[redacted]

227

UNCLASSIFIED

10/15/98
RBCrane
Review Date: 10/26/98
Authority: ADD
W Layne
Declassify

TCG-NNT-1

JUN 9 1961
File: P-6.0
T-16734
Project No. 13.860.07

TO: DISTRIBUTION

Re: Parachute Deployment Test (U)

Summary of Results

A method of parachute deployment which will not use a pilot chute was tested for contemplated use in the TX-57. The parachute was deployed by means of a piston and cylinder arrangement, with the piston being driven with ignited smokeless powder. Mark 2 Mod 1 Seat Ejection Cartridges with quantities of powder ranging from 25 grams to 54 grams were used in six of seven tests. An MC-1362 Gas Generator with approximately 85 grams of smokeless powder was used for the seventh and final test. Successful deployment was achieved in the last four tests with smokeless powder charges of 37½ grams, 54 grams and the MC-1362 Gas Generator.

Object of Test

The object of this test was to determine the effectiveness of a powered parachute deployment system for contemplated use in the TX-57.

RECEIVED
JUN 13 1961
CENTRAL RECORD FILE

Authorization for Test

This test was requested in a Work Order Authorization to R. S. Hooper, 7321-5, from H. Mullin, 7124-2, dated 12/2/59. Dale Buchanan was the Division 7321 Project Engineer.

Function of Object Tested

The parachute deployment system is designed to deploy the TX-57 parachute to line stretch when the TX-57 has zero forward velocity.

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP
CLASSIFICATION CHANGED TO: U
Carmela Gallegos 10/26/98
PERSON CHANGING MARKING & DATE
W C Layne 10/28/98
PERSON VERIFYING MARKING & DATE
AUTHORITY: W C Layne
RECORD ID: 99SN0197
DATED: 10/26/98

CENTRAL RECORD FILE
ACCOUNTABILITY CARD
FILE No. P-6

UNCLASSIFIED

[redacted]

16734

[redacted]

To: Distribution 2 8-16734

UNCLASSIFIED

Setup for Test

The test fixture was supplied by Division 7124 and was attached to the rocket test stand in Area III to provide horizontal deployment. The mounting of the test fixture is shown in Figure 1. Figure 2 is a closeup of the test fixture showing the parachute, simulated weight, hinged supports and shear bolt.

Test equipment used consisted of a Consolidated 5-119 recording oscillograph. Velocity was measured by means of Fastax movie cameras. Table I lists the size charges used for each test. The pressure in the cylinder was measured by means of a Statham 0-10,000 psi pressure transducer, type PG10TC-10M-350. The location of the pressure transducer is shown in Figure 1.

Procedure

The test fixture for these tests was mounted to the rocket test stand to allow for horizontal deployment of the parachute, (see Figure 1). The Mark 2 Mod 1 Seat Ejection cartridges were inserted into the cylinder head. A retaining cap containing the initiator was screwed over the cartridge. The firing lines for the 3000' track and the track console were used for the fire circuit.

Results

The results of the seven tests and pressures generated by the different size charges are shown in Table 1. Peak velocities for tests numbered 2, 5, and 6 are also shown in Table 1. In the first test, the piston failed to eject as expected because the shear bolt did not shear (Figure 2). Pressure was indicated when the cylinder cap was removed, and is shown in Figure 3. Zero time in Figure 3 represents first indication of pressure on the recorder. A peak pressure of 1550 psi occurred 0.11 second after the fire pulse.

After reducing the diameter of the shear bolt, test number 2 was run. The piston and parachute were deployed, but the parachute did not fully open as shown in Figure 4. Figure 5 is a closeup view of the unopened parachute cover. Oscillograph record, Figure 6, showed a peak pressure of 3390 psi, 0.119 second after the fire pulse. Zero time represents first indication of pressure on the record. Velocity at the point of ejection was calculated to be 53.4 ft/sec. Figure 7 shows the test fixture after the piston is deployed. In test number 3, the parachute was ejected but the parachute cover did not separate as shown in Figure 8. Pressure was recorded at 2850 psi, 0.12 sec after the fire pulse and is shown in Figure 9. Zero time indicates the beginning of pressure buildup.

UNCLASSIFIED

[redacted]

To: Distribution 3 E-36734

For tests numbered 4 and 5, complete deployment was achieved in both tests. Figure 10 shows the parachute when completely deployed. Figure 11 shows the parachute cover after test number 4. The pressure record of test number 4 is shown in Figure 12, and the pressure record of test number 5 is shown in Figure Number 13.

4700 psi was the peak pressure reading of test number 4, and 4750 psi was the peak reading for test number 5. Time from fire pulse to maximum peak pressure for test 4 and 5 was lost. Velocity was calculated to be 86.8 ft/sec at ejection in test number 5. No pressure record was obtained from test number 6. Complete deployment of the parachute was achieved and the velocity at ejection was calculated to be 98.8 ft/sec.

The ejection cartridge was replaced by a MC-1362 Gas Generator for test number 7. The pressure record shown in Figure 14 shows a peak reading of 5400 psi. Complete deployment was obtained in test number 7.

Conclusions and Recommendations

These tests have shown that the method of parachute ejection tested is feasible. The MC-1362 Gas Generator gives better performance than the seat ejection cartridges. Further tests should be conducted utilizing actual hardware and simulating normal operating conditions of the system.

Leonard Hitchcock 7323-1
LEONARD HITCHCOCK - 7323-1

7321 PROJECT ENGINEER: Dale Buchanan
DALE BUCHANAN - 7321-5

APPROVED BY: E. S. HOOPER - 7321-5

LH:br
Enc. Table 1
Figures 1-14

Distribution:
W. J. Denison, 7124, Attn: H. Mellin, 7124-2
J. M. Wiesen, 1442
E. H. Copeland, 7321
J. R. Harrison, 7523
R. K. Smeltzer, 3421-3

UNCLASSIFIED

[redacted]

#230

FIGURE 1 - MOUNTING OF TEST FIXTURE -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. T-16734

#61-755

UNCLASSIFIED

[redacted]

#231

[redacted]

UNCLASSIFIED

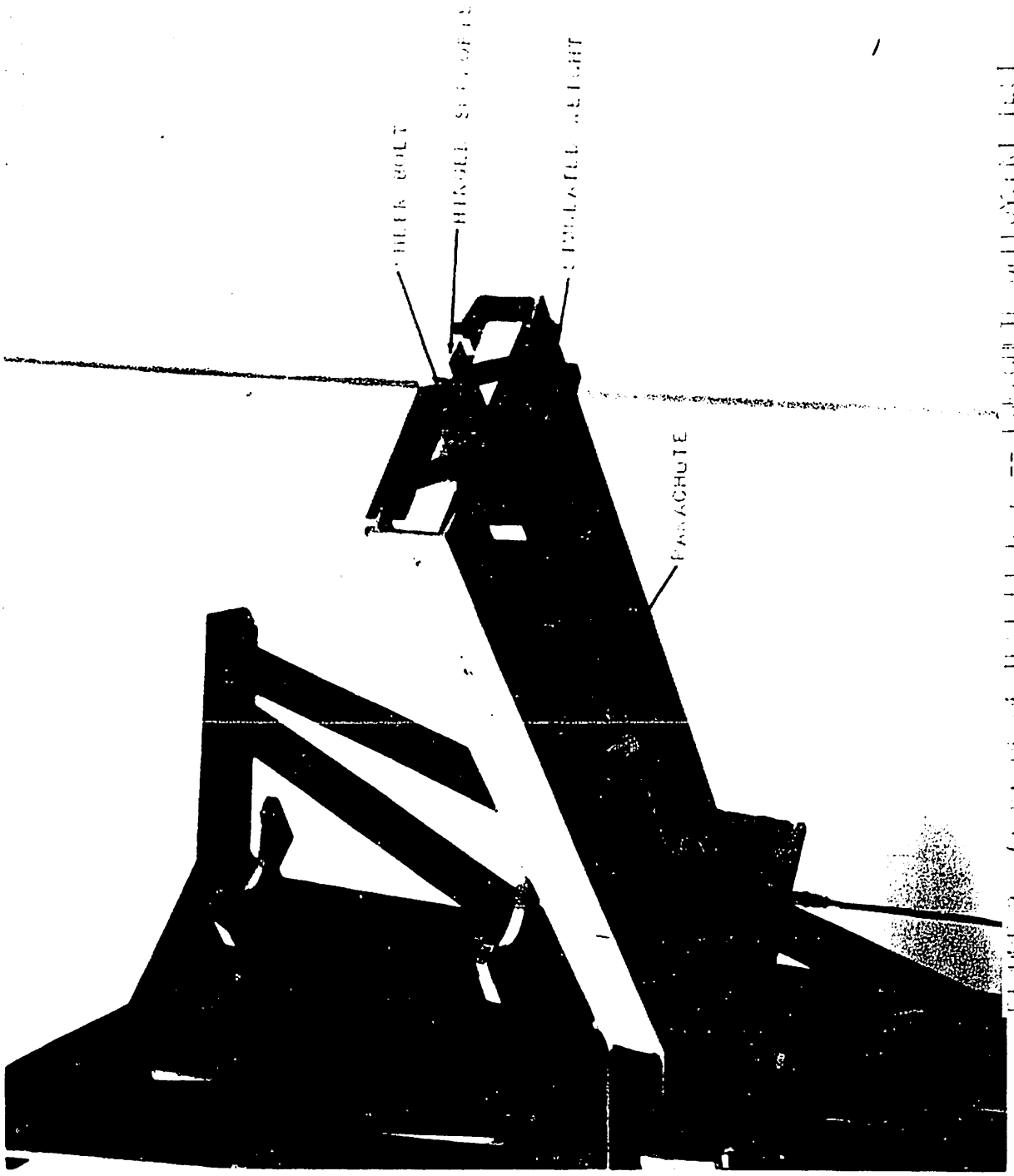

FIGURE 2 - CLOSE UP OF TEST FIXTURE -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. T-16734

D#61-7566

UNCLASSIFIED

[redacted]

K+E 10 X 10 TO THE INCH 359-5DG
KEUFFEL & ESSER CO. MADE IN U.S.A.

UNCLASSIFIED

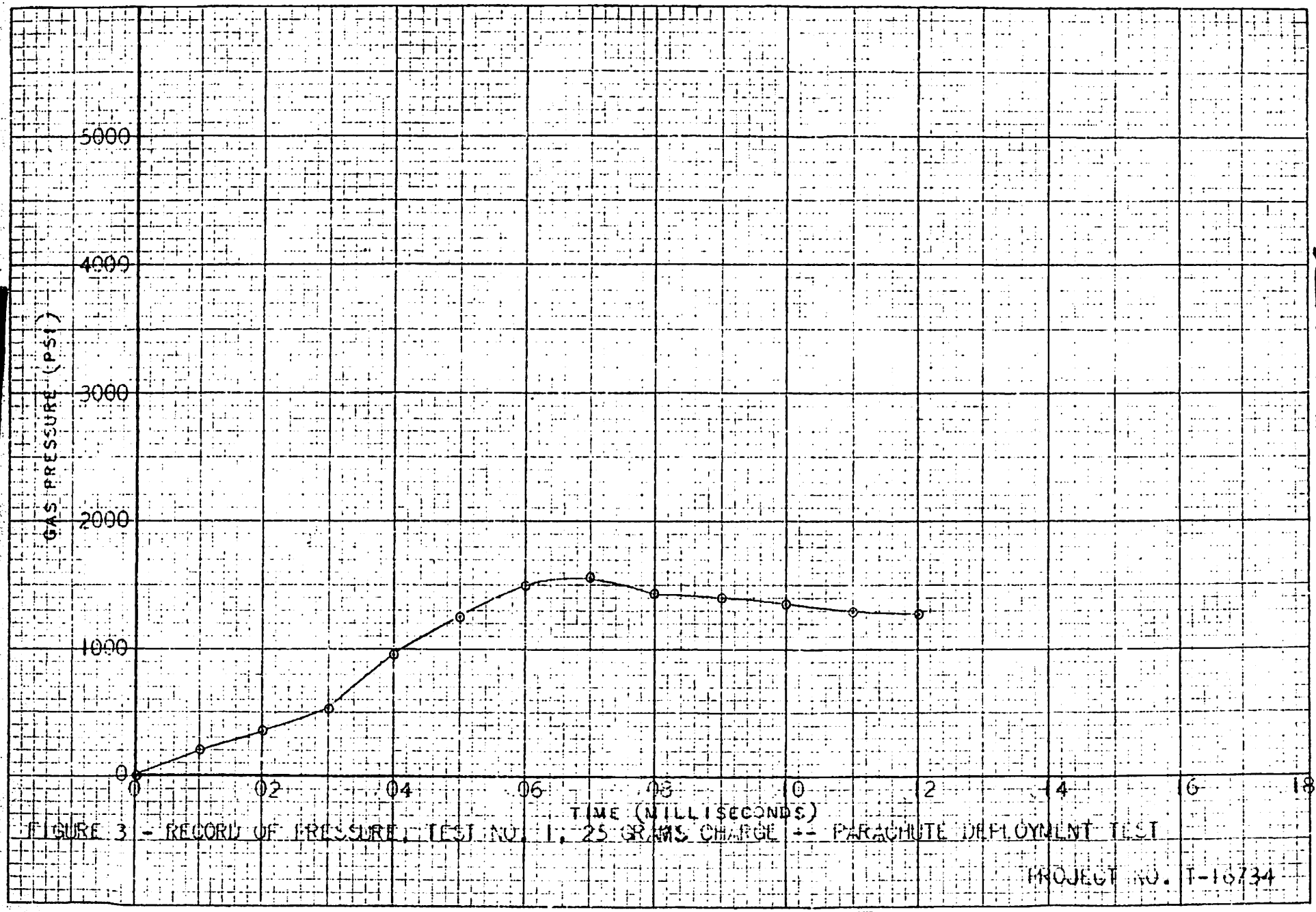

FIGURE 3 - RECORD OF PRESSURE, TEST NO. 1, 25 GRAMS CHARGE -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. T-10734

UNCLASSIFIED

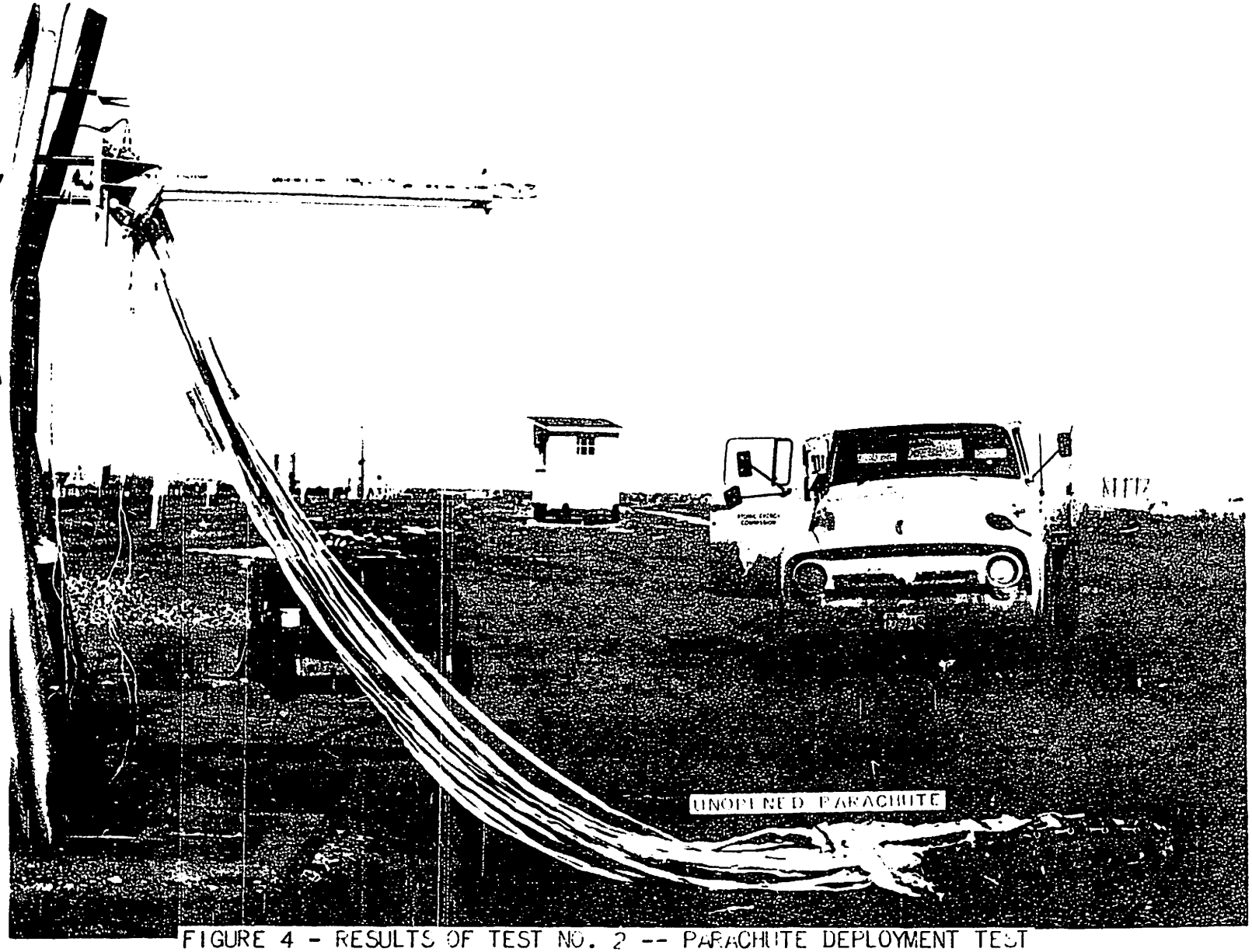

FIGURE 4 - RESULTS OF TEST NO. 2 -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. T-16734

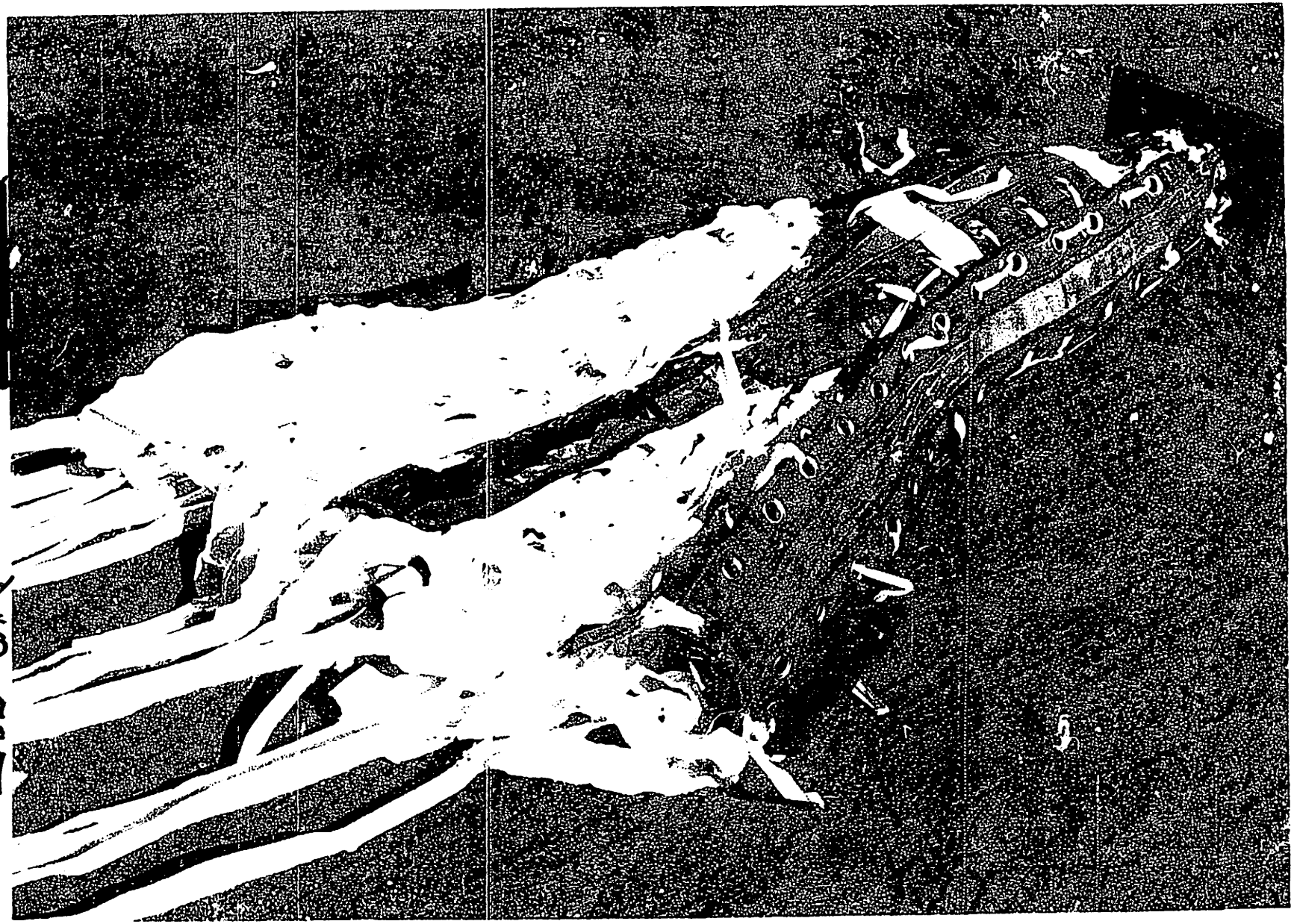

FIGURE 5 - CLOSE UP OF UNOPENED PARACHUTE AFTER TEST NO. 2 -- PARACHUTE DEPLOYMENT TEST

K+E 10 X 10 TO THE INCH 359-5DG
KEUFFEL & ESSER CO.

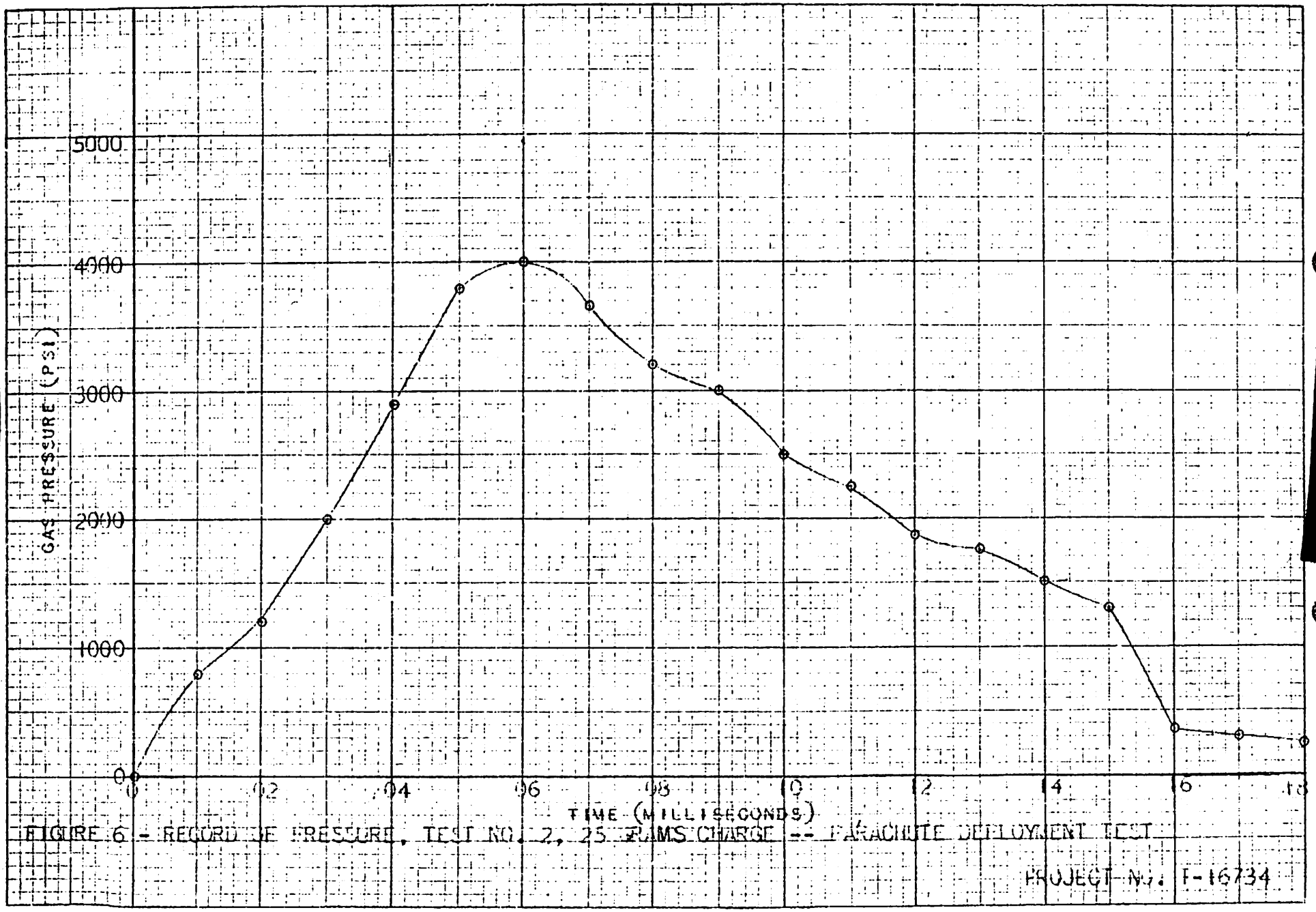

FIGURE 6 - RECORD OF PRESSURE, TEST NO. 2, 25 GRAMS CHARGE -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. F-16734

[redacted]

#236

UNCLASSIFIED

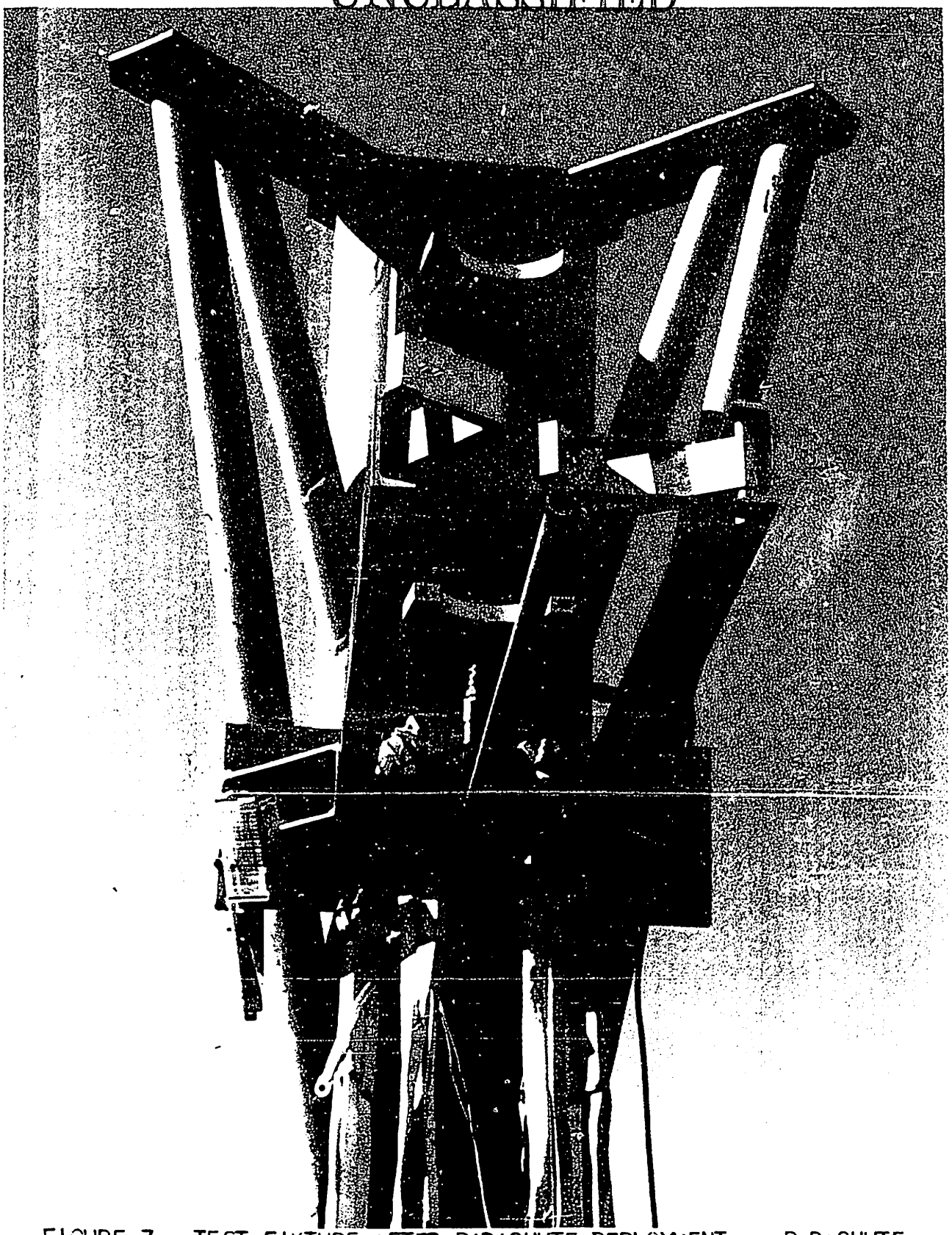

FIGURE 7 - TEST FIXTURE AFTER PARACHUTE DEPLOYMENT -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. T-16734

D#0-784

[redacted]

UNCLASSIFIED

UNCLASSIFIED

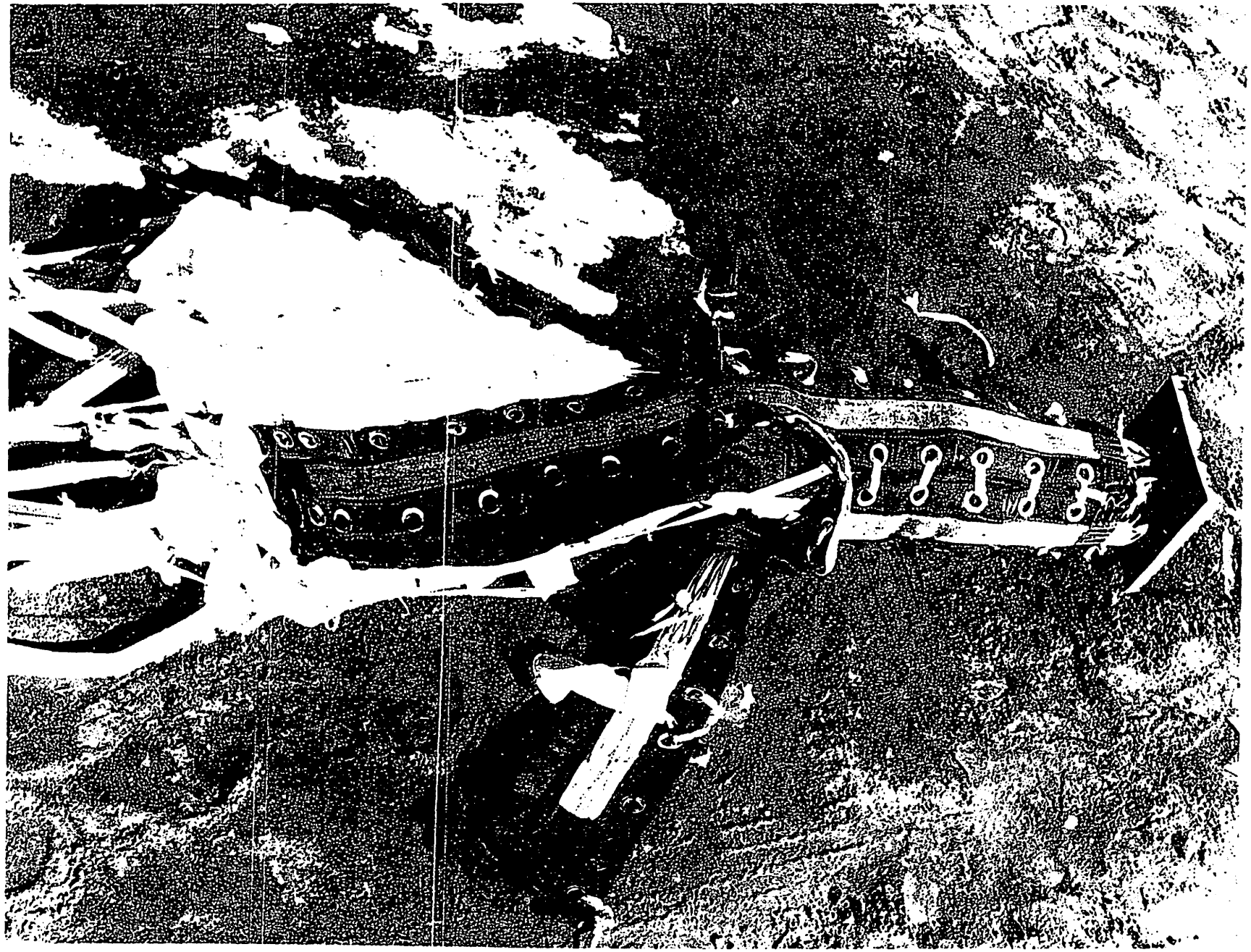

FIGURE 8 - CLOSE UP OF UNOPENED PARACHUTE AFTER TEST NO. 3 -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. T-16734

UNCLASSIFIED

#0-2713

#2367

K•E 10 X 10 TO THE INCH 359-5DG
KEUFFEL & ESSER CO MADE IN U.S.A.

[redacted]

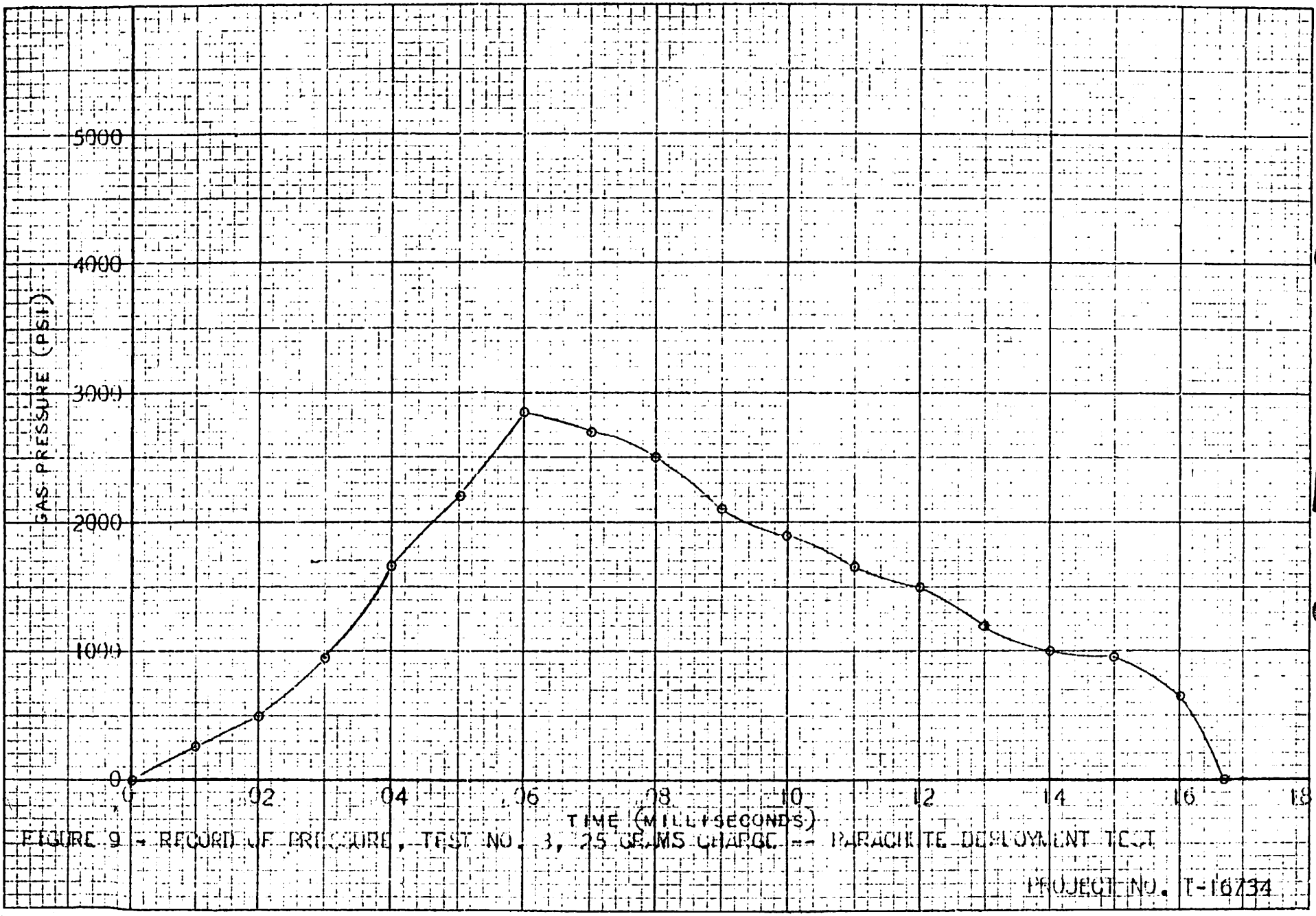

FIGURE 9 - RECORD OF PRESSURE, TEST NO. 3, 25 GRAMS CHARGE -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. T-16734

[redacted]

FIGURE 10 - RESULTS OF TEST NO. 4 -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. T-16734

#61-7528

#237

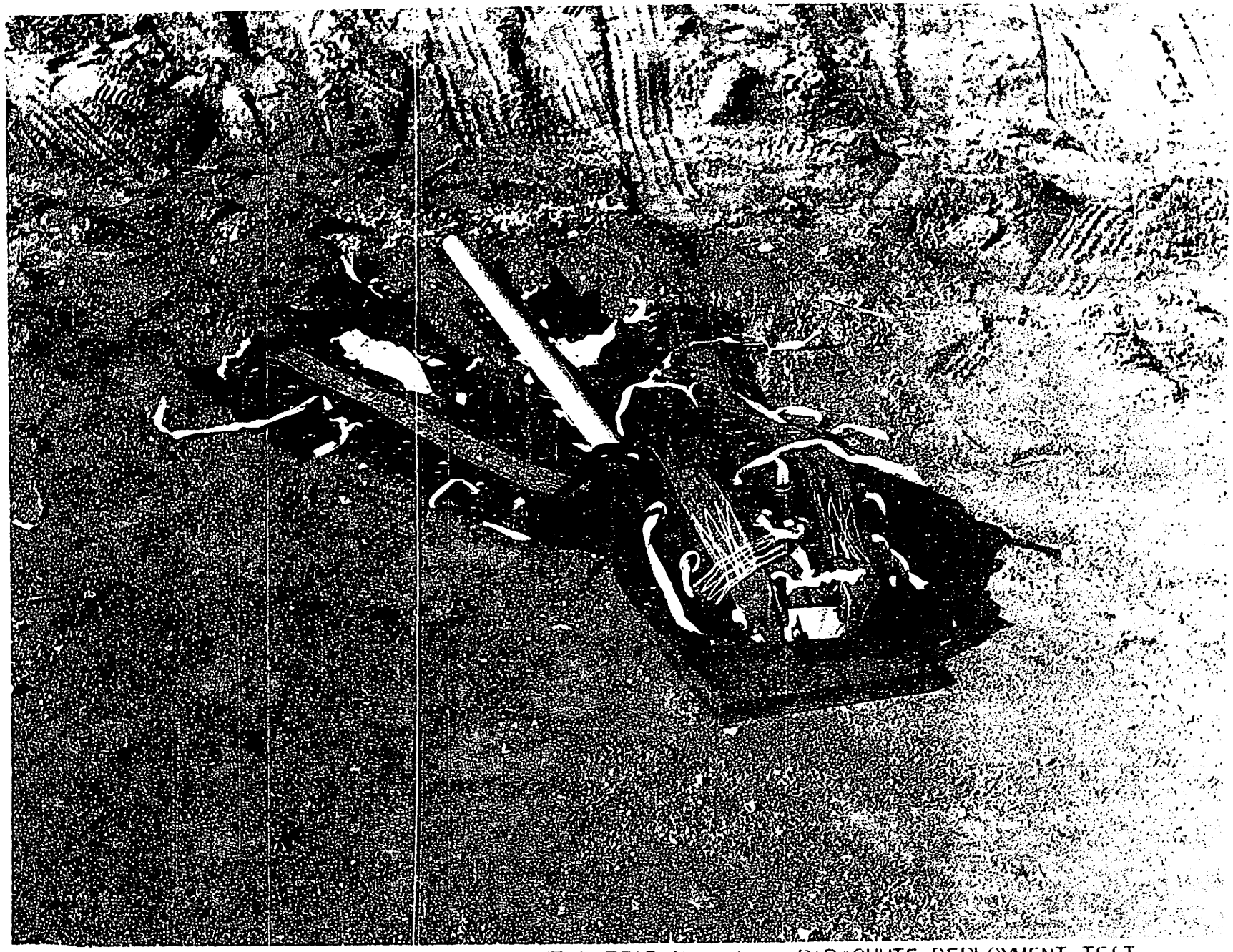

FIGURE 11 - PARACHUTE COVER AFTER TEST NO. 4 -- PARACHUTE DEPLOYMENT TEST

D#0-3031

#240

K+E 10 X 10 TO THE INCH KEUFFEL & ESSER CO. 359-5DG MADE IN U.S.A.

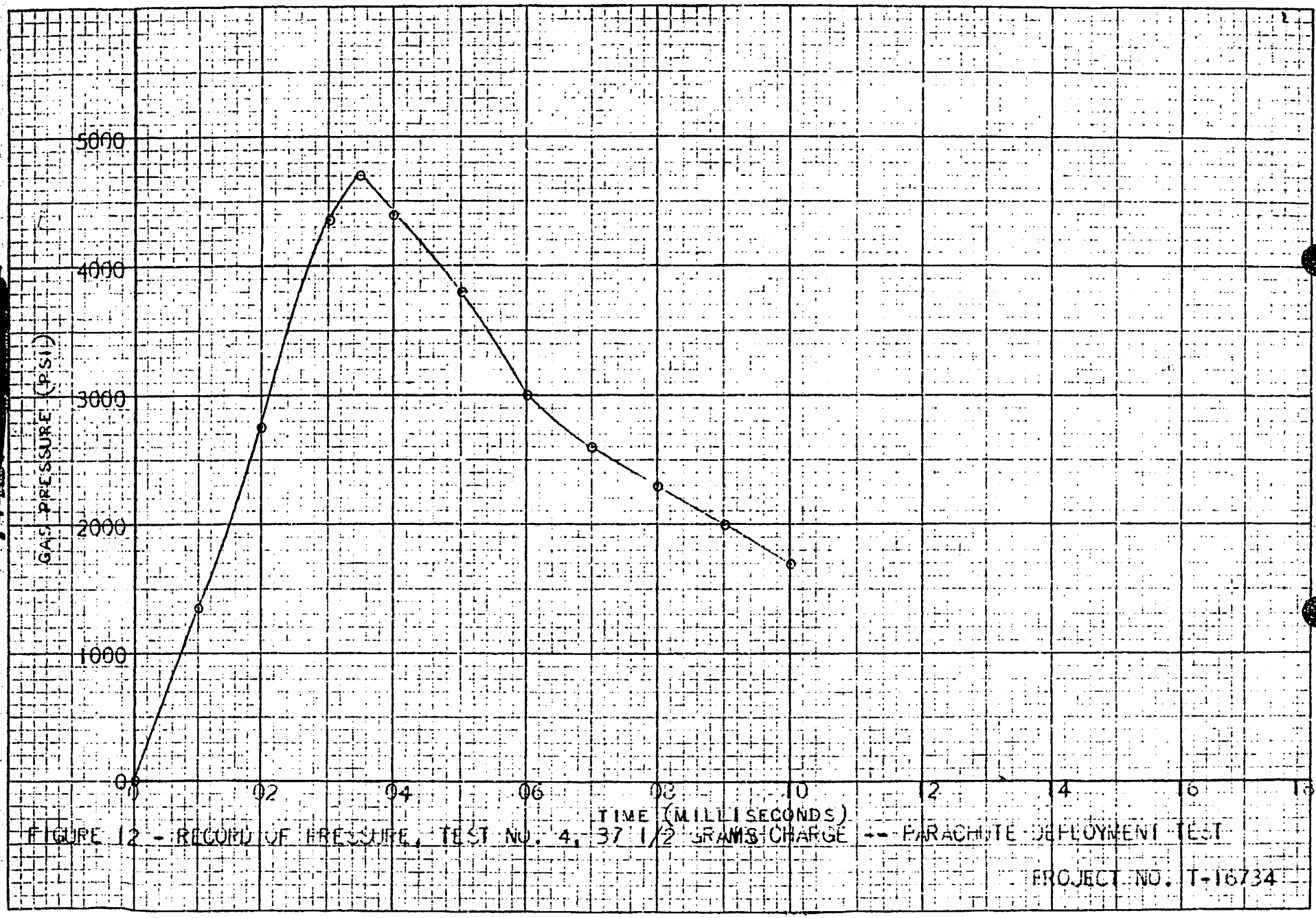

FIGURE 12 - RECORD OF PRESSURE, TEST NO. 4, 37 1/2 GRAMS CHARGE -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. T-16734

K+E 10 X 10 TO THE INCH KEUFFEL & ESSER CO. 359-5DG MADE IN U.S.A.

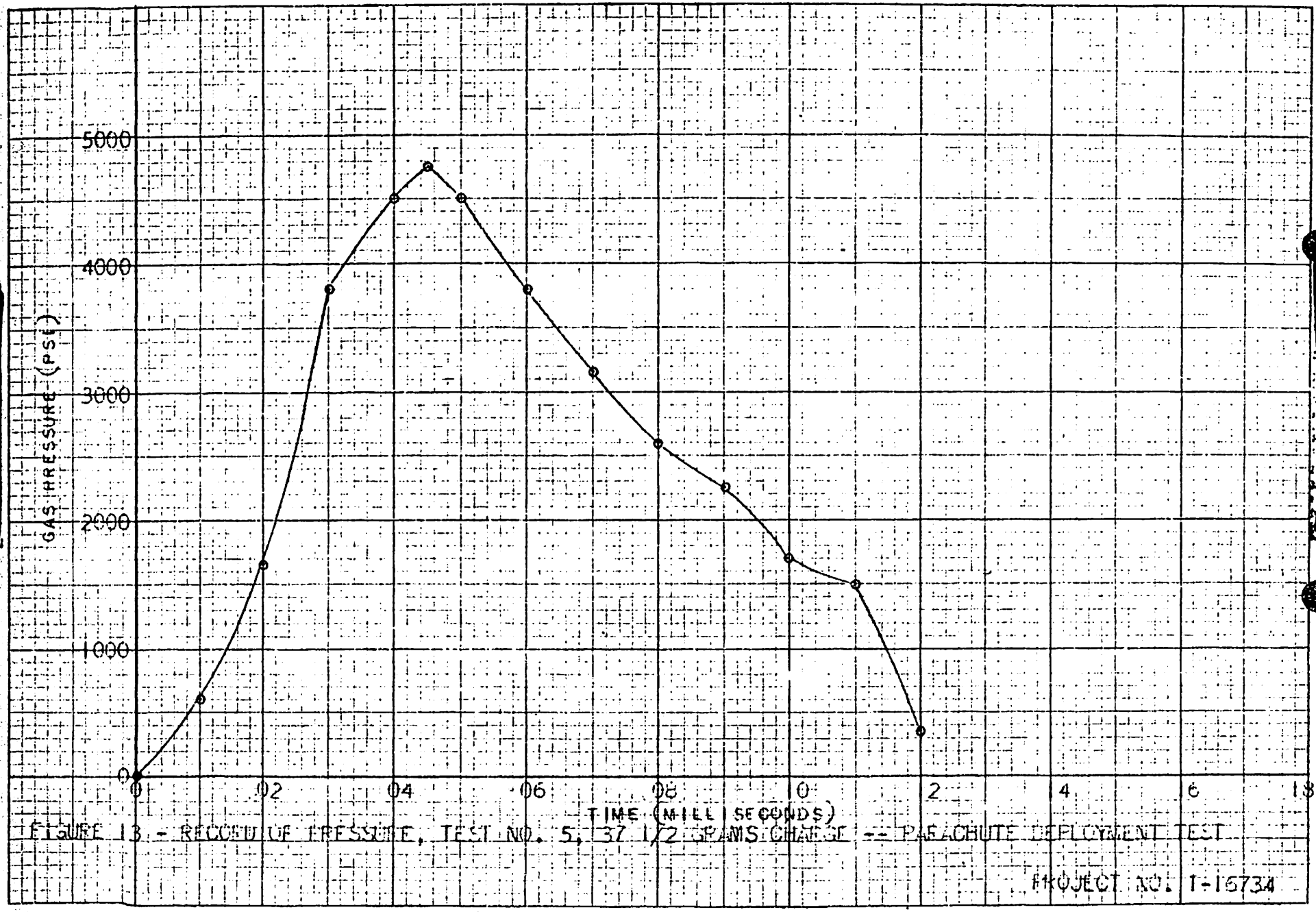

FIGURE 13 - RECORD OF PRESSURE, TEST NO. 5, 37 1/2 GRAMS CHARGE -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. T-16734

K+E 10 X 10 TO THE INCH KEUFFEL & ESSER CO 359-5DG MADE IN U.S.A.

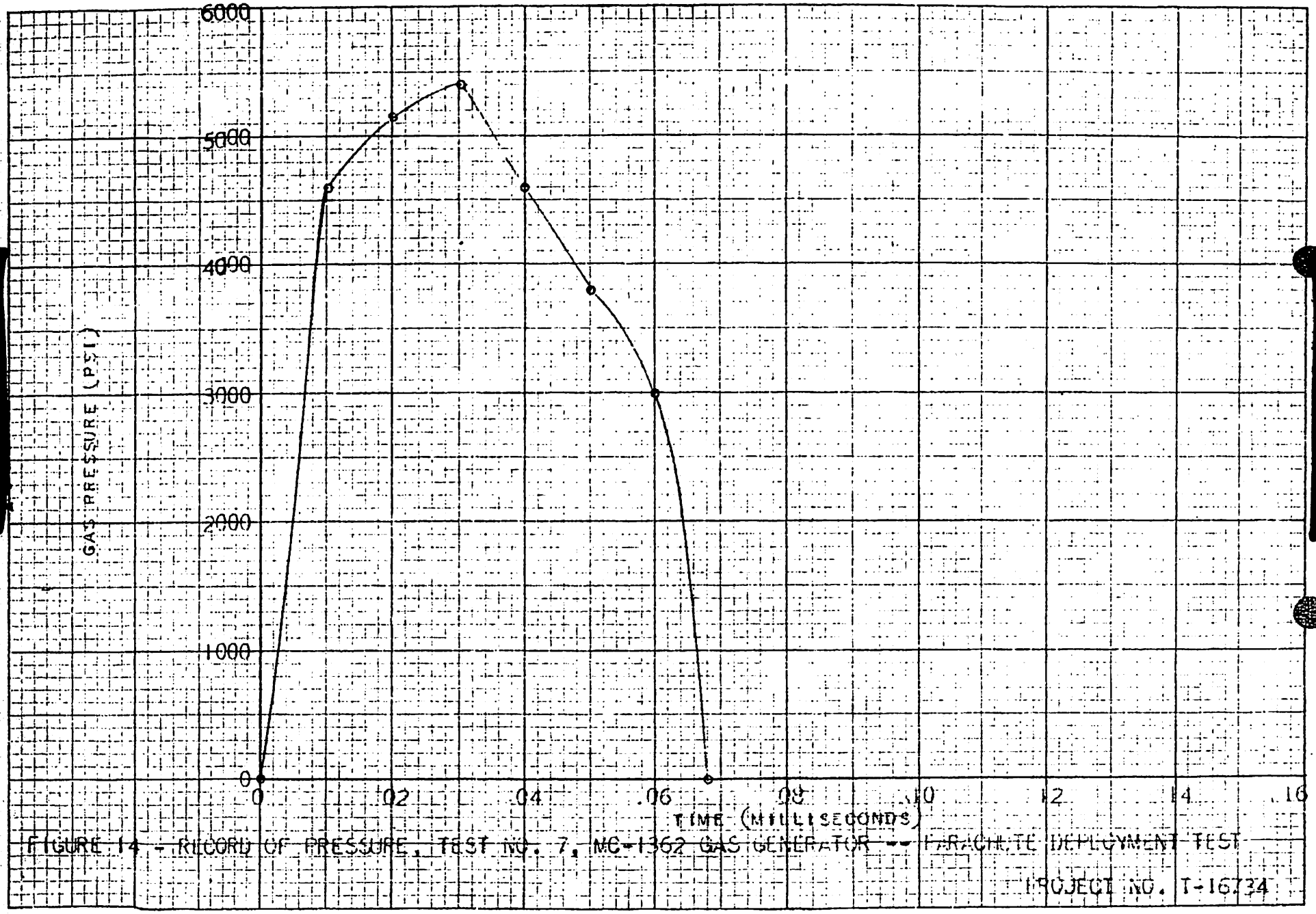

FIGURE 14 - RECORD OF PRESSURE, TEST NO. 7, MC-1362 GAS GENERATOR -- PARACHUTE DEPLOYMENT TEST

PROJECT NO. T-16734

UNCLASSIFIED

TABLE I

RESULTS OF PARACHUTE EJECTION TESTS, T-16734

Test No.	Size of Charge	Pressure	Results	Velocity	Ref. Fig.
1	25 grams	3000	Did not eject	-	3
2	25 grams	3390	Chute ejected, did not open cover	53.4 ft/sec	6
3	25 grams	2850	Chute ejected, did not open cover	-	9
4	37½ grams	4700	Complete deployment	-	12
5	37½ grams	4750	Complete deployment	86.8 ft/sec	13
6	54 grams	-	Complete deployment	98.8 ft/sec	-
7	(MC-1362) 85 grams	5400	Complete deployment	-	14

UNCLASSIFIED