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U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

REPORT NO. 1118

GUNFIRE TEST OF MODEL FJ-2 AIRPLANE OXYGEN CYLINDER MOUNTING BRACKETS

FINAL Report

Copy No. _____

Task Assignment TED No. NPG AE5102

Classification RESTRICTED SECURITY INFORMATION

Gunfire Test of Model FJ-2 Airplane
Oxygen Cylinder Mounting Brackets

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PART A

SYNOPSIS

1. The purpose of this test was to determine the ability of the Model FJ-2 airplane bracket assembly to retain a 514 cubic inch, non-shatterable, aviator's oxygen breathing cylinder, charged to a pressure of 1800±50 p.s.i., when subjected to the impact of a .50 caliber armor piercing projectile.

2. The three (3) bracket assemblies submitted for gunfire test were subjected to .50 caliber armor piercing projectile impacts at angles of 45, 35 and 90 degrees, respectively.

a. The first bracket assembly tested failed to retain the oxygen cylinder, with damage being inflicted to the bracket and surrounding fuselage structure.

b. The second bracket assembly tested retained the oxygen cylinder with no apparent damage to the bracket. The surrounding fuselage structure was torn and the access door was blown free.

c. The third bracket assembly tested retained the oxygen cylinder with no apparent damage to the bracket and surrounding fuselage structure.

3. It is concluded that two (2) of the three (3) bracket assemblies tested performed satisfactorily in accordance with the specified requirements of paragraph 5.2.1 of Bureau of Aeronautics Specification SR-114c.

Gunfire Test of Model FJ-2 Airplane
Oxygen Cylinder Mounting Brackets

TABLE OF CONTENTS

	Page
SYNOPSIS	1
TABLE OF CONTENTS	2
AUTHORITY	3
REFERENCES	3
BACKGROUND	3
OBJECT OF TEST	3
PERIOD OF TEST	3
REPRESENTATIVE PRESENT	3
DESCRIPTION OF ITEM UNDER TEST	4
DESCRIPTION OF TEST EQUIPMENT	4
PROCEDURE	4
RESULTS AND DISCUSSION	5
CONCLUSIONS	6
DISPOSITION OF MATERIAL	6
APPENDIX A - NPG PHOTOGRAPHS	FIGURES 1-4 (Incl)
APPENDIX B - DISTRIBUTION	1-2 (Incl)

Gunfire Test of Model FJ-2 Airplane
Oxygen Cylinder Mounting Brackets

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PART B

INTRODUCTION

1. AUTHORITY:

This test was conducted under TED No. NPG AE5102, initiated and authorized by reference (a) which directed the gunfire test of the Model FJ-2 aircraft oxygen cylinder mounting bracket assembly.

2. REFERENCES:

a. Bureau of Aeronautics ltr Aer-AE-512, Ser 2093 of 7 Jan 1953 with BUORD 1st End. NP9 Re3 of 16 Jan 1953
b. Bureau of Aeronautics Specification SR-114c
c. North American Aviation drawing 181-73301 and 181-973304

3. BACKGROUND:

The North American Aviation, Inc. submitted to the Naval Proving Ground for gunfire test three (3) oxygen cylinder mounting bracket assemblies designed for installation in the Model FJ-2 aircraft.

4. OBJECT OF TEST:

As requested by reference (a), this test was conducted to determine the ability of the subject mounting bracket assembly to retain a 514 cubic inch, non-shatterable, aviator's oxygen breathing cylinder, charged to a pressure of 1800±50 p.s.i., when subjected to the impact of a .50 caliber M-2 armor piercing projectile.

5. PERIOD OF TEST:

a.	Date of Project Letter	7 January 1953
b.	Date Necessary Material Received	2 December 1952
c.	Date Commenced Test	6 February 1953
d.	Date Completed Test	6 February 1953

6. REPRESENTATIVE PRESENT:

LCDR J. B. Jones Bureau of Aeronautics

PART C

DETAILS OF TEST

7. DESCRIPTION OF ITEM UNDER TEST:

The model FJ-2 aircraft mounting bracket assembly is designed to support and retain one (1) 514 cubic inch, non-shatterable, oxygen cylinder charged to a pressure of 1800 p.s.i. The bracket assembly is located on the port side of the aircraft between F.S. 15 and F.S. 54, and consists of the following: a deep recess for the base of the cylinder to rest in; one (1) Marman stainless steel securing strap which encircles the center of the cylinder; metal braces which are attached to the structure for the cylinder to rest on; an aluminum and wood stop which is bolted to the structure for the neck of the cylinder to rest in, to prevent any forward movement of the cylinder. Detail drawings of the test specimen are contained in reference (c). Figure 1 is a view of the test specimen prior to the gunfire test.

8. DESCRIPTION OF TEST EQUIPMENT:

The following equipment was employed in conducting this test:

a. .50 caliber accuracy gun.

b. .50 caliber M-2 armor piercing ammunition.

c. Three (3) 514 cubic inch, non-shatterable, aviator's oxygen breathing cylinders charged with oxygen to a pressure of 1800±50 p.s.i.

9. PROCEDURE:

The longitudinal axis of the assembled bracket and cylinder was placed at each of the three (3) angles considered necessary to satisfactorily test the performance of the bracket when subjected to .50 caliber armor piercing projectile impacts. One (1) shot was fired at each cylinder at each of the angles, as listed below.

10. RESULTS AND DISCUSSION:

The first bracket assembly tested was mounted in a horizontal position with the longitudinal axis of the cylinder at an angle of 45° to the line of fire and attacked with a .50 caliber armor piercing projectile. The base of the cylinder was closer to the muzzle of the gun than was the neck. The initial impact occurred in the base of the cylinder, the projectile exiting through the aft wall. The effect of the projectile impact and/or the force initiated by the escaping oxygen resulted in the following damage: severed the angle attaching the Marman strap to the fuselage structure allowing the cylinder to fall free of the bracket; the access door was blown free and its hinges severed; the surrounding fuselage structure was torn and some sections were blown free. The damage to the test specimen is shown in Figure 2.

The second bracket assembly tested was mounted in a horizontal position with the longitudinal axis of the cylinder at an angle of 35° to the line of fire and attacked with a .50 caliber armor piercing projectile. The base of the cylinder was closer to the gun muzzle than was the neck. The initial impact occurred in the forward end of the cylinder approximately 8" below the valve, the projectile exiting through the opposite wall immediately below the neck of the cylinder. The bracket retained the cylinder with no apparent damage, although as a result of the force of the escaping oxygen, the surrounding fuselage structure was torn and some sections were blown free. The damage to the test specimen is shown in Figure 3.

The third bracket assembly tested was mounted in a horizontal position with the longitudinal axis of the cylinder at an angle of 90° to the line of fire and attacked with a .50 caliber armor piercing projectile. The initial impact occurred in the center of the cylinder, the projectile exiting through the opposite wall of the cylinder. The bracket retained the cylinder with no apparent damage to the bracket assembly. For this test the access door, having been damaged during the two (2) previous tests to an extent that it could not be fastened mechanically, was taped to the installation. The absence of structural damage to this installation was probably due to the fact the access door was easily blown off and the oxygen readily escaped.

PART D

CONCLUSIONS

11. It is concluded that two (2) of the three (3) bracket assemblies tested performed satisfactorily in accordance with the requirements of paragraph 5.2.1 of Bureau of Aeronautics Specification SR-114c.

PART E

DISPOSITION OF MATERIAL

12. The material used in this test will be disposed of as directed by reference (a).

Gunfire Test of Model FJ-2 Airplane
Oxygen Cylinder Mounting Brackets

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The test upon which this report is based was conducted by:
E. E. WIGINGTON, Lieutenant, USN
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Aviation Ordnance Department

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By direction

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NPG REPORT NO. 1118

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

Final Report

on

Gunfire Test of Model FJ-2 Airplane Oxygen Cylinder Mounting Brackets

Project No.: TED No. NPG AE5102
No. of Pages: 7

Date:

APR 23 1953

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NP9-62274

6 February 1953

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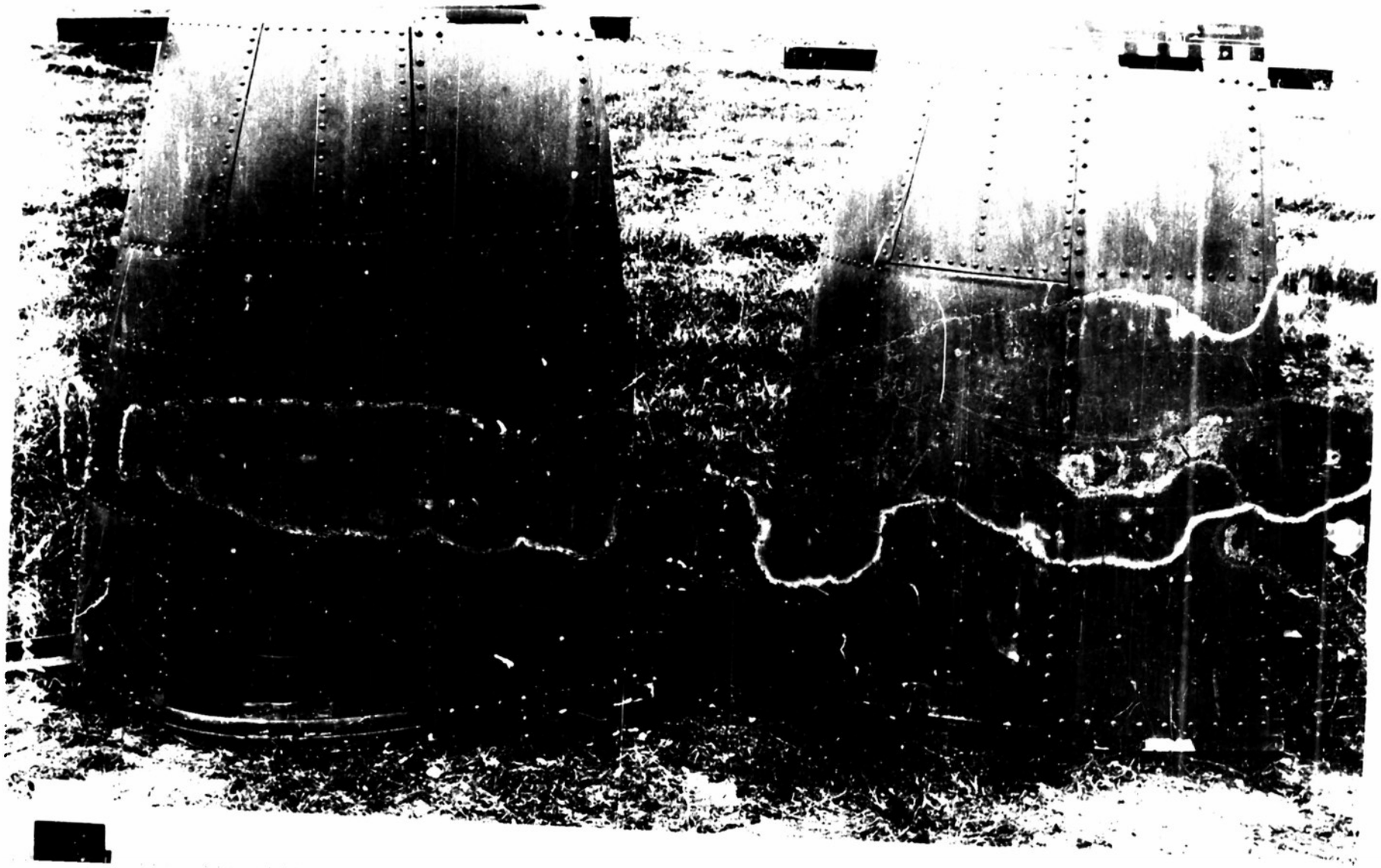
Gunfire Test of Model FJ-2 Airplane Oxygen Cylinder Mounting Brackets. View showing test specimen prior to gunfire test with .50 caliber armor piercing ammunition.

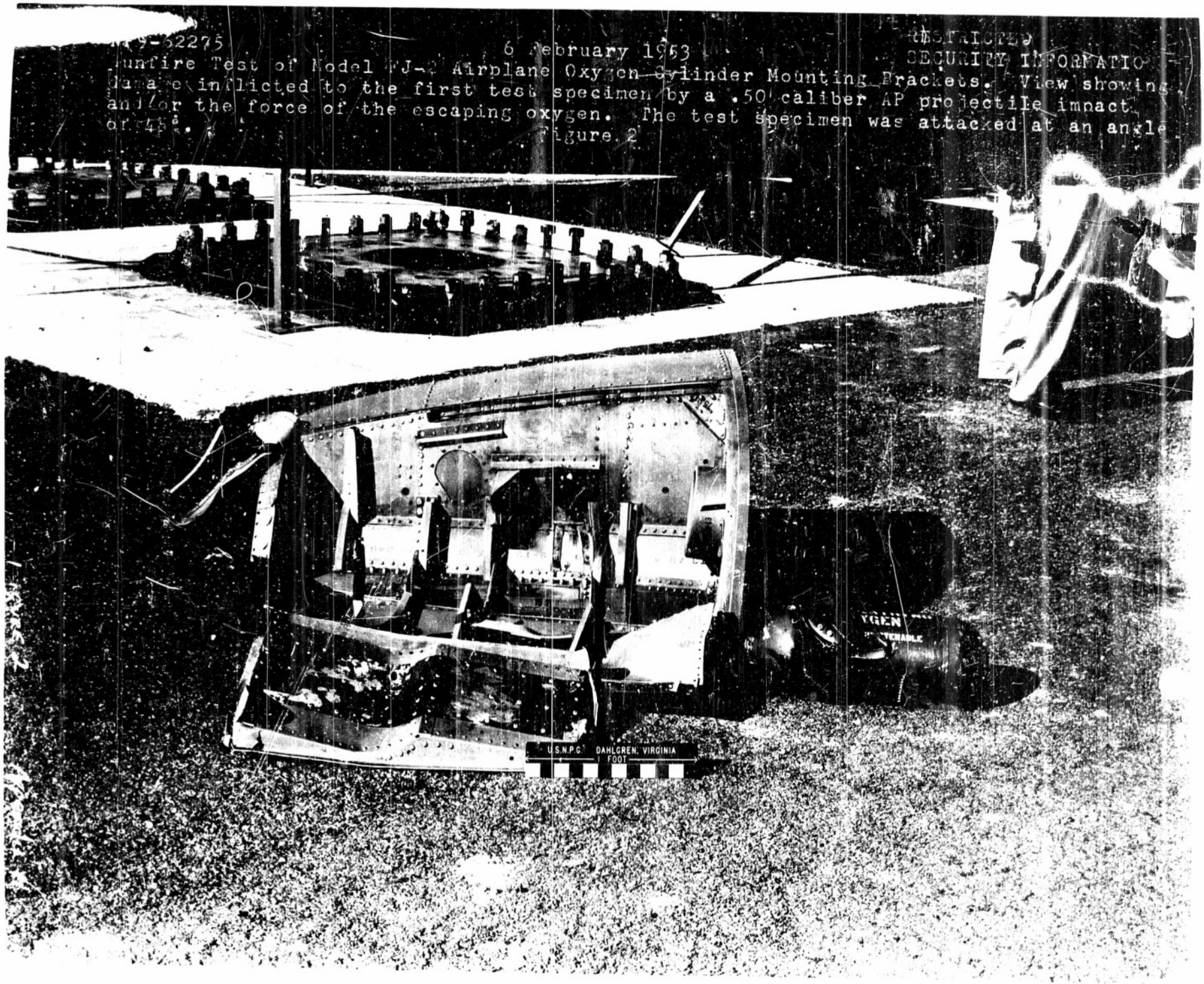
Figure 1



9-32275 6 February 1953

Gunfire Test of Model FJ-2 Airplane Oxygen Cylinder Mounting Brackets. View showing damage inflicted to the first test specimen by a .50 caliber AP projectile impact and/or the force of the escaping oxygen. The test specimen was attacked at an angle of 45°.

Figure 2



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Gunfire Test of Model FJ-2 Airplane Oxygen Cylinder Mounting Brackets. View showing damage inflicted to the second test specimen by a .50 caliber AP projectile impact and/or the force of the escaping oxygen. The test specimen was attacked at an angle of 35°.

Figure 3

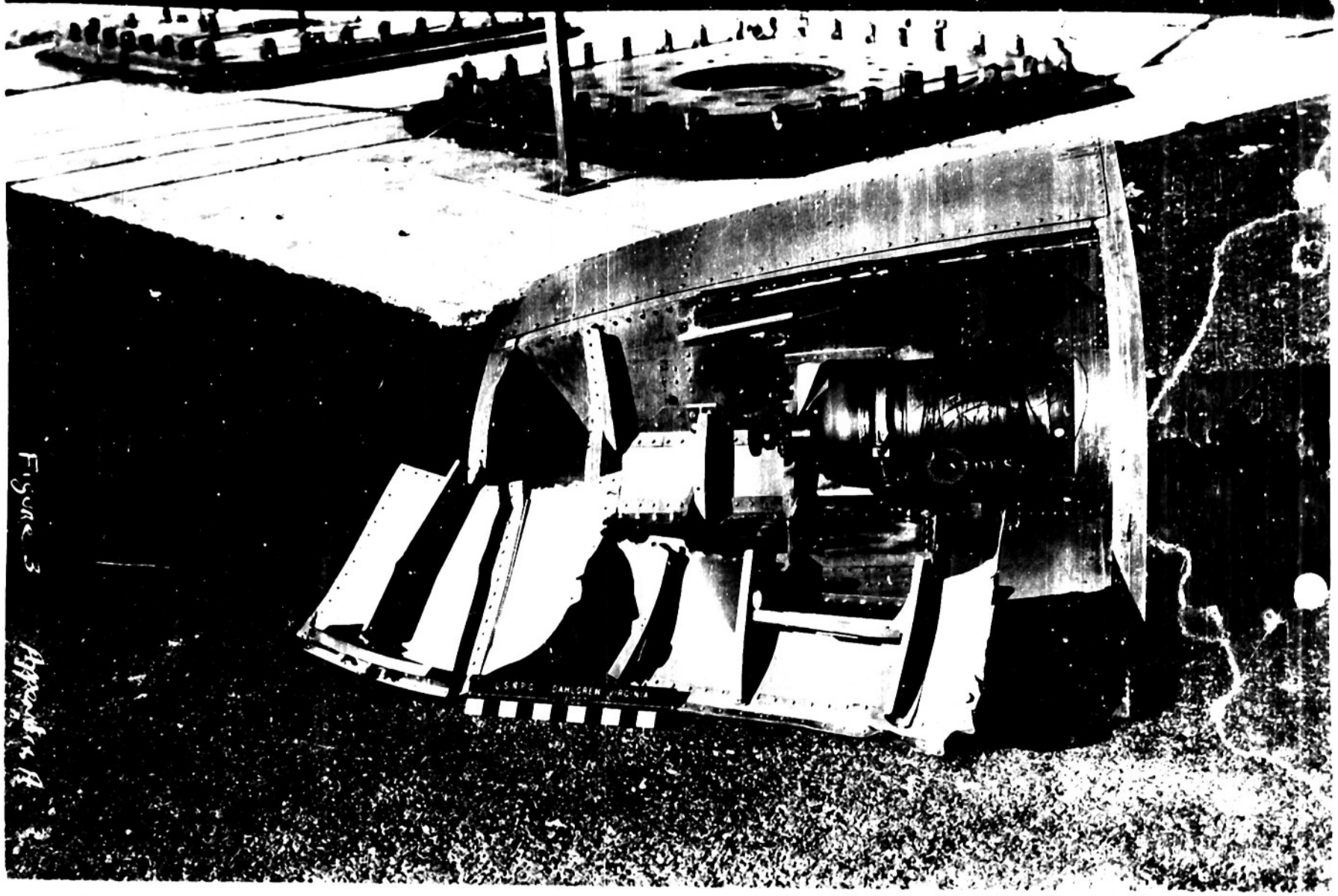

Figure 3 Appendix A

NP9-62277 6 February 1953 RESTRICTED SECURITY INFORMATION

Gunfire Test of Model FJ-2 Airplane Oxygen Cylinder Mounting Brackets. View showing the third test specimen after being subjected to the attack of a .50 caliber AP projectile. The test specimen was attacked at an angle of 90°.
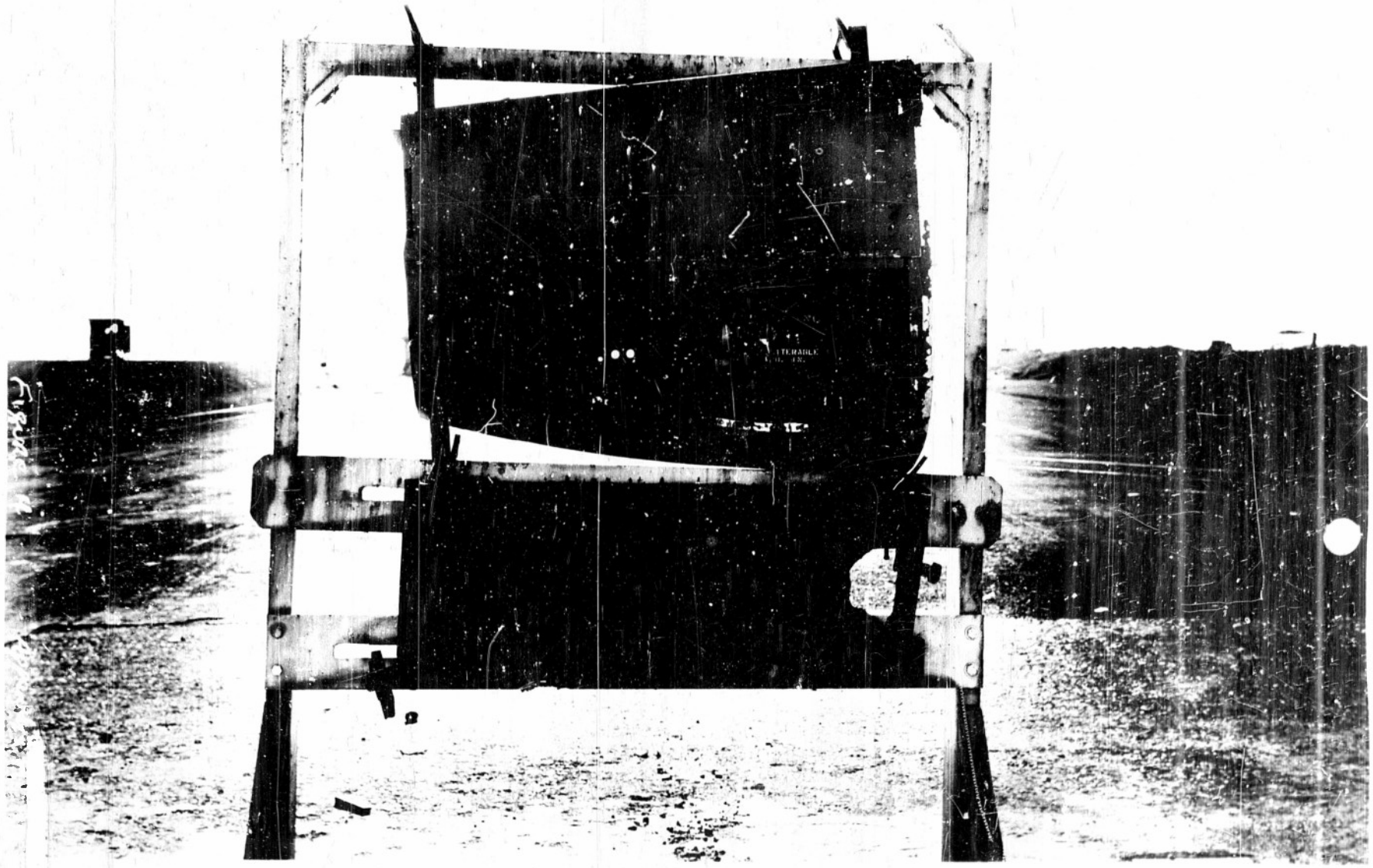
Figure 4