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APR 2 1959 4-2-59

TX28-X2, 4.4
Project No: ET-6140
Case No: 689.00
Completed: 9-11-58

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
1st Review Date: 8/11/98
Authority: DADC ADD
Name: R B Cramer
2nd Review Date: 8/20/98
Authority: ADD
Name: W Layne
Determination (Circle Numbers):
1. Classification Retained
2. Classification Changed to: U
3. Contains No DOE Classified Information
4. Coordinate With:
5. Contains UCAI? NO
6. Comments: Declassify

PROGRAM
CATEGORY
ORG. 000
DATE 5924

Explosive Tests of Parachute Ejection
For The TX28-X2

CENTRAL RECORD FILE
TX-28-X2
4-4

RECEIVED
APR 2 1959
CENTRAL RECORD FILE

Summary

Nine shots were fired in the test series. The items under investigation in this test series included; the ability of primacord to cut shroud lines and aluminum sheet, evaluation of shroud line cutter, evaluation of the case cutting method, deployment of cover plate, and evaluation of a safing device for the cover plate.

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
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CLASSIFICATION CHANGED TO: U
AUTHORITY: W.C. Layne
Emelda Selph 8/25/98
PERSON CHANGING MARKING & DATE
RECORD ID: 98SN3787
WC Layne 8/25/98
PERSON VERIFYING MARKING & DATE
DATED: 8/20/98

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Object of Test

The object of this test was to evaluate the parachute ejection system of the TX28-X2.

Authorization for Test

This test was requested by Division 1215 in a work order authorization dated 4-3-58. The consultants were G. Hughes, D. Novaria, and B. Caskey.

Acknowledgements

Division 1611 wishes to acknowledge the participation and assistance of the following organizations in the tests of the parachute ejection system.

Section 1613-4 for liaison services
Section 5213-3 for camera coverage

General Information

All tests were performed in Area III.

Fastax film coverage on the various shots was obtained, and is available and may be viewed by contacting D. G. Ahlstrom, Division 1611.

Further tests are presently being performed on the parachute ejection system of the TX28-X2 weapon.

Procedure and Results

Shot No. 1 - Figure No. 1 is a view of the test setup prior to shot No. 1. The primacord used in this test was lead covered 10 grain/foot. An engineering Corporation detonator was used to detonate the primacord.

The following tabulation shows what materials were subjected to the primacord blast and at what position they were placed. The station numbers are those seen in Figure No. 1.

Station	Number of Shroud Line Strands	Distance From Primacord in Inches
1	1	0
2	2	0
3	3	0
4	1	0.125
5	2	0.125
6	3	0.125

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Station	Number of Shroud Line Strands	Distance From Primacord in Inches
7	1	0.25
8	2	0.25
9	3	0.25
10	2	0
11	2	0

Station	Gage of 6061-T6 Aluminum Sheets	Distance From Primacord in Inches
12	0.032	0
13	0.064	0
14	0.125	0
15	0.032	0.7
16	0.064	0.75
17	0.125	0.80
18	0.064	0
19	0.064	0
20	0.032	0
21	0.064	0
22	0.125	0

Figure No. 2 is a view following shot No. 1.

All suspension lines were intact after this shot. The lines close to the primacord at each station were somewhat frayed and blackened. However, the lines were essentially undamaged. The distance between the primacord and lines apparently made no great difference.

The three aluminum pieces which were placed directly over the primacord and held by C-clamps were damaged as follows:

0.032 gage sheared off around the C-clamp foot.
0.064 gage sheared off around the C-clamp foot.
0.0125 gage was slightly bent.

The three aluminum straps placed 0.075" from the primacord were blown into the air and were damaged by the primacord as follows:

0.032 gage 40° Bend
0.064 gage 15% Bend
0.125 gage 0° Bend

The three aluminum strips which were placed across a support with a 2-inch span were damaged as follows:

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0.032 gage 135° Bend
0.064 gage 120° Bend
0.125 gage Slight Bend

The two aluminum strips (both .064 gage) placed on the ground with the primacord over them were slightly deformed.

Shot No. 2 - Figure No. 3 is a view of the test setup prior to shot No. 2. The primacord used was 30 grain/foot. An engineering corporation detonator was used.

The following tabulation shows what materials were subjected to the primacord blast, and at what positon they were placed. The station numbers can be seen in Figure No. 3.

Station	Number of Shroud Line Strands	Distance From Primacord in Inches
1	1	0
2	2	0
3	1	0.125
4	2	0.125
5	1	0.250
6	2	0.250
7	1	0
8	2	0
9	1	Primacord wrapped around shroud line (once)
10	2	Primacord wrapped around shroud line (once)
11	1	Primacord wrapped around shroud line (twice)
12	2	Primacord wrapped around shroud line (twice)

Station	Gage	Material	Distance From Primacord In Inches
13	0.125	2024-T3	0
14	0.063	6061-T6	0
15	0.032	2024-T3	0
16	0.125	2024-T3	1
17	0.063	6061-T6	1
18	0.032	2024-T3	1

Figure No. 4 is a view following shot No. 2.

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All single strand lines were severed in this test. In addition, the doubled lines placed directly on the primacord had all lower lines severed, while the upper lines were burned and frayed but were not severed.

Four unsupported shroud lines were wrapped with primacord in an attempt to determine if this might be a means of cutting lines. Due to the sharp radii used, the primacord around three of the samples failed to detonate. A single wrap around one strand of line did sever the lines successfully.

The three aluminum plates riveted to the aluminum test fixture were removed by the blast. Only the 0.032 and the 0.064 sheets were recovered. Examination of these items indicated that the sheets had sheared before being torn away from the rivets. The .125 sheet, which was not recovered, appeared to have sheared the rivet heads as it was removed by the blast.

Additional aluminum sheets were placed on blocks 1 inch away from the primacord. The 0.032 sheet was sheared while the 0.064 and the 0.25 sheets were slightly bent.

Shot No. 3 - Figure No. 5 is a view of the test setup prior to Shot No. 3. Twenty grain primacord was used in this shot in an effort to sever the shroud lines. Ten grain primacord was used to separate the cover plate from the test ring. The detonator used was an engineering corporation detonator.

Twelve shroud lines were stretched over the test jig at various degrees of tightness.

A 3/8" thick 24s-T4 aluminum plate was used as the cover plate. It was attached to the test ring by 8 1/4-20 socket head cap screws. The plate was counterbored so that a nominal 0.081 thickness remained under the bolt heads.

The following tabulation shows the positions of the shroud lines, the number of strands, and the amount of slack in the shroud lines.

The station numbers can be seen in Figure No. 5.

Station	Number of Shroud Line Strands	Distance From Primacord in Inches	Slack in Lines in Inches
1	1	0	0
2	1	0.125	0

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Station	Number of Shroud Line Strands	Distance From Primacord In Inches	Slack in Lines in Inches
3	1	0.250	0
4	1	0	0.125
5	1	0	0.250
6	2	0	0
7	2	0	0
8	1	0	0.375
9	1	0	0.250
10	1	0.250	0
11	1	0.125	0
12	1	0	0

None of the shroud lines were severed by the action of the 20 grain/foot primacord.

The cover plate was successfully separated from the test ring and visual observations indicated that it was blown 20 to 30 feet above the test ring. All bolts remained in the test ring. The plate was bowed slightly.

Shot No. 4 - In this shot a cover plate was once again separated from a test ring. This shot differed from the cover plate test in shot three in only two respects. The eight attaching bolts were placed 1/4" further from the primacord groove, and the test ring was blocked up from the concrete test pad to allow venting of blast gases.

A test jig employing a knife cutting method for line separation was tested in this shot. The jig consisted of a steel knife blade, a 1" diameter aluminum spool, a line tightening plate and supporting structure. In addition, 1/8" steel pipe was attached to either end of the jig to attempt to confine the blast. Three single strand 6000 lb. shroud lines were placed in the jig.

Ten grain primacord was used to separate the cover plate and also to actuate the shroud line cutter. The detonator was an engineering corporation detonator.

The cover plate separated successfully. However, it only reached a height of approximately 15 feet as compared to 30 feet in shot 3. The cover plate was once again slightly bowed.

The knife cut the shroud lines cleanly and continued into the spool, marking it slightly. The 1/8" steel pipe was flattened and severed along the longitudinal joint.

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Shot No. 5 - Figure No. 6 is a view of the test jig used in shot No. 5. The test jig consisted of a 5" cylinder of 0.064" 24S-T1 aluminum sheet stiffened by two aluminum rings. Two rows of 5/32 diameter 2YS-T3 rivets on 3/4" centers were used to fasten each stiffener ring to the skin. A 0.170" square groove was cut into one ring on the o outer diameter to allow passage of primacord. A 3/8" ring was bolted over the groove to contain the blast. Ten grain primacord was used in this shot along with an engineering corporation detonator.

The skin failed to separate as a result of this test. Failure occurred both by shearing and tensile fracture of the rivets in each ring.

Figures 7 and 8 are views of the test jig following this shot.

Shot No. 6 - Figure No. 9 is a view of the setup prior to shot No. 6. This was the second attempt at shroud line cutting utilizing an explosively-driven knife. Both 6000 lb. and 9000 lb. lines were used in this test.

The 9000 lb. lines were installed in the small test jig previously used in shot No. 4.

The 6000 lb. lines were installed in a cylindrical case section simulating a proposed case design. Twelve lines were employed, each of which was looped and stretched. Four 1" x 3" hollow aluminum spools were used to support the lines. Steel knife blades (3/16" x 3/8" x 3 1/8") were placed above the line and spool assembly.

Ten grain primacord was used to actuate the knives in both test jigs. Only one of the 9000 lb. shroud lines was completely severed. The remaining two lines were deeply cut but not parted. Failure to part appeared to be the result of two factors. One apparent reason was the fact that one end of the knife blade appeared to be in contact with the line. This appeared to keep the blade from gaining the necessary inertia prior to the beginning of the cutting. A second factor was the fact that the knife and slot had been designed for 1/8" thick line. The use of 3/16" thick 9000 lb. line resulted in movement of the spool 1/16" further from the slot, this apparently being enough to cause the knife to rotate slightly.

None of the 6000 lb. lines in the case section were completely severed in this test. This was due to the collapse of the relatively thin-walled spools which occurred before the lines completely cut.

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An additional amount of information concerning blast effect on the proposed inner chute can was obtained by the placement of a cylindrical shell inside of the test case. This shell was made of both 0.64" and 0.125" aluminum. Slight damage occurred in the section of 0.64" thickness, while the 0.125" thick section appeared to be unharmed.

Shot No. 7 - This shot was performed on the cylindrical case section with twelve shroud lines. The setup was the same as described in shot No. 6. 6000 lb. shroud lines were used along with 10 grain primacord and an engineering corporation detonator.

Four lines severed cleanly as a result of this test, while 8 lines had one or more threads which were not severed.

Shot No. 8 - A new type cover plate was used in this shot. This plate differed from those previously tested in that the primacord was housed in the cover plate rather than the test ring. Four 2-inch by 3-inch aluminum tabs were attached to the plate in an attempt to observe the effect of the primacord blast at cover separation. Ten grain primacord was used in this test with a proplex No. 8 detonator.

The cover plate separated successfully and was blown upward approximately 20 feet into the air. Only very slight buckling of the cover plate resulted.

The blast tabs indicated that only a small amount of the lead sheathing from the primacord was sprayed beyond the test ring. This spray was limited to a distance of approximately 1/2 inch from the plate.

Shot No. 9 - The purpose of this test was to determine the effectiveness of a safety device designed by 1284-3. This device is designed to prevent cover separation during handling should the primacord accidentally fire. The test ring and the cover plate used in this test were of the same type as used in shot No. 8. Ten grain primacord was used in this test along with a proplex No. 8 detonator.

The safing device for this unit is an XH-733 and consists of 4 honeycomb washers 1" thick and a steel washer 3/8" thick which fits on top of the honeycomb. A bolt fits through the steel and the honeycomb washer and screws into the cover plate. When the primacord detonator is fired the shock transferred to the plate is absorbed in the honeycomb. The honeycomb washers used in this test were filled with an epoxy.

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The device operated as expected upon detonation, preventing separation. The honeycomb washers were deformed approximately 0.400 inches.

Tests Conducted by: P. S. Young - 1611-1

Original Signed By
G. P. BARNETT
for APR 2 1959
D. G. Ahlstrom - 1611-1

Original Signed By
G. P. BARNETT
Approved by: G. P. Barnett - 1611-1

DGA:1611-1:eg

Encs: Figure 1 thru 9

Copy to:
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W. A. Gardner, 1610
L. R. Meyers, 1615-1
J. M. Wiesen, 1592
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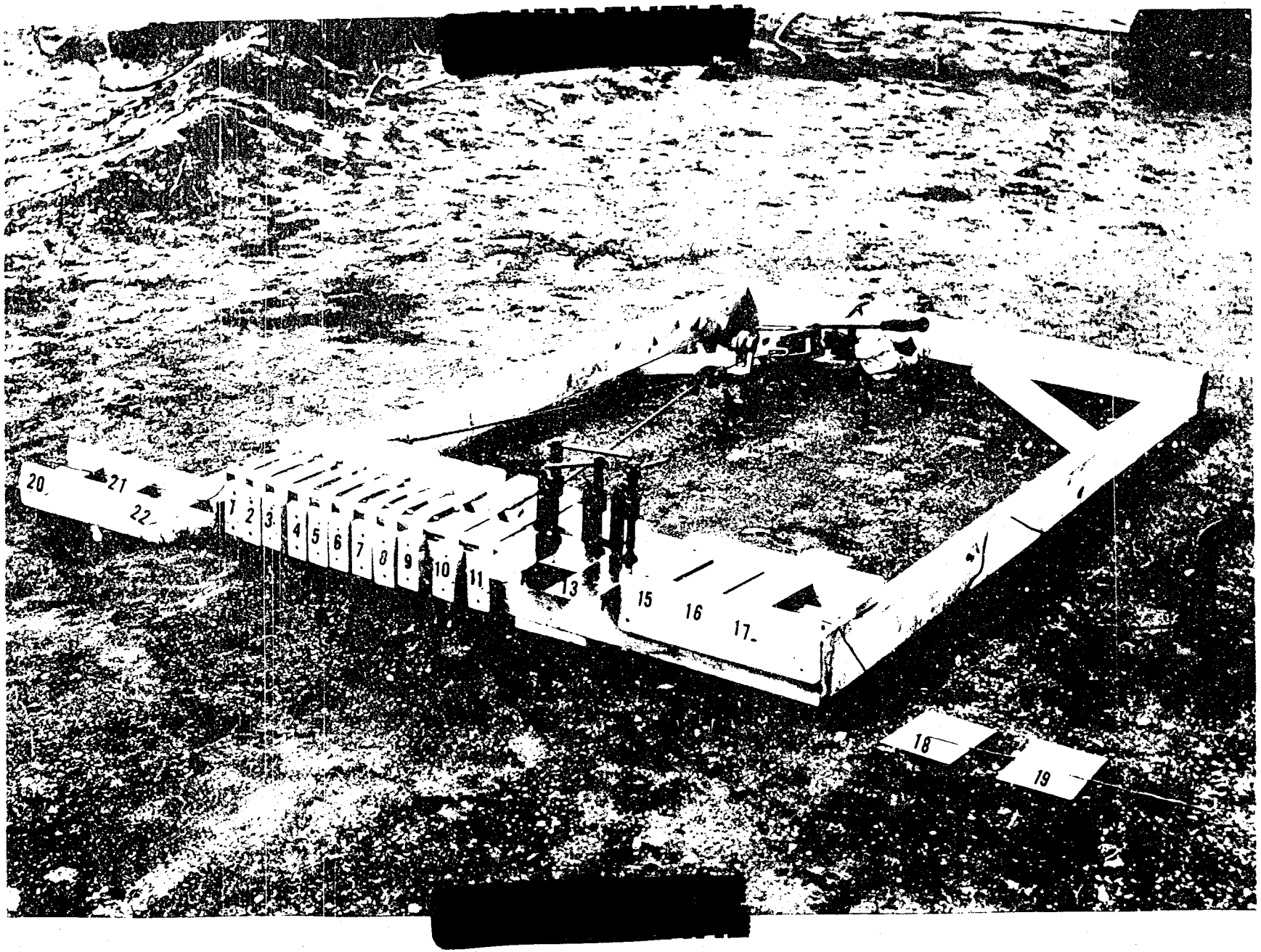

D# 9-3502

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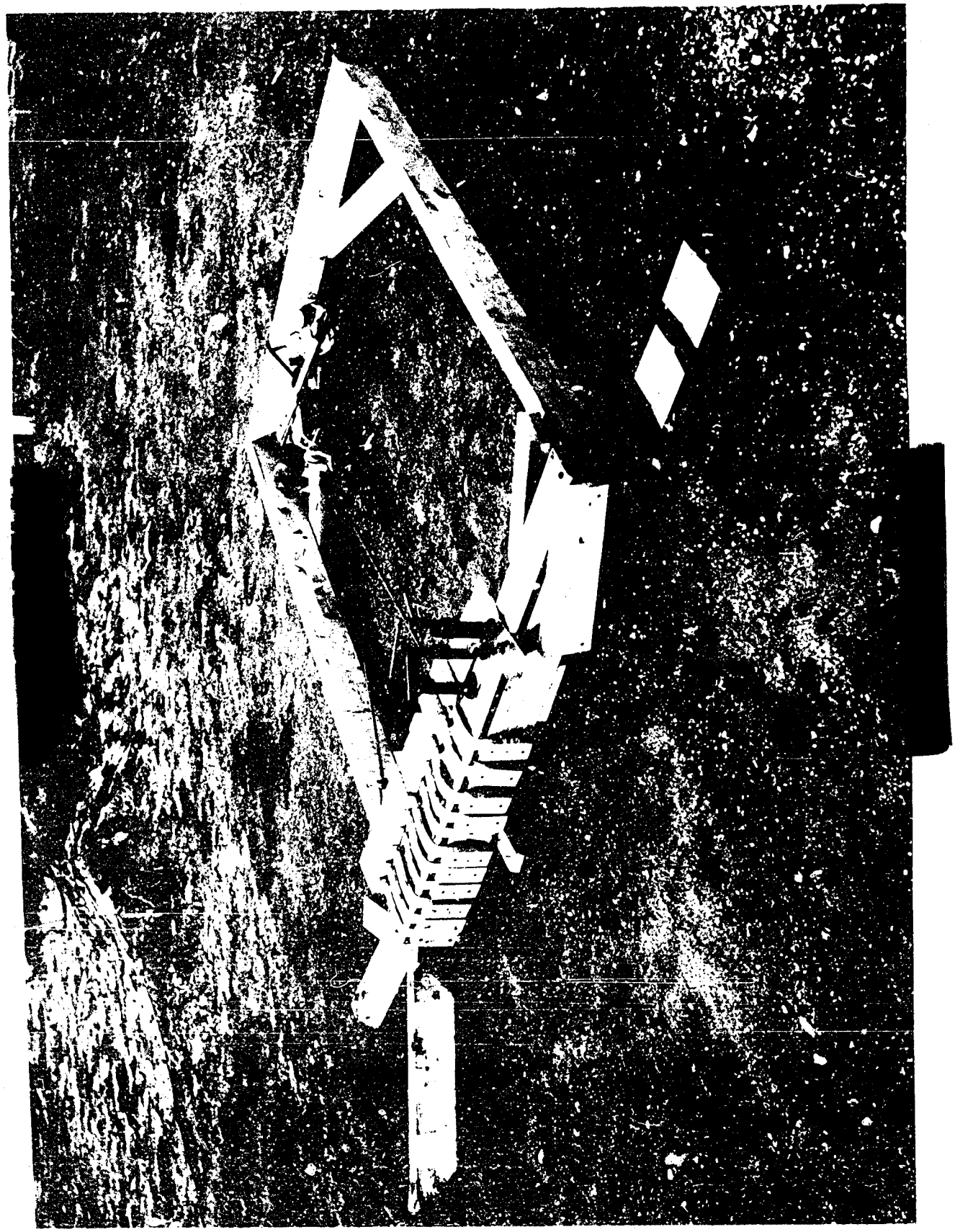
#341



D#9-3523

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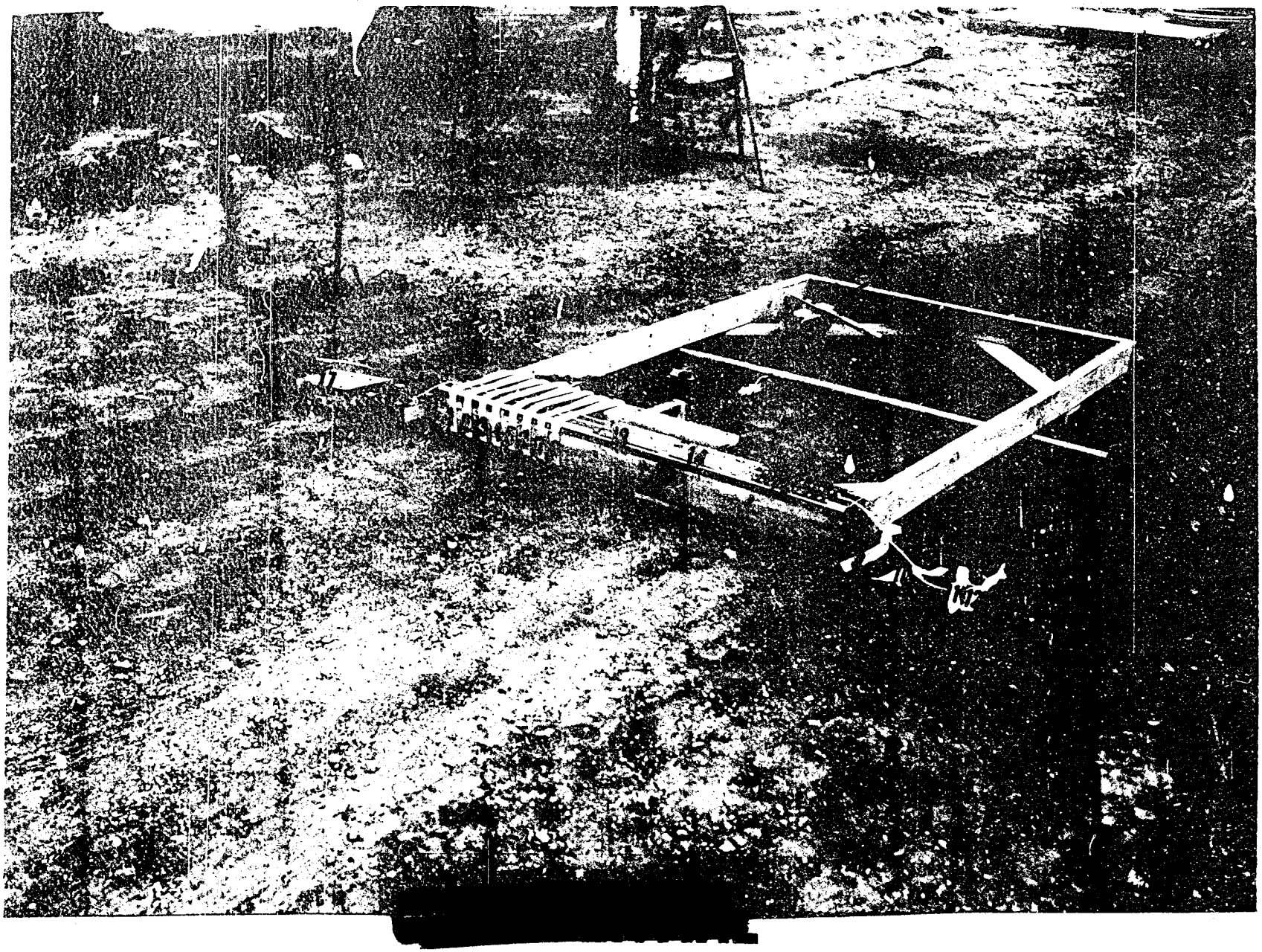

FIG. 3 TEST SET UP PRIOR TO SHOT NO. 2 D#9-3524 ET-6140

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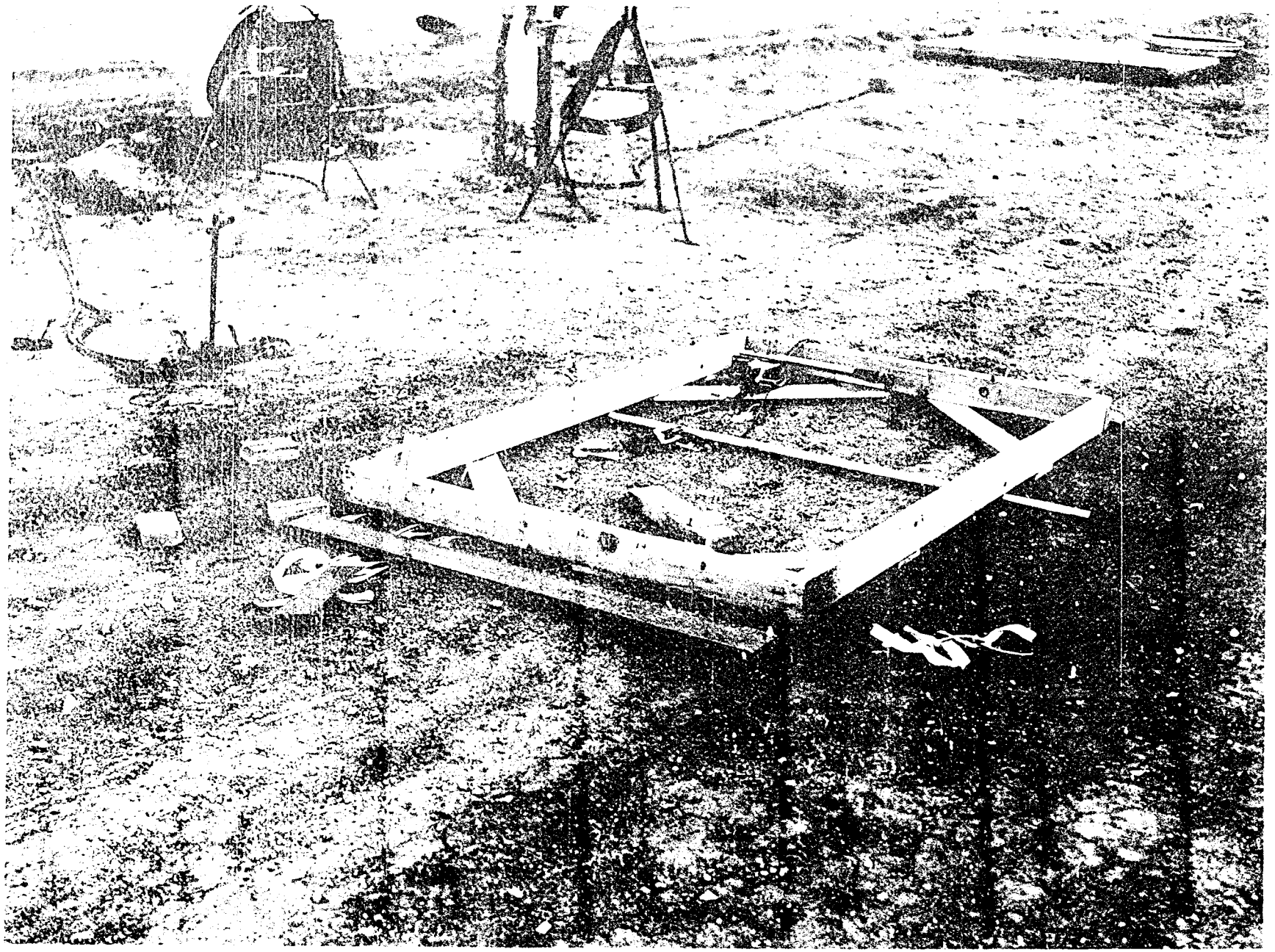

FIG. 4 VIEW FOLLOWING SHOT NO. 2 [redacted] ET-6140

D# 105701

#343

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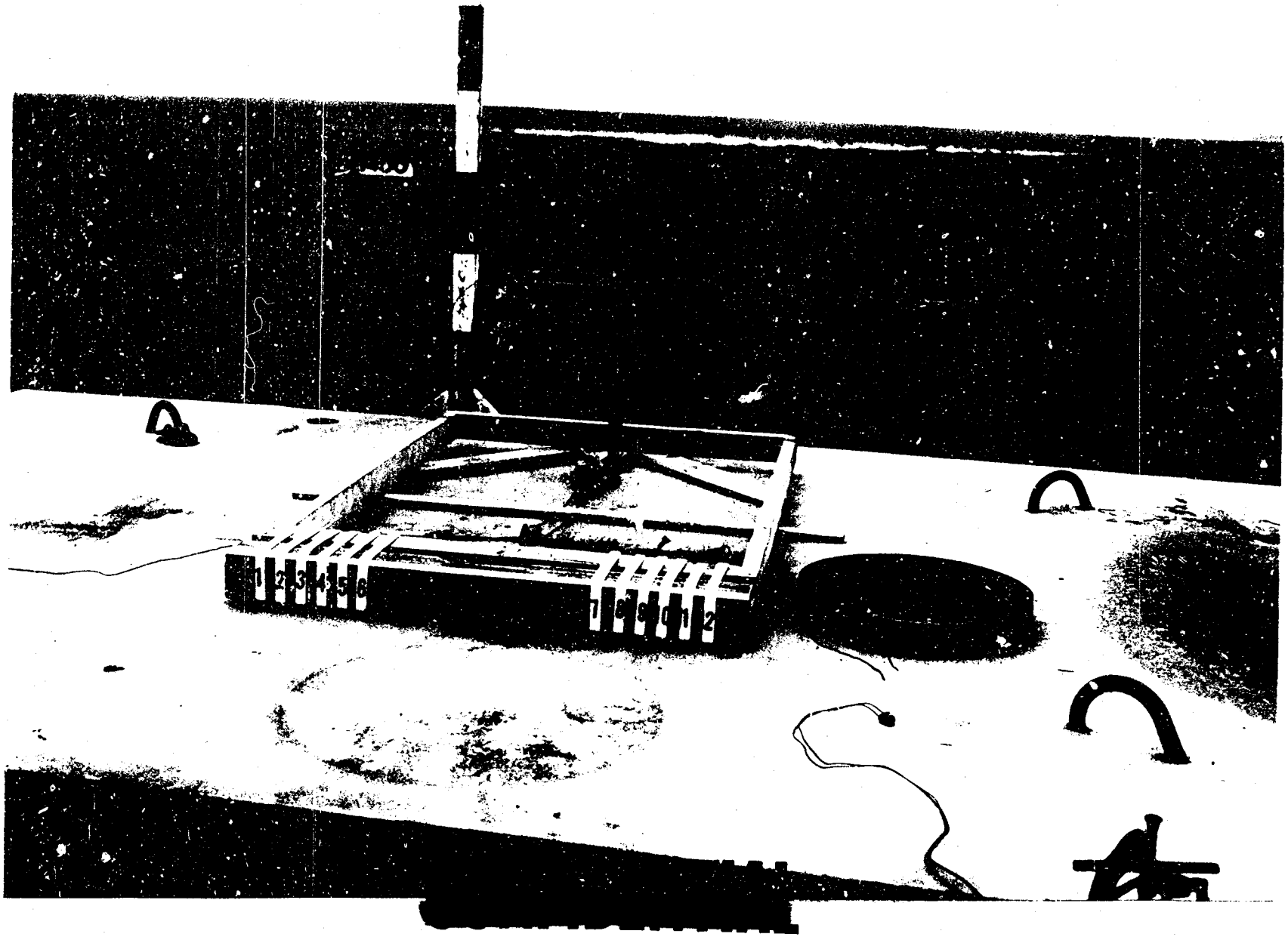

FIG. 5 [illegible]

D#9-3525

#344

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FIG. 6 TEST SETUP PRIOR TO SHOT NO. 5 ET-6140

D# 106178

#345

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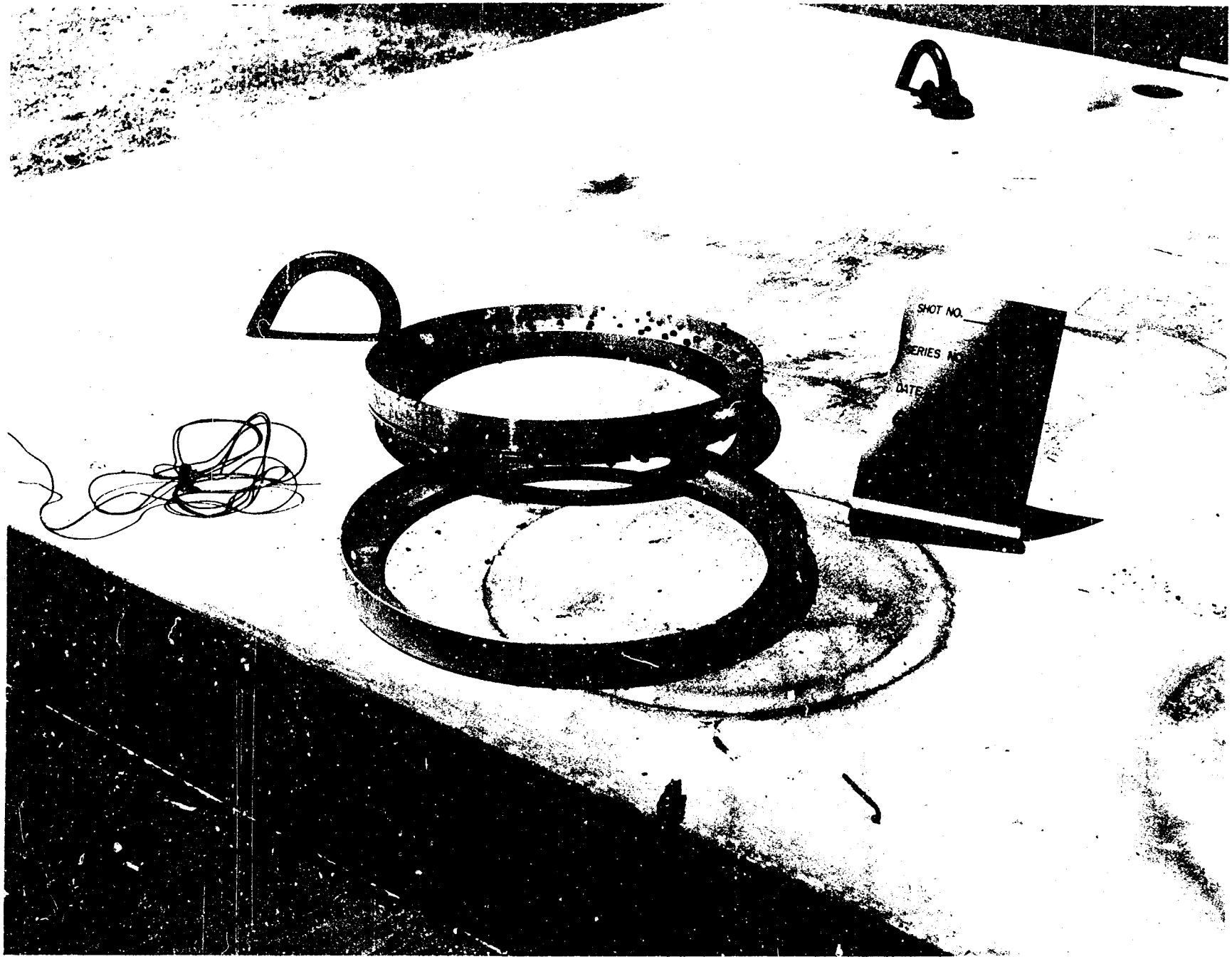

FIG. 7 VIEW FOLLOWING SHOT NO. 5 D#106779 ST-6140

#346

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FIG. 8 VIEW FOLLOWING SHOT NO. 5 D# 106780 ET-6140

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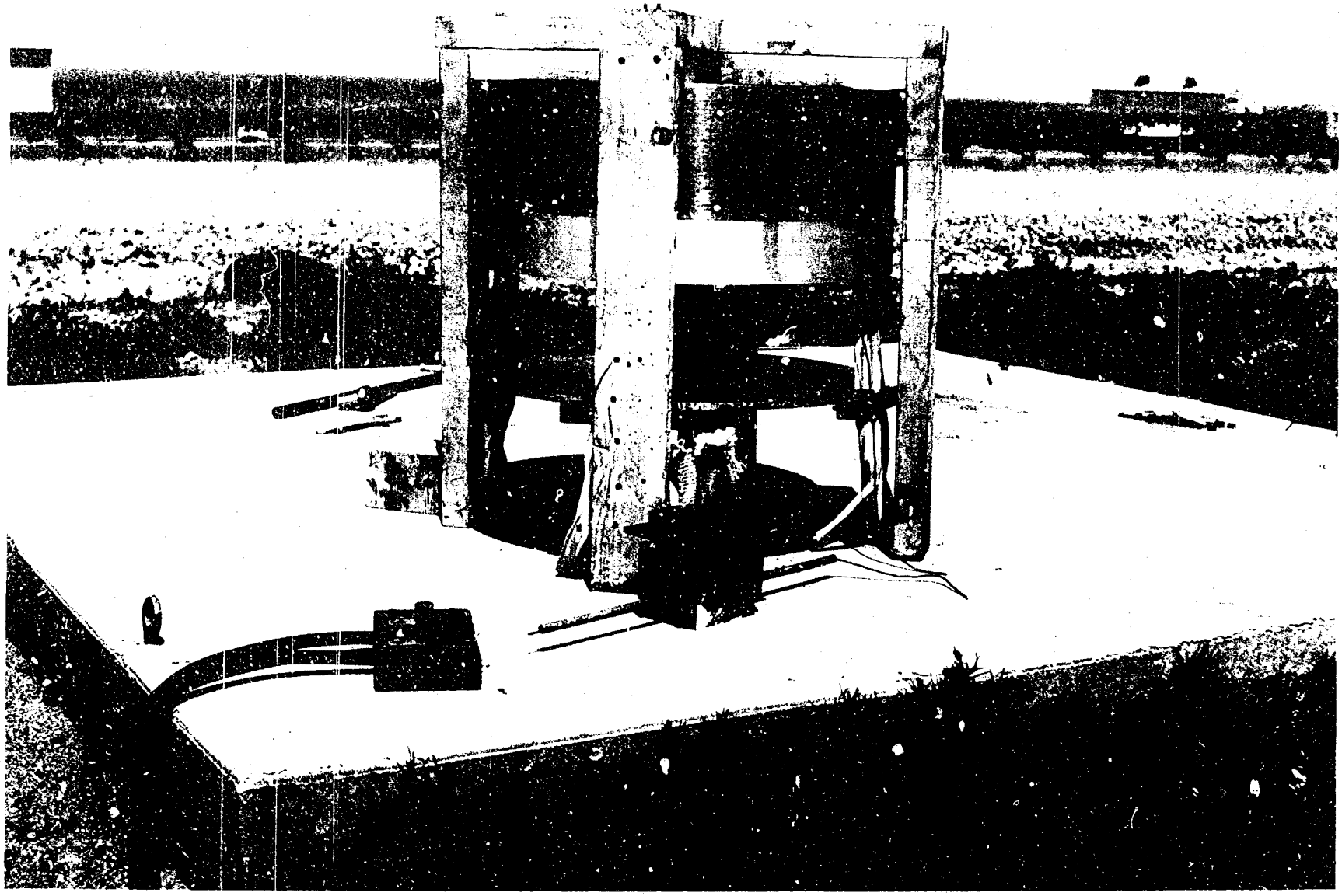

FIG. 9 T T . TUI PRIOR TO SHOT NO. 6 ET-6140

D# 106446

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