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U. S. NAVAL PROVING GROUND DAHLGREN, VIRGINIA  
 REPORT NO 1084  
 TESTING OF  
 WARHEADS FOR AIR TARGET GUIDED MISSILES  
 61st Partial Report

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FRAGMENTATION OF SHALLOW-GROOVED  
 WARHEAD NO 142

Task Assignment NPG-Re3f-607-1-53  
 Classification CONFIDENTIAL  
 SECURITY INFORMATION

FINAL Report  
 Copy No. 1

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NPG REPORT NO. 1084

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NPG REPORT NO. 1084

U. S. NAVAL PROVING GROUND  
DAHLGREN, VIRGINIA

Sixty-First Partial Report

on

Testing of


Warheads for Air Target Guided Missiles

-----  
Final Report

on

Fragmentation of Shallow-Grooved Warhead No. 142

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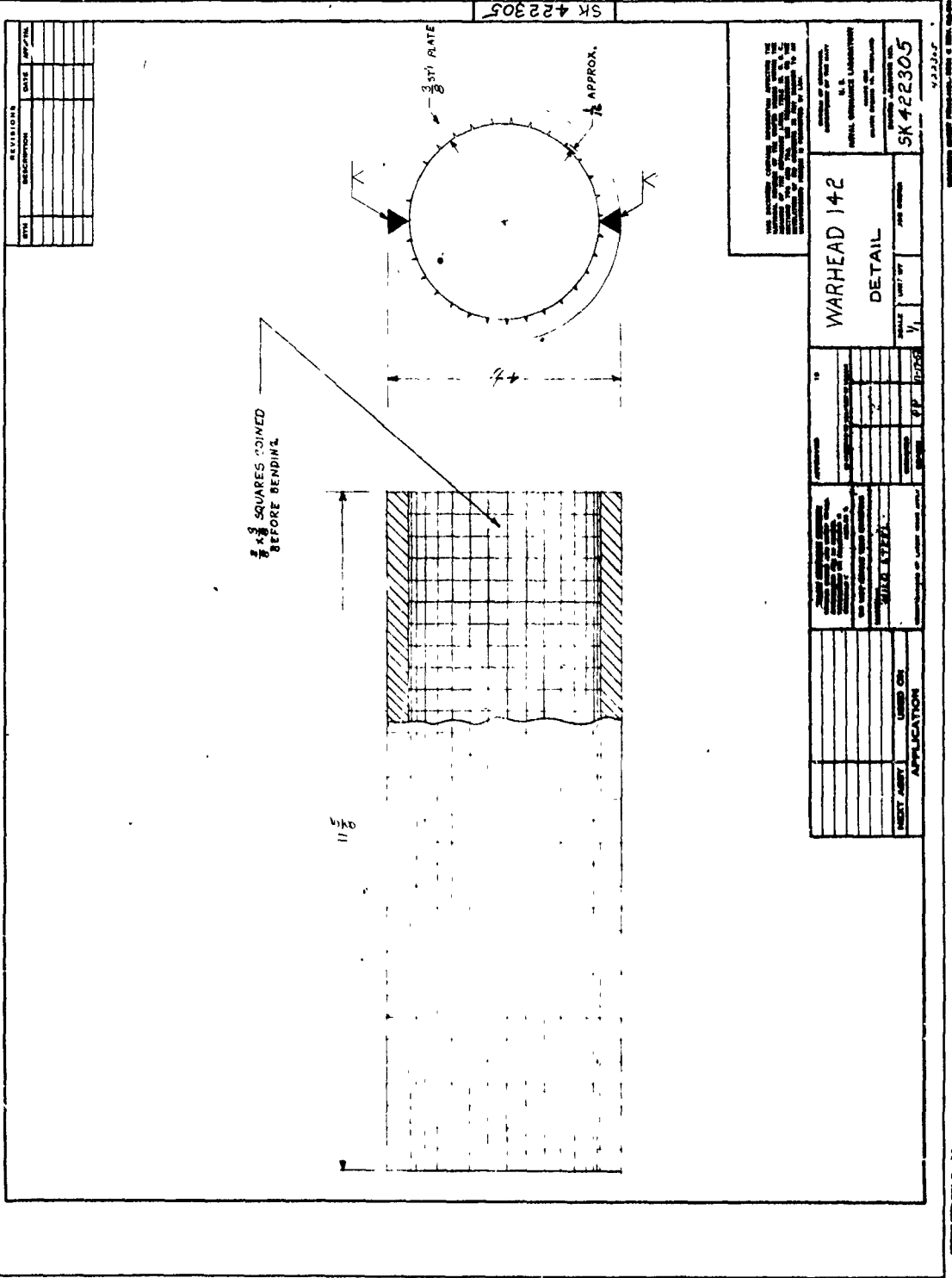
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17 October 1952

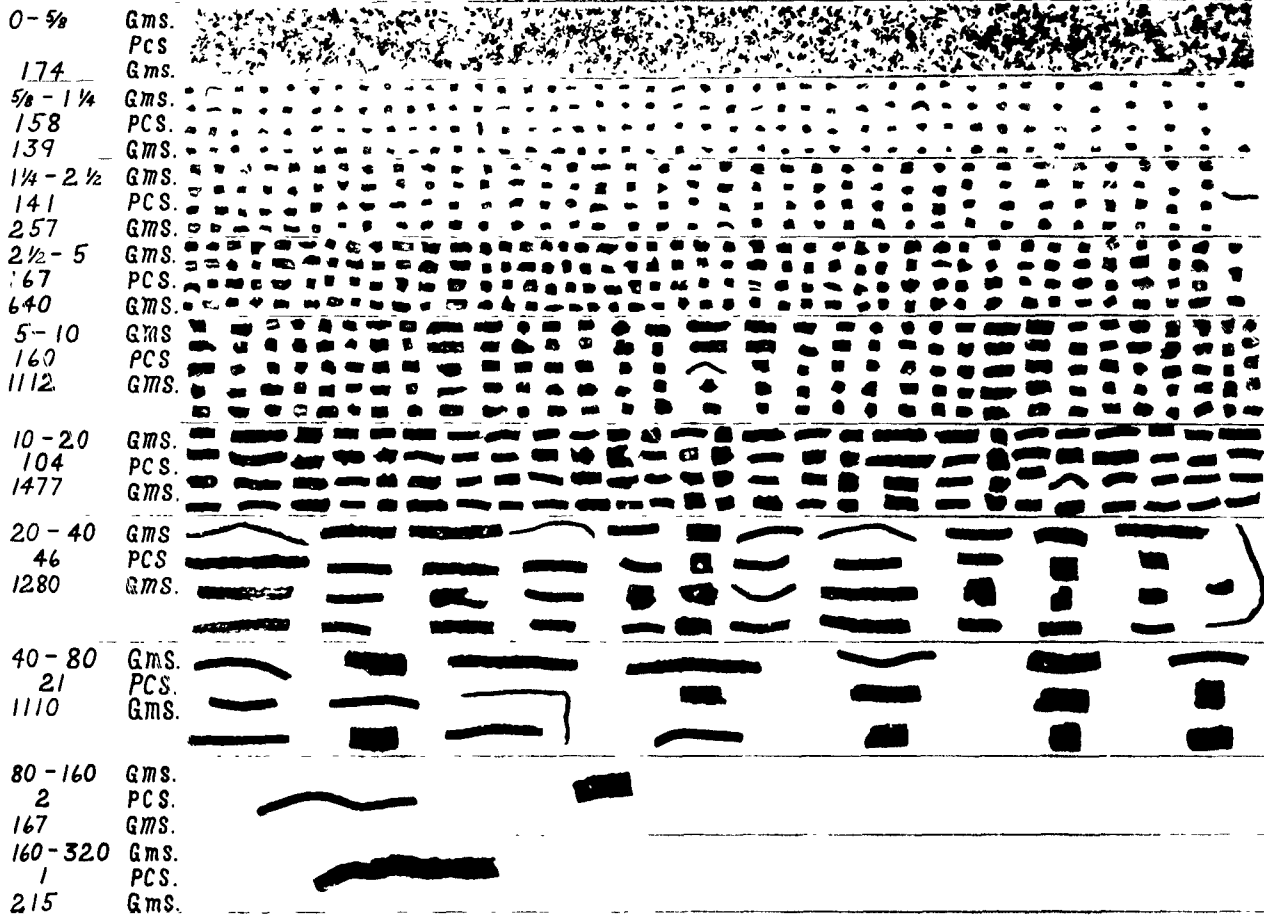
Warhead No. 142



FRAG NO. 1693

NOL WARHEAD NO 142-1

MP9 NO 524



SCALE 1"

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NFG REPORT NO. 1084

Fragmentation of Shallow-Grooved Warhead No. 142  
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PART A

SYNOPSIS

1. This test was conducted to determine the ability of shallow coined grooves, 1/16" deep and in a square grid pattern to control fragment size in a warhead model. The warhead used was No. 142, cylindrical, 4-1/8" in diameter, with a 3/8" wall, and Composition C-3 loaded.
2. a. The grid-pattern shallow grooves of Warhead No. 142 were unsatisfactory in controlling fragment size.  
b. It is believed that grooves having depths of greater than 50% of wall thickness are needed for controlling fragment size in a warhead of this design.

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Fragmentation of Shallow-Grooved Warhead No. 142

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Fragmentation of Shallow-Grooved Warhead No. 142  
-----PART BINTRODUCTION

## 1. AUTHORITY:

This test was authorized by reference (a) and conducted under Task Assignment No. NPG-Re3f-607-1-53, reference (b).

## 2. REFERENCES:

- a. NOL Conf Work Request WG/27/53 of 18 November 1952
- b. BUORD Conf ltr NP9 Re3f:EKJ:gg Ser 42699 of 29 July 1952
- c. NPG Conf Report No. 687 of 20 November 1950

## 3. BACKGROUND:

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

b. In an effort to provide controlled fragment warheads with a control method involving only a simple manufacturing operation, the Naval Ordnance Laboratory designed Warhead No. 142, which has coined narrow grooves. The grooves are similar to coined grooves used in industry to induce breaks in plate blanking operations.

## 4. OBJECT OF TEST:

This test was conducted to determine the ability of shallow coined grooves in a square grid pattern to control fragment size in a warhead model.

## 5. PERIOD OF TEST:

- |                                     |                  |
|-------------------------------------|------------------|
| a. Date Project Letter              | 18 November 1952 |
| b. Date Necessary Material Received | 19 November 1952 |
| c. Date Commenced Test              | 11 December 1952 |
| d. Test Completed                   | 11 December 1952 |

Fragmentation of Shallow-Grooved Warhead No. 142  
-----PART CDETAILS OF TEST

## 6. DESCRIPTION OF ITEM UNDER TEST:

Warhead No. 142, cylindrical, 4-1/8" outside diameter, 3/8" thick mild steel wall, 11-5/8" long, had grooves 1/16" deep in a 3/8" square grid pattern, Figure 1. The grooves were formed on a flat plate which was cold formed into a sleeve with the grooves on the inside. The warhead was loaded with Composition C-3 and the weights are as follows:

<u>Warhead No.</u>	<u>Empty Wt.</u>	<u>Comp. C-3 Wt.</u>	<u>Total Wt.</u>
142-1	14.59 lbs.	6.4' lbs.	21.00 lbs.

## 7. PROCEDURE:

The warhead was initiated with a 26 gram tetryl pellet and a special engineers' blasting cap at one end of the warhead. After detonation in a sawdust filled chamber, the sawdust was sifted and the fragments recovered by the use of sieves and a magnetic separator.

## 8. RESULTS AND DISCUSSION:

a. The shallow grooves, 1/16" deep in a 3/8" wall, were unsatisfactory in producing fragments of controlled size. The depth of groove, approximately 17% of the wall thickness, is considered to be too shallow for effective control. Reference (c) reported tests of notched ring warheads in which a groove depth of at least 25% of wall thickness was needed to offer fragment control and staggered notches were recommended over in-line notches for obtaining a greater number of control size fragments. Detailed mass fragmentation data of Warhead No. 142 is shown in Figure 2. Only 160 fragments, or 17% of the design number 930, were obtained in the design fragment weight group 5-10 grams.

Fragmentation of Shallow-Grooved Warhead No. 142

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PART D

CONCLUSIONS

9. CONCLUSIONS:

a. The grid-pattern shallow grooves of Warhead No. 142 were unsatisfactory in controlling fragment size.

b. It is believed that grooves having depths of greater than 50% of wall thickness are needed for controlling fragment size in a warhead of this design.

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NPG REPORT NO. 1084

Fragmentation of Shallow-Grooved Warhead No. 142  
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The tests upon which this report is based were conducted by:

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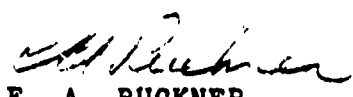
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