

CONFIDENTIAL

NPG REPORT NO. 948

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

Fortieth Partial Report
on
Warheads for Air Target Guided Missiles;
Testing of

Final Report
on
AAP Rod-Producing Warhead and
Rocket Motor; Fragmentation of

Project No.: NPG-Re3f-607-1-52
Copy No.: 11
No. of Pages: 7

Date: MAR 27 1952

CONFIDENTIAL
SECURITY INFORMATION

17-32000-8-1

MP-4/487

December 1951

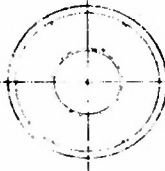
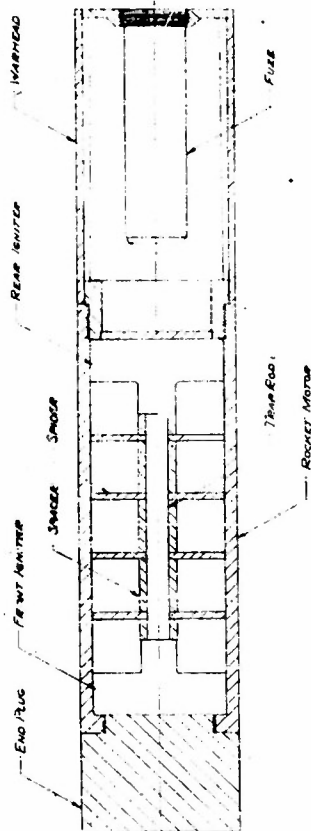
SECRET

Board Drawing SK 315165

Outline Drawing of Air Warhead and Rocket Motor

Figure 1

REVISION	DATE	BY	CHKD
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			



SK 315165

NAME: SK 315165 DATE: 12/1/51 BY: [Signature] CHECKED: [Signature] DO NOT SCALE THIS DRAWING MATERIAL:		APPROVED: [Signature] TITLE:		AIR-TRIAL WARHEAD TYPE No. 5 TEST ASSEMBLY		SK 315165	
SCALE: 1" = 1"		QUANTITY: 1		UNIT: 1		JOB NO:	

CONFIDENTIAL
SECURITY INFORMATION

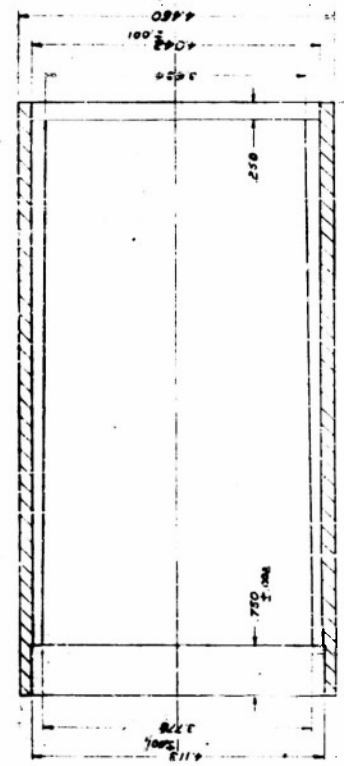
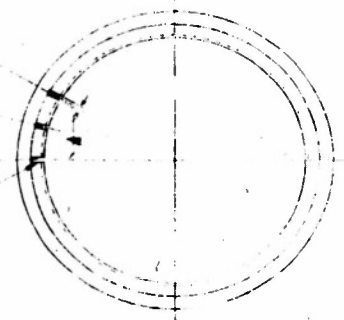
5 December 1951

NP9-47488

Encl Drawing SK 315753. AAP Prod-Production Not Read.

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

24 GROOVES
1/16" THICKNESS / 1/8" RADIUS



0.075 ± 0.005

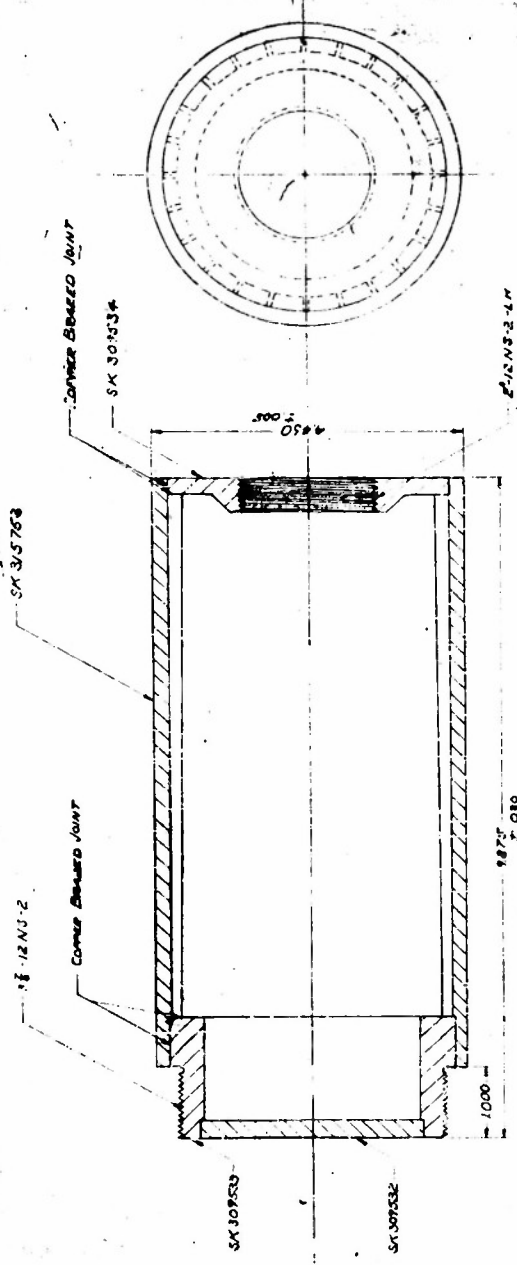
TAPER OF INSIDE WALL = 0.09 PER IN.

SK 315753

AAP TUBAL WAREHO TYPE No 9 TUBE		SK 315753
DATE DRAWN CHECKED APPROVED BY	NO. QTY UNIT PRICE TOTAL	DATE DRAWN CHECKED APPROVED BY



REV	DESCRIPTION	DATE	BY



WARMED 1/8 TO BE CORNER PLATED

- HEAT TREATMENT**
1. QUENCH IN OIL FROM 1640-1665°F; DRAW TO ROOM TEMP 140-144
 2. HEAT AND QUENCH WITH CYLINDRICAL AXIS IN VERTICAL POSITION TO MINIMIZE DISTORTION.
 3. HEAT IN CONTROLLED ATMOSPHERE OR SALT BATH FURNACE TO PRODUCE SOME FREE SURFACE.

NAME SKETCHED BY DATE CHECKED BY DATE APPROVED BY DATE		AAP TRIAL WARMHEAD TYPE NO. 9 ASSEMBLY	
MATERIAL Q101213 QRS		PART NUMBER SK 309534	

AAP Rod-Producing Warhead and Rocket Motor, Fragmentation of

TABLE I

ANGULAR DISTRIBUTION DATA

AAP Rod-Producing Warhead and Rocket Motor
30.5 Foot Radius Arena, 15' High Panels

Rd. No. 2 Serial No. 505-2		Rd. No. 3 Serial No. 505-3		Rd. No. 4 Serial No. 505-4	
Longitude	Fragment	Longitude	Fragment	Longitude	Fragment
Angle (Degrees)	Length (Inches)	Angle (Degrees)	Length (Inches)	Angle (Degrees)	Length (Inches)
2	8 1/4	This round detonated Low Order. Sec Figure 6.		6	3 *
18	3 1/4			25	8 1/4
19	3 3/4			39	7 3/4
34	7			56	8
51	8			92	8
132	3			137	5
132	4			153	5 1/4
148	4 *			169	4 *
164	3 *			185	6
180	3 1/2 *				

* These fragment lengths were probably greater. They penetrated the 1" thick STS panels and the impact openings were recorded as the fragment lengths.

CONFIDENTIAL

NPG REPORT NO. 948

AAP Rod-Producing Warhead and Rocket Motor, Fragmentation of

TABLE II

FRAGMENT VELOCITY DATA

35mm Fastax Camera
Rd. 2 NOL 505-2 AAP
30.6 foot Radius Arena
Total Weight 60.46 lbs.

3150 frames per sec.
Comp. C-3

Filler Weight 4.61 lbs.

<u>Longitude Zone</u>	<u>No.</u>	<u>Frame in Which Hit Occurred</u>	<u>No. Rod-like Fragments</u>	<u>Velocity (f/s)</u>
350°-55°	5	22	5	4380
125°-190°	4	23	4	4190
350°-55°	1	24	1	4020
Median				4380
Average				4270

Motor Hits

<u>Longitude Zone</u>	<u>No.</u>	<u>No. Motor Fragments</u>	<u>Velocity (f/s)</u>
350°-55°	1		
125°-190°	1	38	2
350°-55°	2		
125°-190°	1	39	3
			2540
			2470

CONFIDENTIAL
SECURITY INFORMATION

APPENDIX C

CONFIDENTIAL

NPG REPORT NO. 948

ALP Rod-Producing Warheads and Rocket Motor, Fragmentation of

TABLE III

FRAGMENT VELOCITY DATA

35mm Fastax Camera
Rd. 4 NOL ALP Warhead 505-4
30.6 foot Radius Arena
Total Weight 60.45 lbs.

3180 frames per sec.
Comp. C-3

Filler Weight 4.50 lbs.

<u>Longitude Zone</u>	<u>No.</u>	<u>Frame in which Hit Occurred</u>	<u>No. Rod-like Fragments</u>	<u>Velocity (f/s)</u>
350°-55°	4			
125°-190°	4	24	8	4050
Average				4050

CONFIDENTIAL
SECURITY INFORMATION

APPENDIX C

TABLE IV

MASS DISTRIBUTION DATA

FRAGMENTATION OF AAP WARHEAD SERIAL NO. 505-1 ASSEMBLED WITH MOCK-UP VT FUZE MODIFIED FOR STATIC FIRING
NUMBER AND WEIGHT OF RECOVERED FRAGMENTS

Comp. Filler Wt. No. lb.	C-3												TOTAL Wt. No.	Photo. No. RPG																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	0-0.525	0.525-1.25	1.25-2.5	2.5-5	5-10	10-20	20-40	40-80	80-160	160-320	320-640	640-1280																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Grams Wt.	Gram

HEAD

MOTOR

* 68.65 - 40 47 81 46 127 35 109 17 310 22 179 18 60 1 458 4 412 2 1513 3 14056 6 17645 203 - - 46967

* Included in Total for Head

** The total recovery for the motor fragments exceeded the initial weight of the motor by 23 grams. This is explained by the fact that some of the finer head fragments were inadvertently classed as motor fragments.

N.P. 46967

Motor		Motor	
0-5	Gms.		
593	Pcs.		
	Gms.		
1/4-1 1/4	Gms.	47	
234	Pcs.	40	
173	Gms.		
1 1/4-2 1/4	Gms.	46	
109	Pcs.	81	
178	Gms.		
2 1/4-5	Gms.	35	
73	Pcs.	127	
266	Gms.		
5-10	Gms.	17	
52	Pcs.	109	
364	Gms.		
10-20	Gms.	22	
28	Pcs.	310	
383	Gms.		
20-40	Gms.	18	
20	Pcs.	479	
576	Gms.		
40-80	Gms.	1	
23	Pcs.	60	
1149	Gms.		
80-160	Gms.	4	
11	Pcs.	458	
1303	Gms.		
160-320	Gms.	2	
7	Pcs.	412	
1144	Gms.		
320-640	Gms.	3	
	Pcs.	1513	
	Gms.		
640+	Gms.	8	
	Pcs.	14056	
	Gms.		

FUZE - FRAGS

82 PCS.
1029 Gms.

SCALE

100-45062

7 December 1945

~~CONFIDENTIAL~~
~~SECURITY INFORMATION~~

Mass Distribution of AAE Rod-producing Warhead and Rocket Motor Serial

No. 505-1.

Figure 4

FRAG NO. 1617

AAP MOTOR FRAGMENTS

NOL 505-2

3 Gms.

8 Gms.

4 Gms.

4 Gms.

11 Gms.

13 Gms.

51 Gms.

99 Gms.

102 Gms.

107 Gms.

135 Gms.

344 Gms.

388 Gms.

1054 Gms.

1129 Gms.

1246 Gms.

1475 Gms.

4569 Gms.

SCALE 1"

NOL 505-2

Sample Rocket Motor Fragments from AAP Serial No. 505-2 recovered in the field.

Figure 5

NP9-47490

5 December 1991

CONFIDENTIAL
SECURITY INFORMATION

AAP Rod-producing Warhead and Rocket Motor Serial No. 505-3 after low order detonation. Exp. plate, fuze and some Composition C-3 were blown out.
Figure 6



AAP FRAGMENTS
NOL 505-4

NP9-46856

HEAD

168 Gms.

MOTOR

27 Gms.

106 Gms.

243 Gms.

357 Gms.

562 Gms.

738 Gms.

11804 Gms.

SCALE 1"

NP9-46856

5 December 1951

CONFIDENTIAL
SECURITY INFORMATION

Sample Warhead and Rocket Motor Fragments from AAP Serial No. 505-4
recovered in cane fiberboard and in the field.

Figure 7

AAP Rod-Producing Warheads and Rocket Motor, Fragmentation of

DISTRIBUTION

Bureau of Ordnance:

Ad3	1
Re2	1
Re3	2
Re3f	5

Chief of Ordnance
 Department of the Army
 Attn: ORDTX-AR

2

Navy Research Section
 Library of Congress
 Washington 25, D. C.
 (Via BUORD Re3)

2

Commanding General
 Aberdeen Proving Ground
 Aberdeen, Maryland
 Attn: Technical Information Section
 Development and Proof Services

2

Commander, Operational Development Force
 U. S. Atlantic Fleet, U. S. Naval Base
 Norfolk 11, Virginia

1

Naval Ordnance Laboratory

1

Naval Ordnance Laboratory
 Attn: Explosives Division
 Attn: Mr. H. W. Semon

1

1

Picatinny Arsenal, Dover, N. J.
 Attn: Technical Division

1

Reports Office
 APL/JHU, Silver Spring, Maryland

1

APL/JHU, Silver Spring, Md.
 Attn: Mr. H. S. Morton
 (Via INSORD, Silver Spring, Md.)

1

AAP Rod-Producing Warheads and Rocket Motor, Fragmentation of

DISTRIBUTION (Continued)

Bureau of Ordnance Technical Liaison Office Bell Telephone Laboratories Whippany, New Jersey	1
USNOTS, Inyokern, China Lake, Calif.	1
Inst. for Cooperative Research JHU/1315 St. Paul St. Via: (District Chief, Phila. Ord District 1500 Chestnut St., Phila. 2, Pa. Attn: Mr. Edward R. C. Niles)	1
Director, Research and Development Division New Mexico Institute of Mining and Technology Socorro, New Mexico Via: Development Contract Officer New Mexico Institute of Mining and Technology Socorro, New Mexico	1
Boeing Airplane Company Seattle Division Seattle, Washington	1
Local: OT	1
OTZ	1
OT-1	1
File	1

UNCLASSIFIED

UNCLASSIFIED