W.O.# 489675
Total Copies - 29

[redacted]

001438

UNCLASSIFIED

TEST REPORT OF DROP TEST 53-5

INVENTORIED
MAR 8 '60
3427-1

6/30/97
RBCraner
6/30/97
W Layne
Release

SCDR 226-59

[redacted]

Ref Sym: 1217(340)

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP

CLASSIFICATION CHANGED TO: U	AUTHORITY: W C Layne
Emelda Selph 7/15/97	RECORD ID: 97SN2326
PERSON CHANGING MARKING & DATE: Carmela Dallegro 7/22/97	DATE: 6/30/97
PERSON VERIFYING MARKING & DATE:	

INVENTORIED
MAR 1 1966
3428-3

Robert J. Brown, 1217

December 1959

Approved by _____
S. A. Moore, 1210

INVENTORIED
AUG 1 1963
3427-1

INVENTORIED
JAN 17 '63

ABSTRACT

This report describes the second high-altitude ballistic flip-fin test of the TX-53 bomb. Test results are included.

[redacted]

This document consists of 18 page(s)
No. 29 of 29 copies, Series A

UNCLASSIFIED

INVENTORIED
SEPT 6 1960

[redacted]

[redacted]

[redacted]

[redacted] written permission [redacted]

DISTRIBUTION:

1/29A - S. A. Moore, 1210
2/29A - E. I. Bruce, 1217
3/29A - A. A. Lieber, 1262
4/29A - R. H. Schultz, 1280
5/29A - C. L. Carpenter, 1285
6/29A - L. D. Smith, 1310
7/29A - J. I. Hegge, Jr., 1320
8/29A - G. J. Hildebrandt, 1330
9/29A - W. E. Boyes, 1440
10/29A - C. M. Gabriel, 2531
11/29A - L. M. Jercinovic, 2640
12/29A - A. Y. Pope, 5140
13/29A - W. H. Curry, 5144
14/29A - W. T. Moffat, 5210
15/29A - J. C. Eckhart, 5250
16/29A - I. M. Moore, 5310
17/29A - M. G. Randle, 3421-2
18/29A - R. K. Smeltzer, 3421-3
19/29A - W. F. Carstens, 3423
20-29/29A - Distribution

[redacted]

TABLE OF CONTENTS

	Page
Introduction	5
Test Objectives	5
Test Description	5
Test Results	10
Release and Impact Data	11

LIST OF ILLUSTRATIONS

Figure		
1	TX-53 Test Unit	6
2	Electrical System	7
3	Electrical System Block Diagram	8
4	Afterbody	12
5	Nose Section	13
6	Main Weapon Case	14
7	Afterbody	15
8	Bermite Cutters	16
9	Flip Fins Extended	17
10	Pluto Camera and Kick Rocket Installation	18

TEST REPORT OF DROP TEST 53-5

Introduction

The TX-53 is a class C weapon incorporating three different delivery profiles: high-altitude free-fall, high-altitude retarded, and low-level laydown. Ballistic drop tests are being conducted to prove out and evaluate the electrical system, the retardation system, the laydown shock mitigation system, and the flip-fin configuration.

This report contains a description of the second high-altitude ballistic flip-fin test.

Test Objectives

The TX-53 test unit (see Figure 1) was a flip-fin system and was used to provide data regarding:

1. The aerodynamic stability of the vehicle.
2. The stability of the vehicle flip-fin combination.
3. The aerodynamic pressure external to the skin of the vehicle.
4. The flip-fin system (for defects in construction or in operation during the deployment sequence).

Test Description

Test Conditions

The 53-5 unit was dropped at Tonopah Test Range on 3 October 1959 from a B-47 flying at 420 knots ground speed at 37,800 feet MSL.

Test Vehicle Description

Electrical System -- The electrical system consisted of an MC-543 timer modified for 1.5- and 2-second closure, one each 28 V Ni-Cad battery along with a 1217 designed and constructed junction box (see Figure 2). A block diagram of this system is shown in Figure 3.

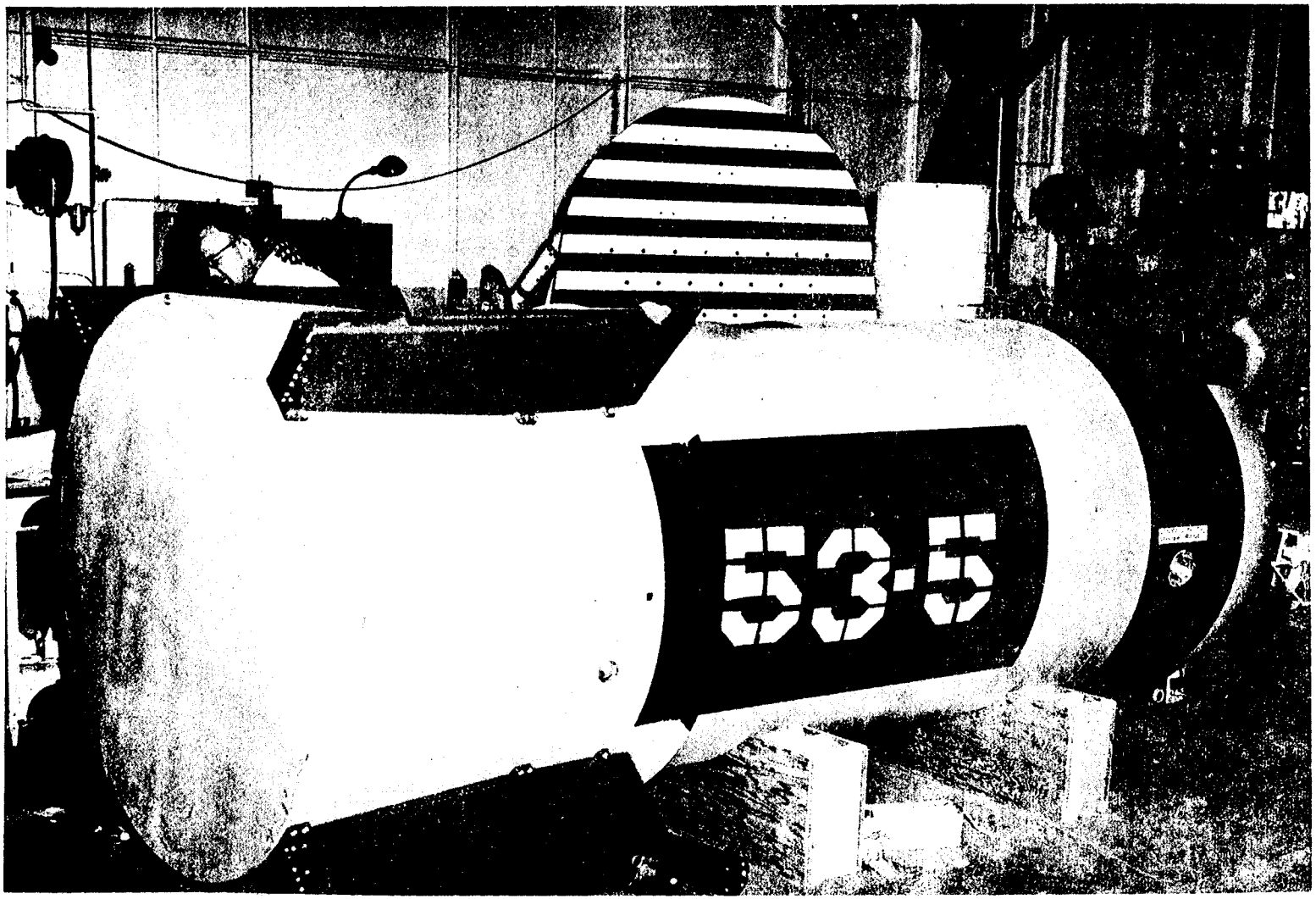

Figure 1. TX-53 Test Unit

001442

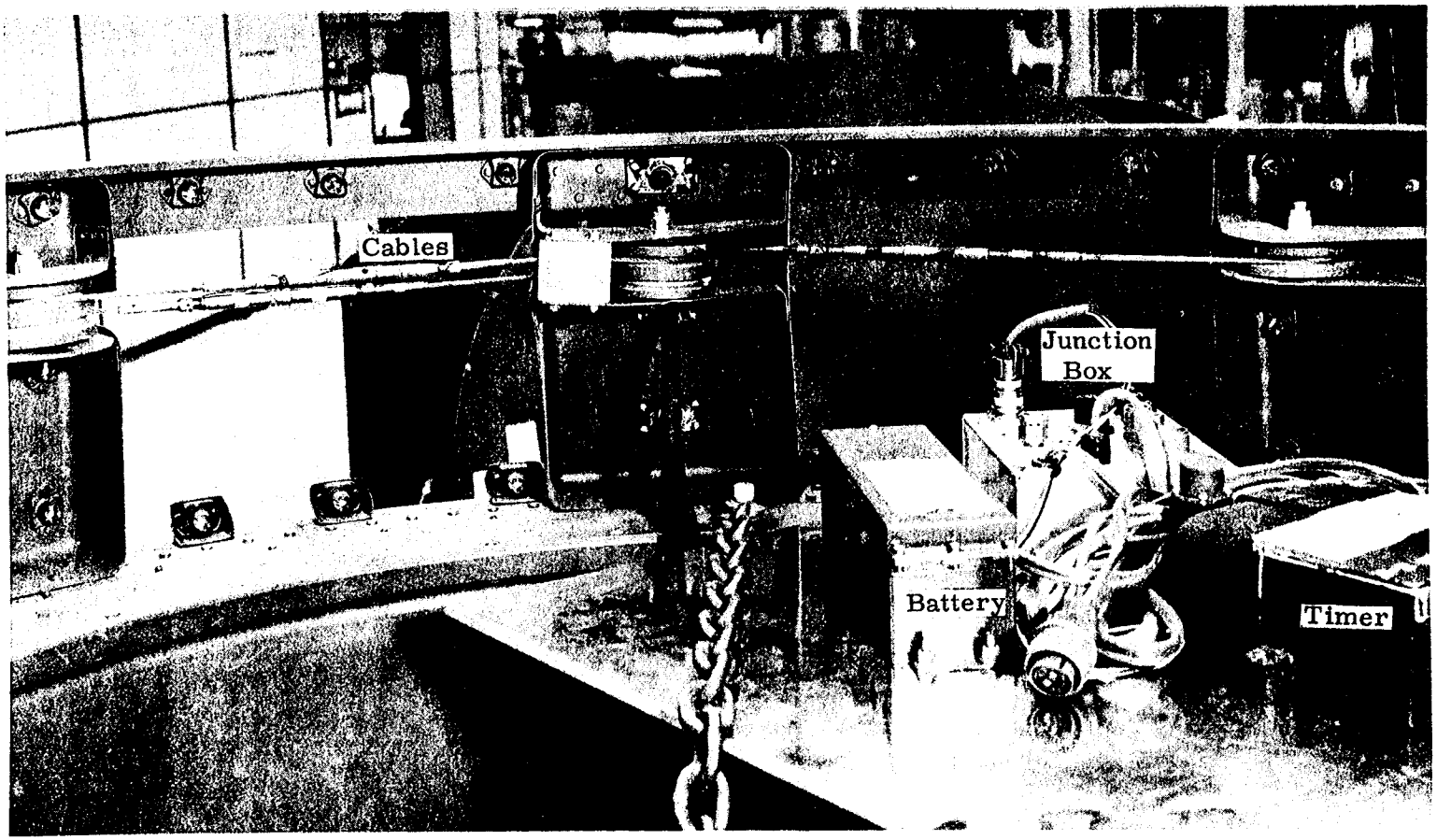

Figure 2. Electrical System

001443

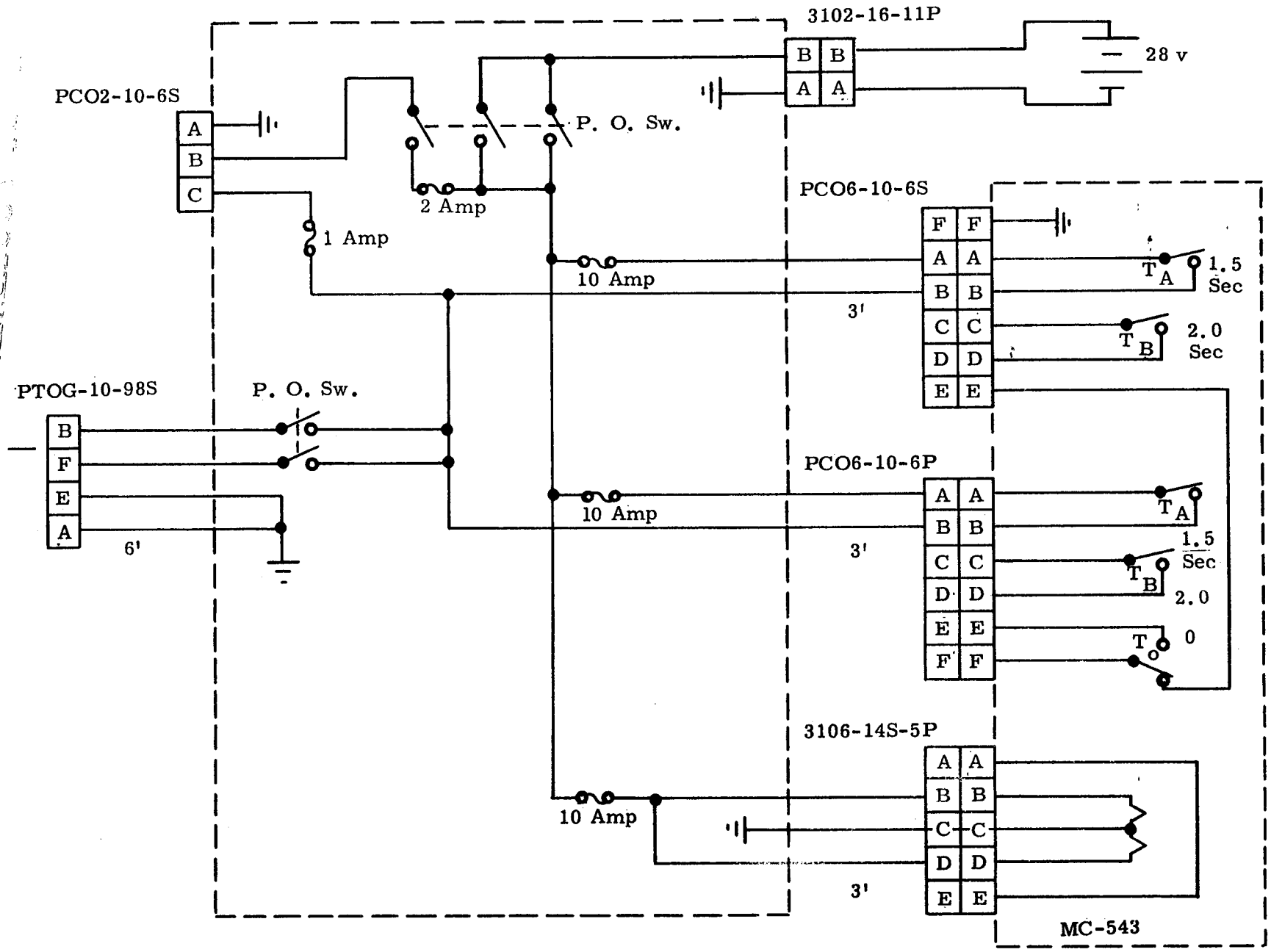

Figure 3. Electrical System Block Diagram

001444

[redacted]

UNCLASSIFIED

Mechanical System -- The test vehicle was composed essentially of three major pieces of hardware; the nose section, the main weapon case (cylinder), and the afterbody, shown assembled in Figure 4.

The nose section (Figure 5) is a combination hemisphere, having a radius of 25 inches and a 30-inch diameter "flat" at Station "0". This shape was derived from preliminary wind tunnel data, and it is defined by SK(1217) 2997-8, Issue C.

The main weapon case (Figure 6) was a converted TX-46 ballistic cylinder. It reflected the size of the TX-53 case as well as the center of gravity and moments of inertia of the TX-53. These converted cylinders were used because they were already available and because, being surplus from the TX-46, they are more economical to use in the ballistic free-fall and retarded test vehicles. This case is described by SK(1217) 2979-8.

The afterbody (Figure 7) housed the electrical system, the flip-fin actuating system and Bermite Cutters (Figure 8), and also served as a mounting structure for the four wedge flip-fins (Figure 9). The afterbody is defined by SK9(1217) 9415. The fins and related flip-fin system are defined in SK9(1217) 9476 and DL-10928, Issue C.

Telemetry System -- The telemetry system was instrumented to record roll, pitch, and yaw rates, accelerations, and aerodynamic pressure along the outer skin of the cylinder and afterbody. The following information was telemetered:

Subcarrier frequency (kc)	A Package - 226.7 mc
5.4	1217 Battery and camera pulse
7.35	Pressure 10-1510 mm Hg. Station 102
10.5	Pressure 10-790 mm Hg. Station 90
14.5	Pressure 10-790 mm Hg. Station 96
22.0	Pressure 10-790 mm Hg. Station 104
30.0	Pressure 10-790 mm Hg. Station 110
40.0	Vertical Acceleration $\pm 5g$
52.5	Horizontal Acceleration $\pm 3g$
70.0	Longitudinal Acceleration $\pm 5g$
	B Package - 232.9 mc
3.9	1 second flash and 1217 det.
5.4	Roll gyros $\pm 60^{\circ}$/sec.
7.35	Pitch gyro $\pm 400^{\circ}$/sec.
10.5	Yaw gyro $\pm 200^{\circ}$/sec.
14.5	Pressure 10-1510 mm Hg. Station 100
22.0	Pressure 10-790 mm Hg. Station 113
30.0	Pressure 10-790 mm Hg. Station 117
40.0	Pressure 10-790 mm Hg. Station 125
52.5	Pressure 10-790 mm Hg. Station 135
70.0	Longitudinal Accelerometer $\pm 5g$

UNCLASSIFIED

[redacted]

[redacted]

Pressure ports were located at stations 90, 96, 100, 102, 104, 110, 113, 117, 125, and 135. Each of the baro hoses at stations 90, 96, 100, 102, and 104 was 30 inches from port to T, with a 24-inch lead. Each of the baro hoses at stations 110, 113, and 117 was 40 inches from port to T, with a 24-inch lead. Each of the baro hoses at stations 125 and 135 was 40 inches from port to T, with a 50-inch lead.

All baro ports were 4° off horizontal ℄.

Two ejectable Pluto cameras (see Figure 10) were located in the nose section six inches off of the horizontal center line, station 39.90 to view the flip-fin deployment. These cameras were intended to be ejected 20 seconds after release.

Three kick rockets (700 pounds thrust each) were inserted in the nose. These rockets were to fire 10, 25, and 40 seconds after release, and the resulting deviations in flight were to be used to check the flight stability of the weapon. The rockets were placed in their holders on the vertical center line.

Miscellaneous Information

The test vehicle configuration compared with the anticipated WR configuration as follows:

	Test vehicle configuration	WR configuration
Weight	8290	8350 pounds
Center of Gravity	77.9	77.24 inches
MI Yaw	1370 slug/ft^2	2144 slug ft^2
Over-all length	146.75 inches	146.4 inches

Supplementary Description

1. The spoiler band was 2 inches high at station 102.
2. The afterbody was tapered.

Test Results

Telemetry System Performance

The telemetry produced satisfactory records and shows that a fin deployment signal was initiated at approximately 1.6 seconds. The pressure data appears very erratic the first 16 seconds and again from 26 seconds to 28 seconds. The 52.5 (station 135) pressure channel on "B" package malfunctioned. Three seconds after release, the roll rate gyro bottomed out and stayed out of channel for most of the next eight seconds. A report from the range said a fin came off just before impact, and the telemetry record shows a marked increase in the roll rate 0.4 second before impact. Chase plane reported fin action. Time of fall was approximately 56.5 seconds.

The approximate circular error was 3390 feet at 5:30 o'clock.

[redacted]

CLASSIFIED

Electrical System Performance

The electrical performance was satisfactory.

Mechanical System Performance

The mechanical system of pulleys, cables and cable-cutter, shown in Figure 8, and the fin and fin-snubber shown extended in Figure 9 operated without any difficulties. However, one fin broke off 0.4 seconds before impact, and the weapon showed a marked increase in roll at this point.

Release and Impact Data

Release Data

Aircraft Type: B-47 #155
Altitude (MSL): 43071
Attitude: Level
True Airspeed: 457 knots
Ground Speed Askania: 429.3 knots
Vertical Velocity Askania: +6.0 fps
Wind at Release Altitude (Rawidar):

Velocity: 31 knots
Direction: 315 degrees

Impact Data

Time of Fall:

Askania: 56.475 seconds
Telemetered: 56.479 seconds

Range: 24576 feet
Impact Altitude (MSL): 5331 feet
Impact Velocity and Angle (Askania):

Velocity: 1011 fps
Angle: 78 degrees

Bombing Error

Circular Error: 3335 feet
Range Component: Under 3255 feet
Deflection: Right 727
Base on True Course of: $344^{\circ}34'$

CLASSIFIED

[redacted]

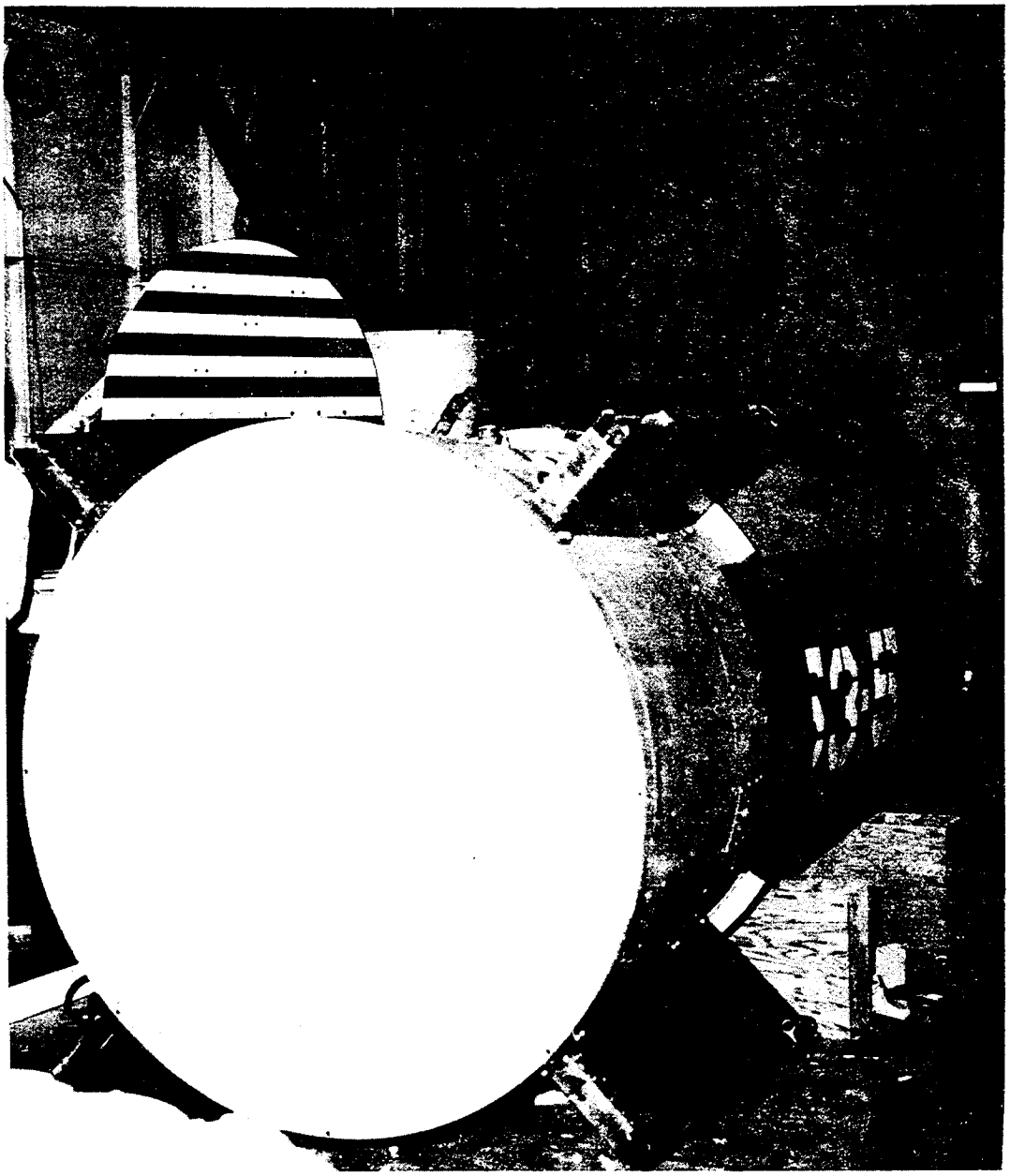

Figure 4. Afterbody

[redacted]

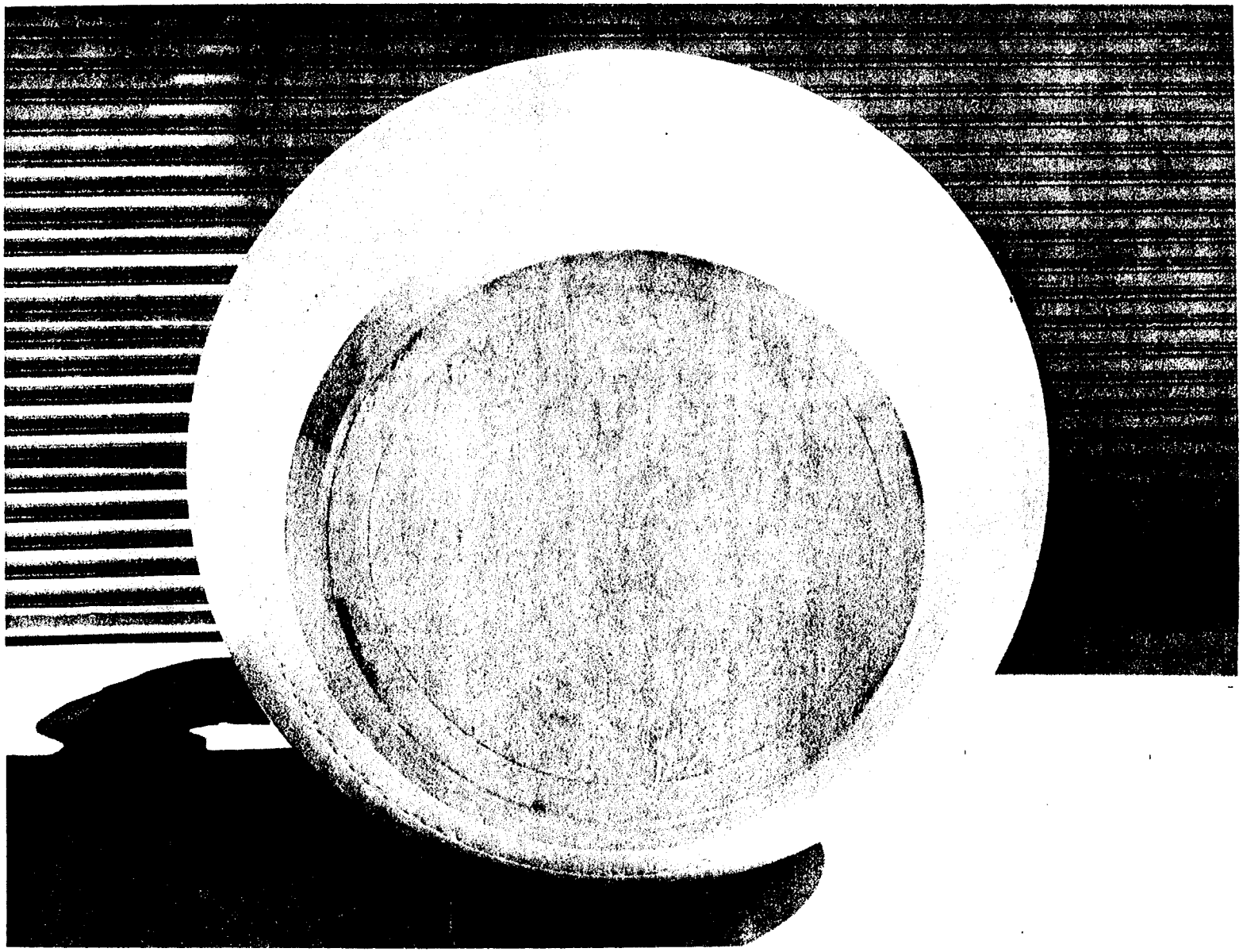

Figure 5. Nose Section

00 1449

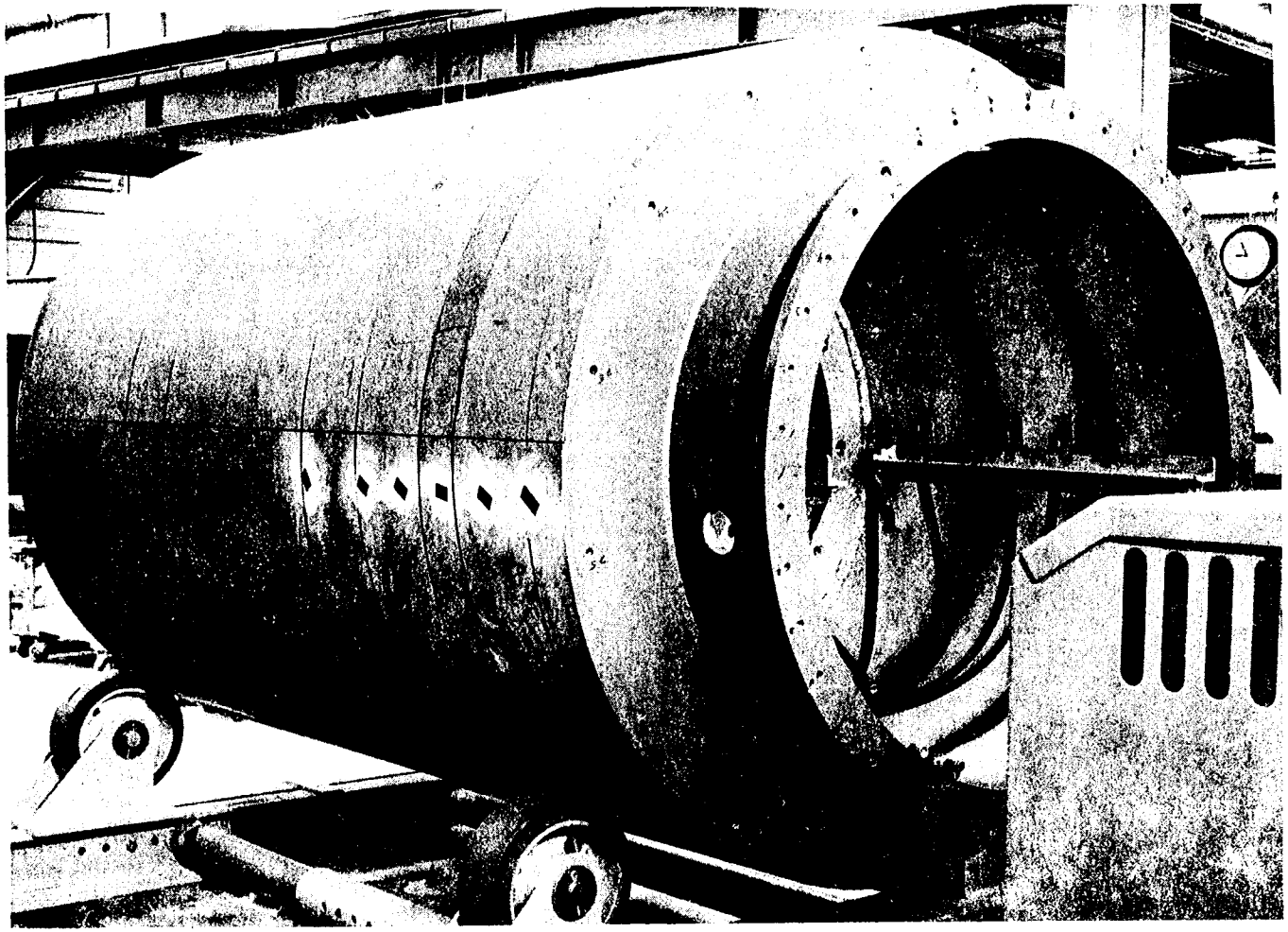

Figure 6. Main Weapon Case

001450

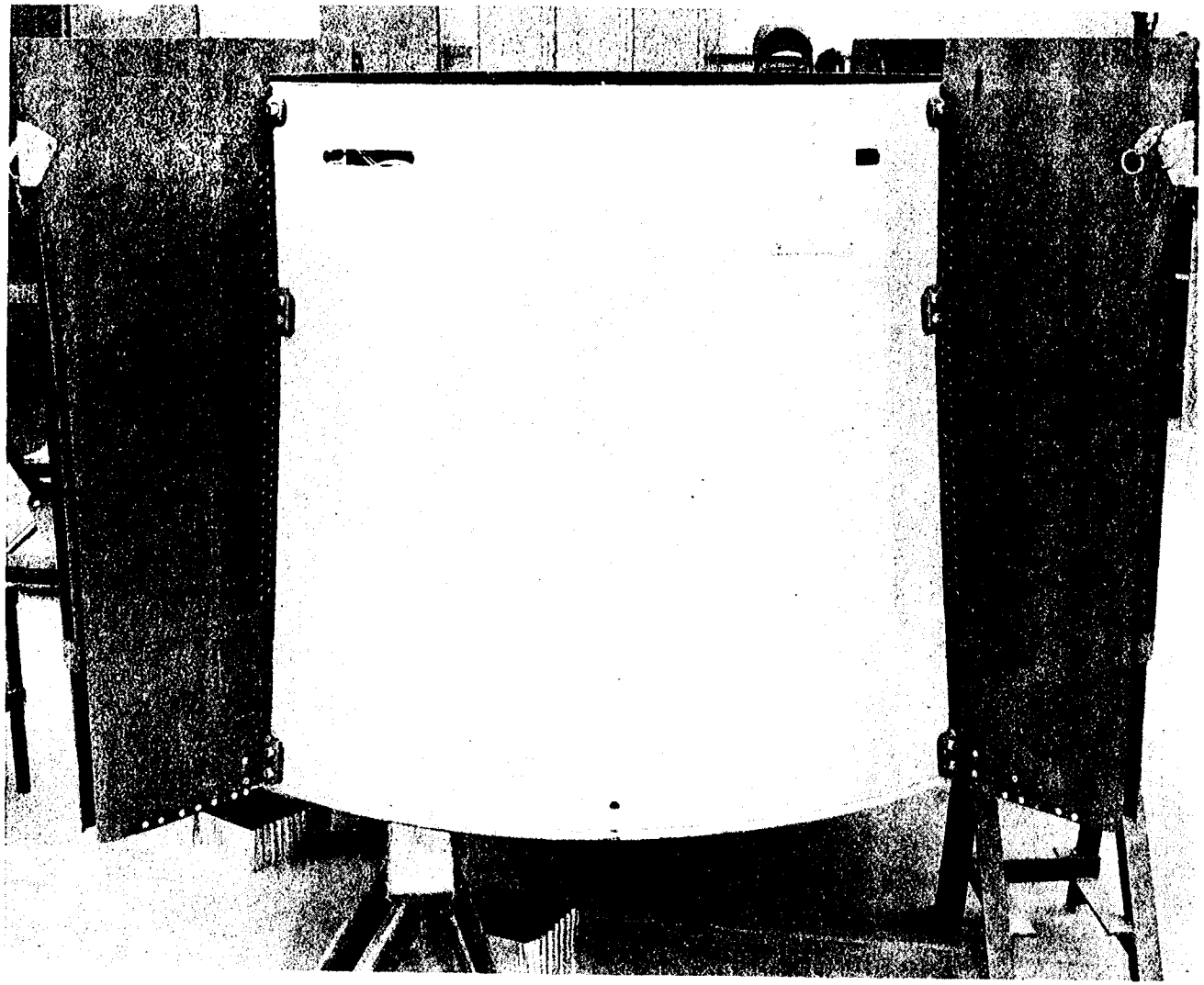

Figure 7. Afterbody

00145

[redacted]

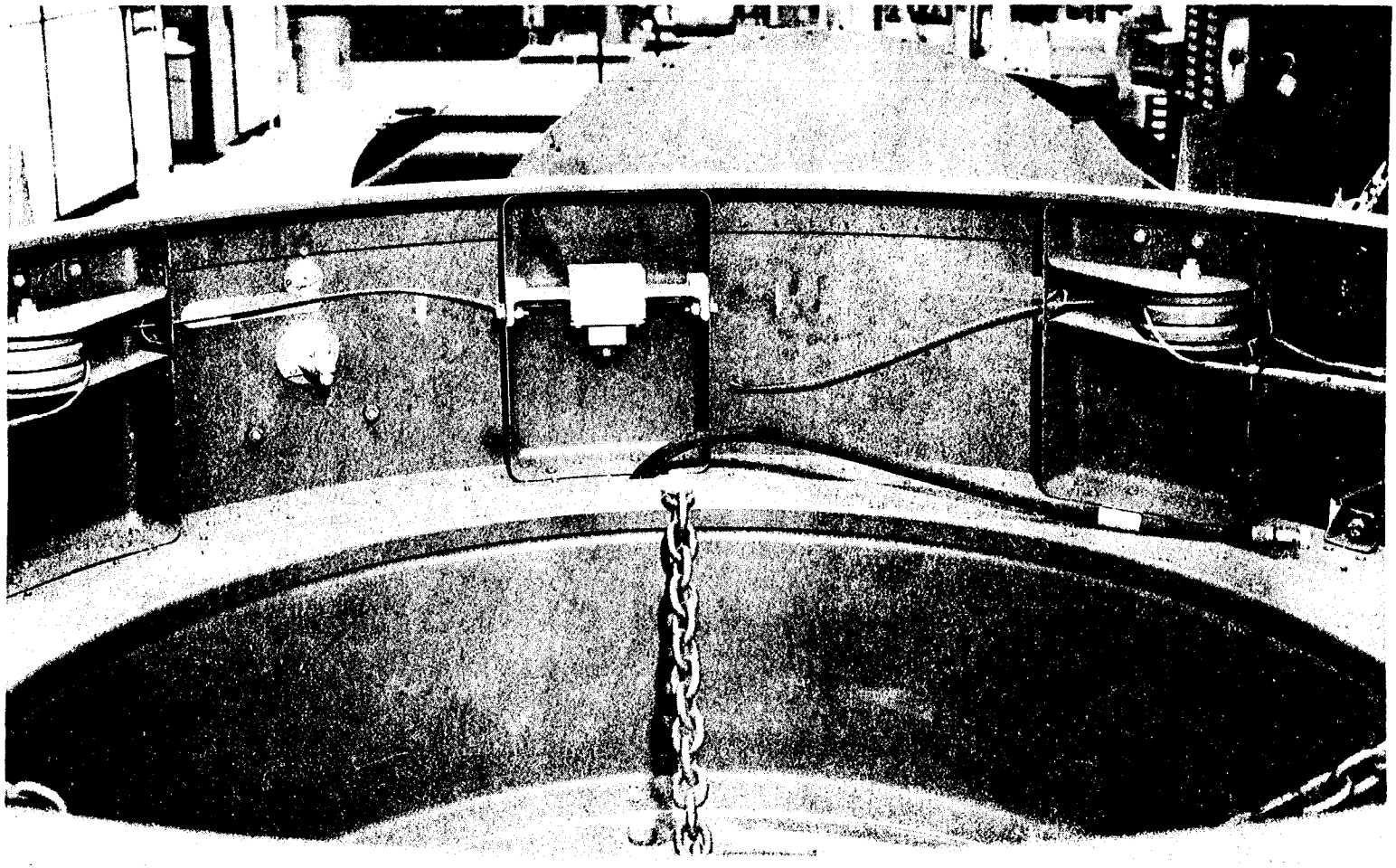

Figure 8. Bermite Cutters

[redacted]

00142

001453

[redacted]

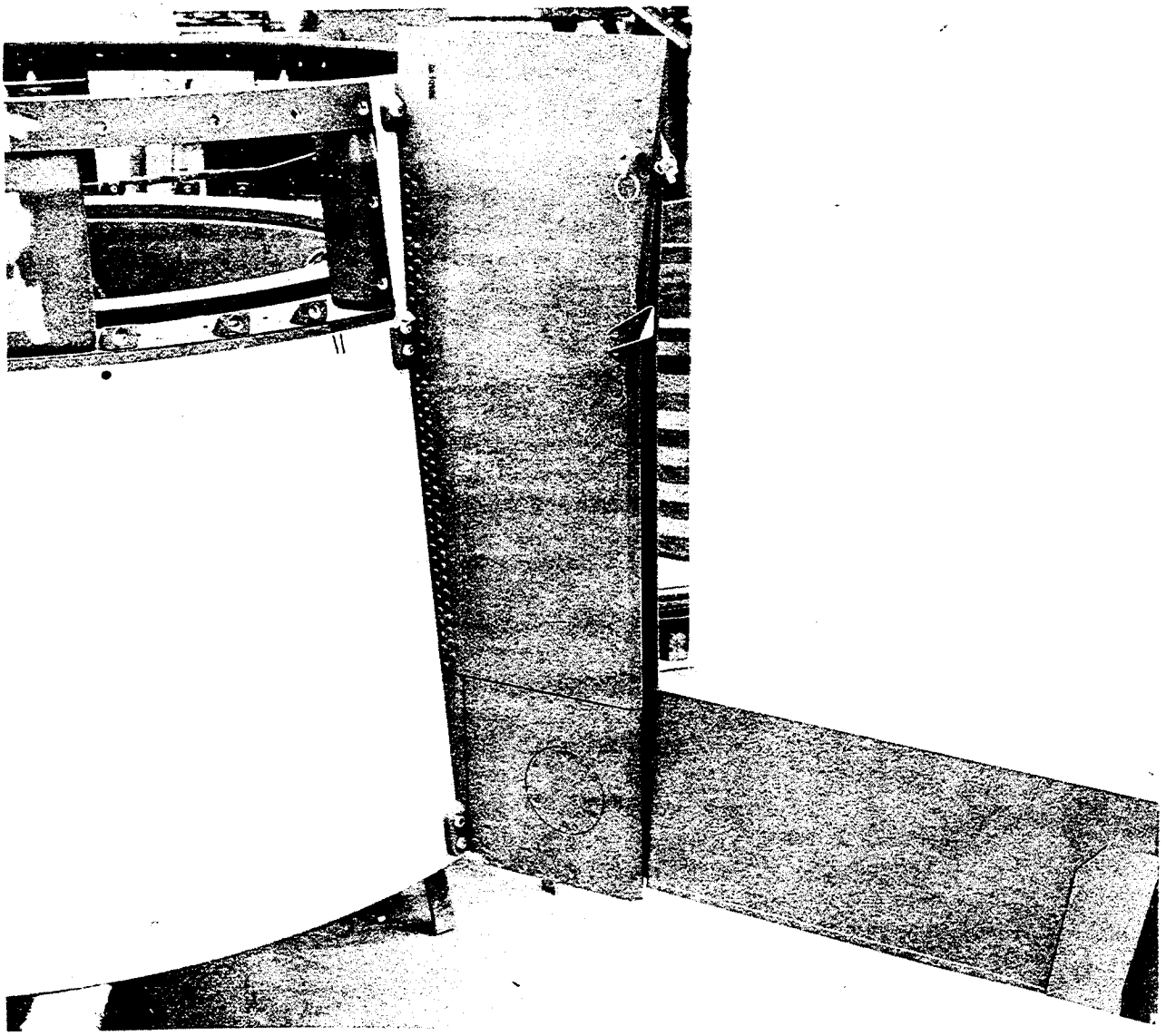

Figure 9. Flip Fins Extended

[redacted]

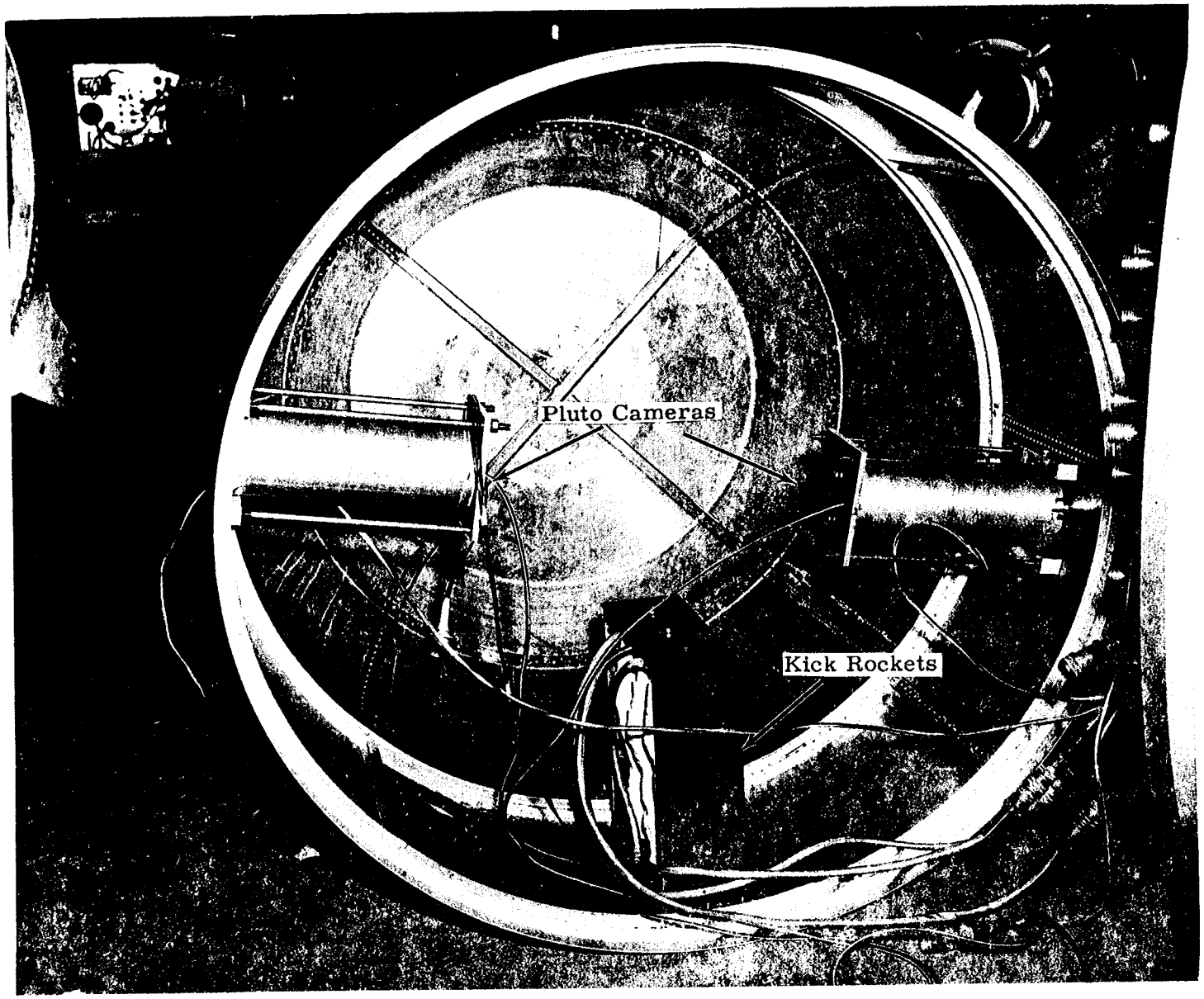

Figure 10. Pluto Camera and Kick Rocket Installation

001454

[redacted]

RECORD COPY
Do Not Take From This Room

37646

29E-137

DEVELOPMENT

REPORT

[redacted]

SANDIA CORPORATION
ALBUQUERQUE · N. MEX.

[redacted]

FEB 9 [redacted]