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UNCLASSIFIED

2004

AUG 31 1960
T-16718
Project No. 13.409.01
Ref. Sym: 1613/258

10/15/98
10/26/98
Classification Changed to: U
Authority: W Layne
Classification Changed to: U
Authority: OCC Classified Information
Jurisdiction With:
Classified OCAT
Classified
OK for Openness

TCG-NNT-1

TO: DISTRIBUTION

INVENTORIED

Re: Parachute Characteristic Study on the 155 mm Gun

SEP 14 1965

3428-3

Summary of Results

The object of this test was to determine the characteristics of various scale model parachutes when attached to a projectile and launched from a 155mm gun at velocities of 500-1000 fps.

Ten tests were performed; an 18-inch ribbon parachute was tested each test. Four tests were performed with one projectile, and six tests were performed with another. During one test the parachute was never found. During the other nine tests chute deployment was successful. Velocity of the projectile varied from 715 fps to 1000 fps.

P-6

Object of Test

The object of this test was to determine the characteristics of various scale model parachutes when attached to a projectile and launched from a 155 mm gun at velocities of 500-1000 fps.

Reason for Test

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This test was requested in a Work Order Authorization from W. H. Curry, 5144, to A. W. Reger, 1613, dated 11/24/59. R. J. Lencharich, 5144, was the consultant.

AUG 6 1964

3427-1

Setup for Test

The setup for Test No. 1 is shown in Figure 1. The setup for Test No. 3 is shown in Figure 2. The setup for Test No. 2 was the same as for Test No. 3. The setup for Test No. 4 is shown in Figure 3. The setup for Test No. 5 is shown in Figure 4; the setup was the same for Test Nos. 6 thru 10.

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CENTRAL RECORD FILE

An 18-inch ribbon parachute was tested each test. See Figure 5.

Test equipment used included:

155 mm gun
CEC Recording Oscillograph, Type 5119R, Property No. S-99101
Kintel Amplifier, Model 111BF, Property Nos. S-93377 & 99078

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP

CLASSIFICATION CHANGED TO: U	AUTHORITY: W C Layne
Pamela Fullmer 10/26/98 PERSON CHANGING MARKING & DATE	RECORD ID: 99SN0196
W C Layne 10/28/98 PERSON VERIFYING MARKING & DATE	DATED: 10/26/98

THIS DOCUMENT CONSISTS OF 23 PAGE(S)

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Table I is a summary of instrumentation used during the tests.

Procedure

The procedure for each test was practically the same. The parachute to be tested was attached to the projectile, and the projectile was then placed on the end of a spigot tube with the parachute stuffed inside the spigot tube. See Figure 6. The instrumentation was calibrated, the assembled projectile-and-spigot tube were inserted in the 155 mm gun barrel (see Fig. 7), the powder charge was loaded, and the gun was fired. The air drag on the drag plate (see Figures 1, 2, 3, and 7) caused separation of the projectile and spigot tube, allowing the chute to deploy. The parachute-retarded projectile then fell to the ground.

The projectile shown in Figure 1 was used during Test Nos. 1 thru 4. The projectile shown in Figure 7 was used during Test Nos. 5 thru 10.

Table II is a summary of test conditions for the tests.

Results

A summary of the recorded test data from all the tests is located in Table III.

During Test Nos. 1 & 2 the chute deployed successfully. See Figure 8. No data was recorded during either test.

The chute deployed momentarily and then tore loose from the projectile during Test No. 3. The projectile was recovered, but the chute was never found.

During Test No. 4 the chute did not deploy. It became tangled, and the projectile fell unretarded. See Figure 9.

The chute deployed well during Test No. 5, but after the projectile and spigot tube had separated, they lightly collided again after chute deployment. However, there was no damage to the projectile or chute.

During Test Nos. 6, 7, 8, 9, and 10 chute deployment was successful.

Figures 10 thru 17 are the oscillograph records for Test Nos. 3 thru 10.

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D. L. Kreng by Hooper

D. L. KRENZ - 1615-1

R. Harlan by RSH

1613 Project Engineer: R. HARLAN - 1613-3

Approved by: E. S. HOOPER - 1613-3

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5/7A D. Williams, 1613
6/7A J. R. Harrison, 5523
7/7A R. K. Smeltzer, 3421-3

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FIGURE 1 - SETUP FOR TEST NO. 1 -- PARACHUTE CHARACTERISTIC STUDY OF THE [illegible] 1613/258

PROJECT NO. 1-16713

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FIGURE 2 - SETUP FOR TEST NO. 3 -- PARACHUTE CHARACTERISTIC STUDY ON THE 155 MM. JUN. 1613/258

PROJECT NO. T-1671

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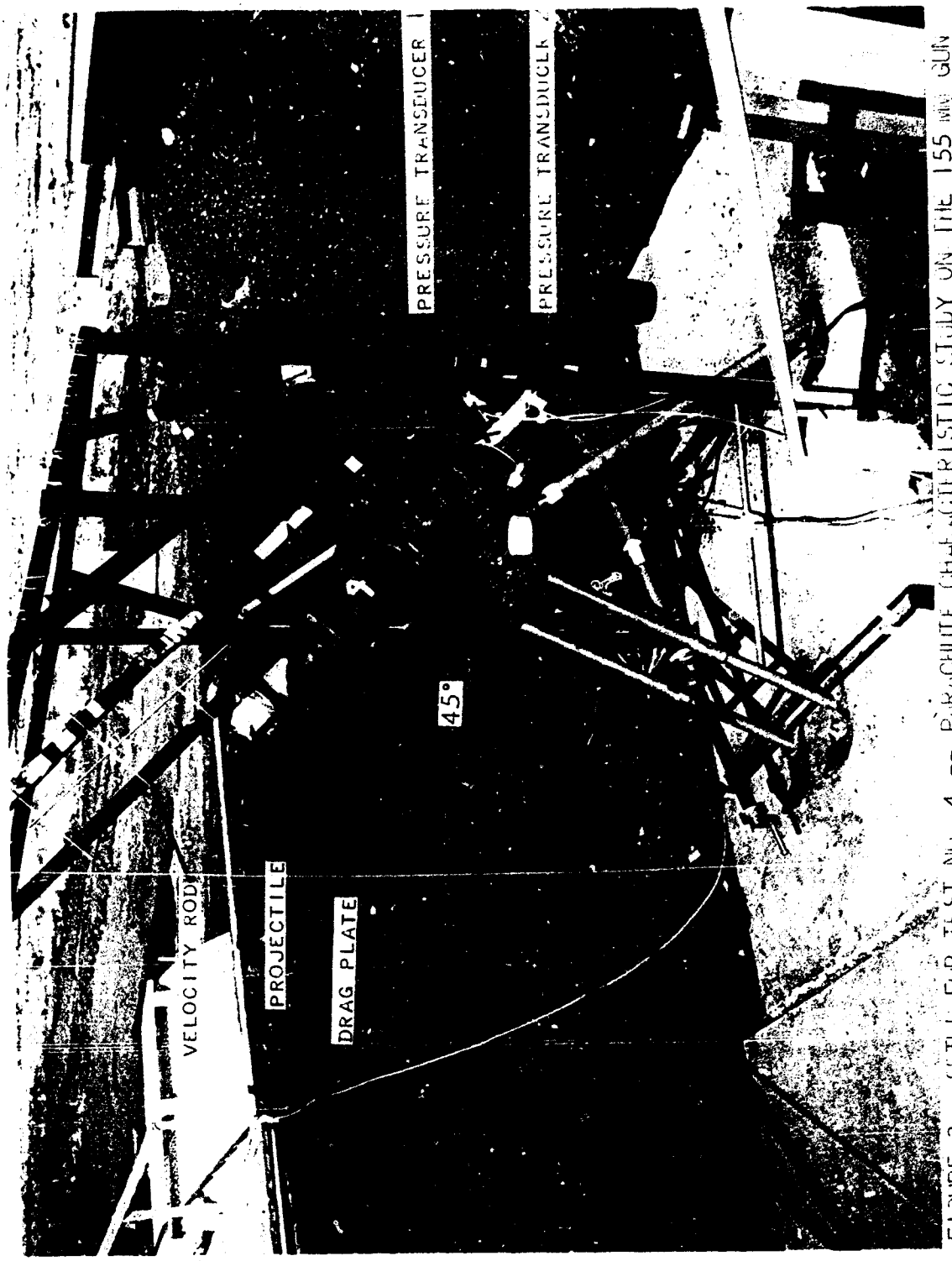

FIGURE 3 - SETUP FOR TEST NO. 4 -- PARACHUTE CHARACTERISTIC STUDY ON THE 155 MM GUN 1613/258

PROJECT NO. T-16718

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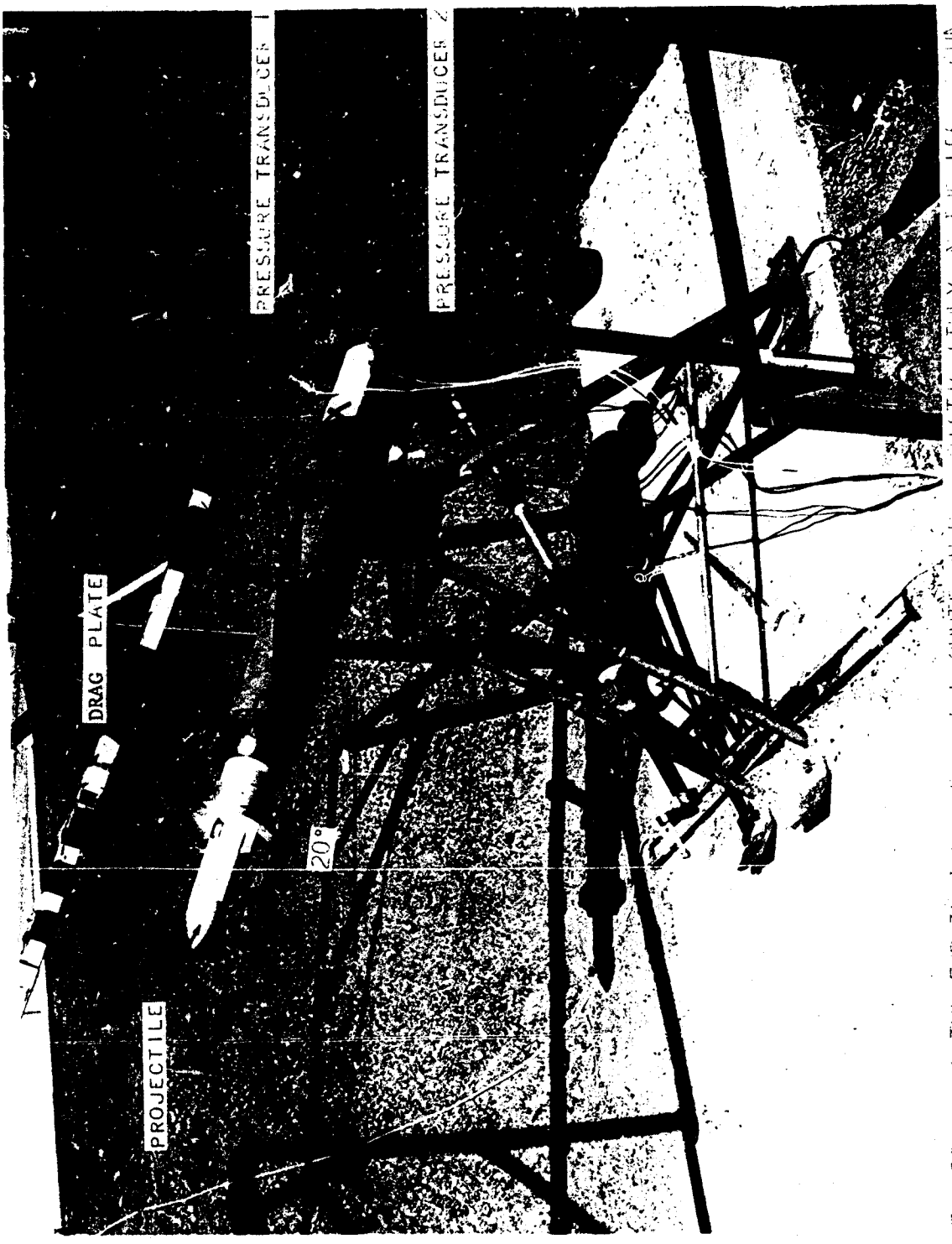

FIGURE 4 - SETUP FOR TEST NO. 6 -- PARACHUTE CHARACTERISTIC STUDY ON THE 155 mm GUN
1613/258
PROJECT NO. T-16713

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FIGURE 5 - PARACHUTE AND PROJECTILE FOR TEST NO. 4 -- PARACHUTE GUN ACTUATING STUDY ON THE 155 MM GUN

1613/258

PROJECT NO. T-16718

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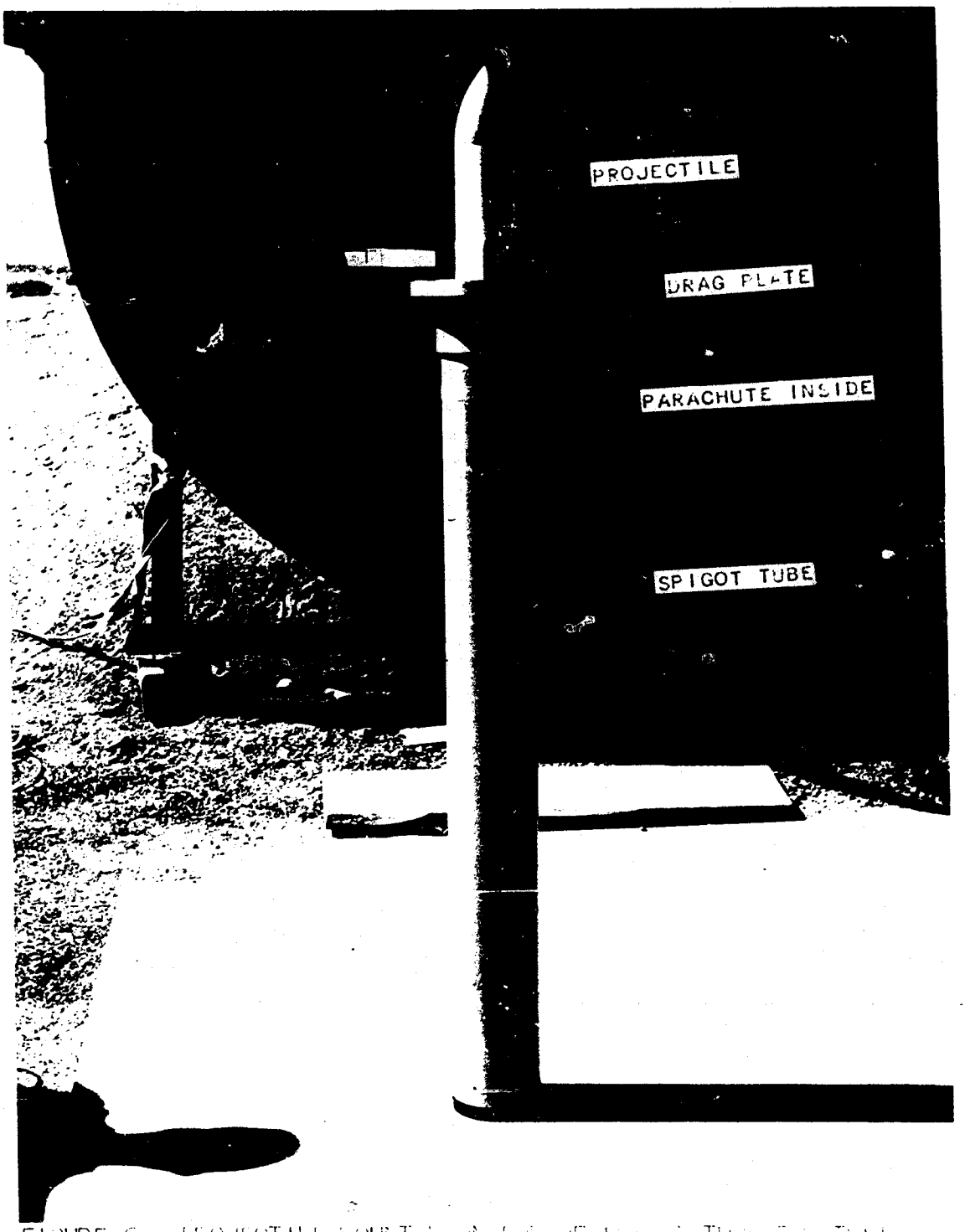

FIGURE 6 - PROJECTILE MOUNTED ON END OF SPIGOT TUBE FOR TEST NO. 5
-- PARACHUTE CHARACTERISTIC STUDY OF THE 155 MM GUN

1613/258
PROJECT NO. 1-16718

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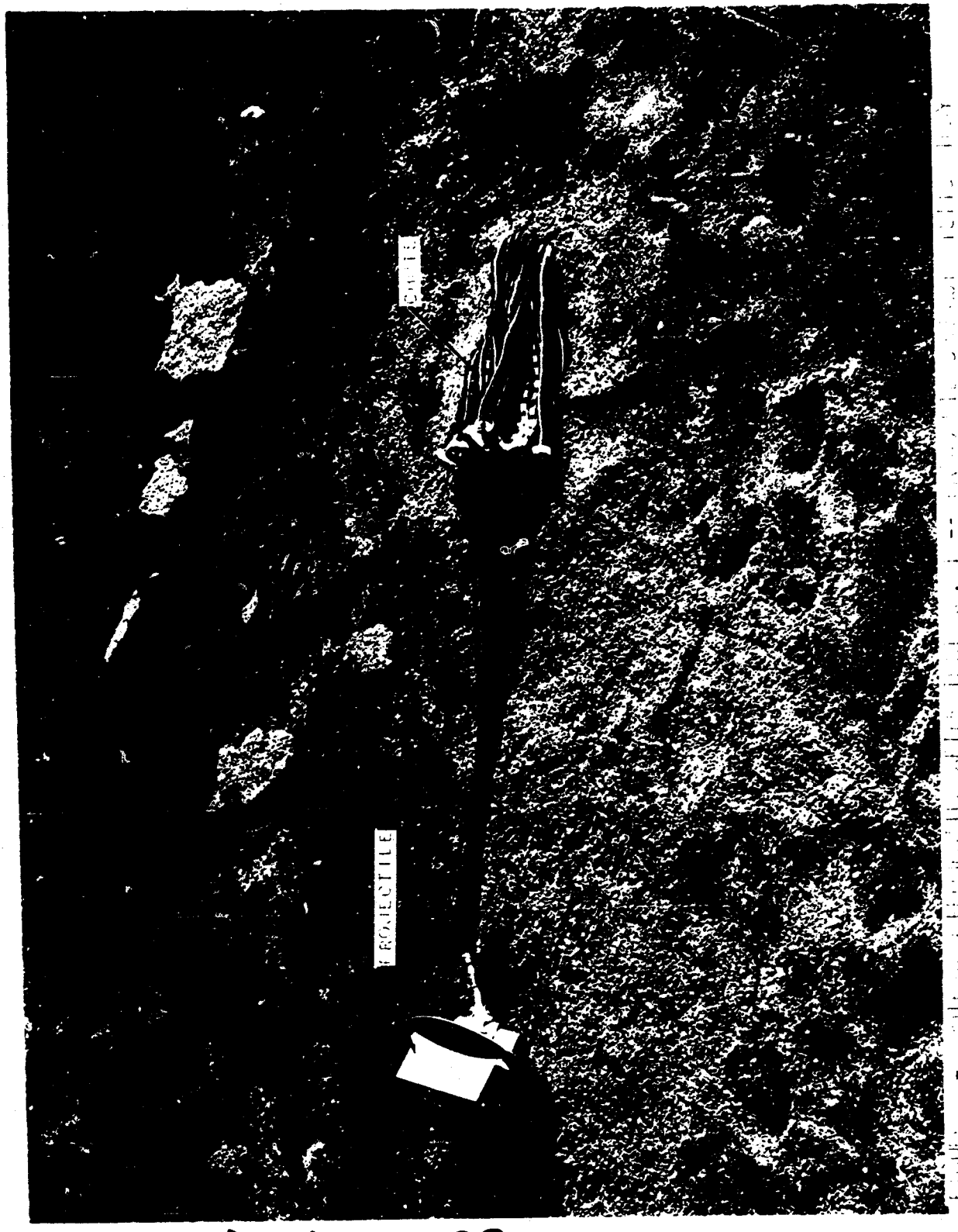

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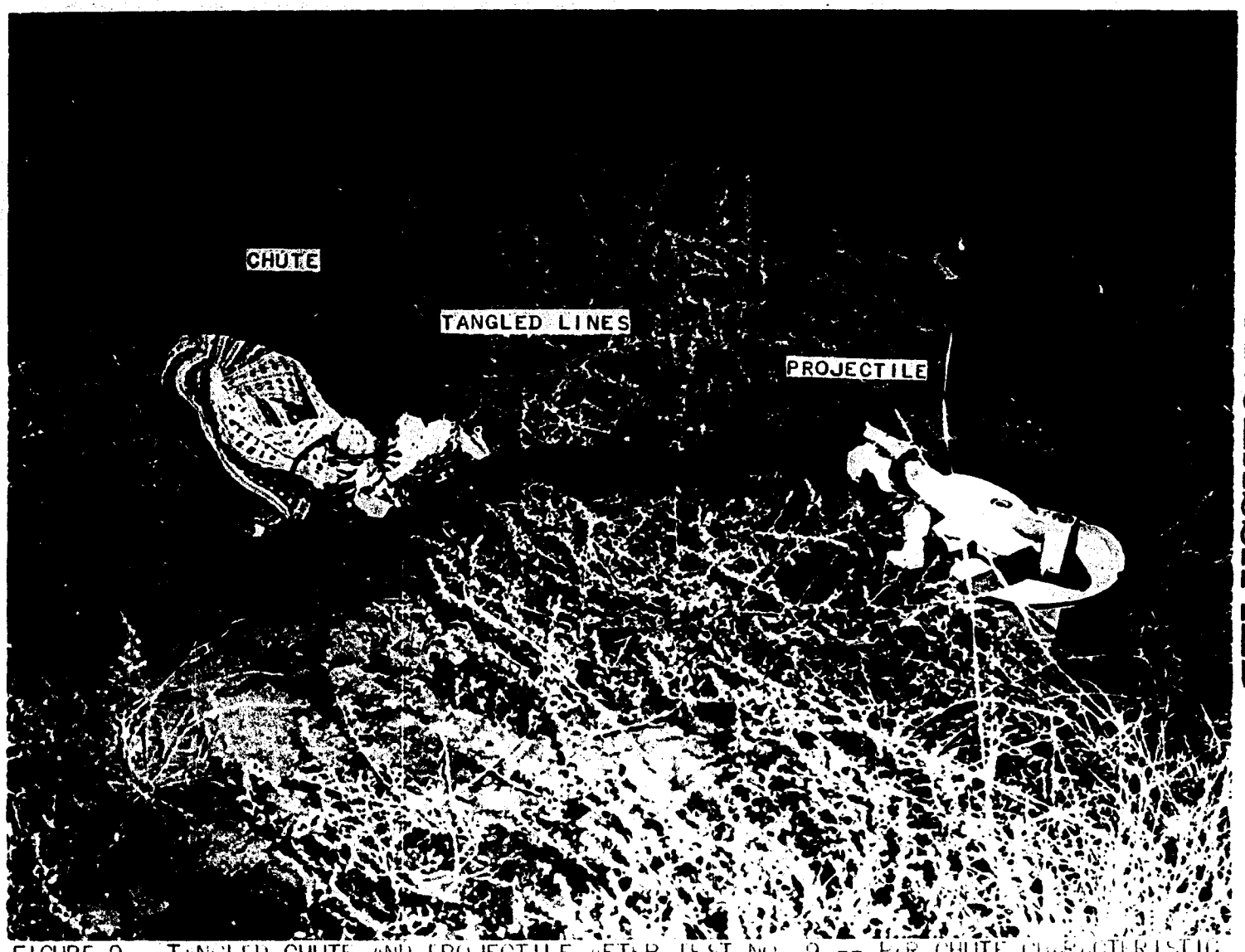

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FIGURE 9 - TANGLED CHUTE AND PROJECTILE AFTER TEST NO. 9 -- PARACHUTE CHARACTERISTIC STUDY OF THE 155 MM GUN

1613/258

PROJECT NO. T-16718

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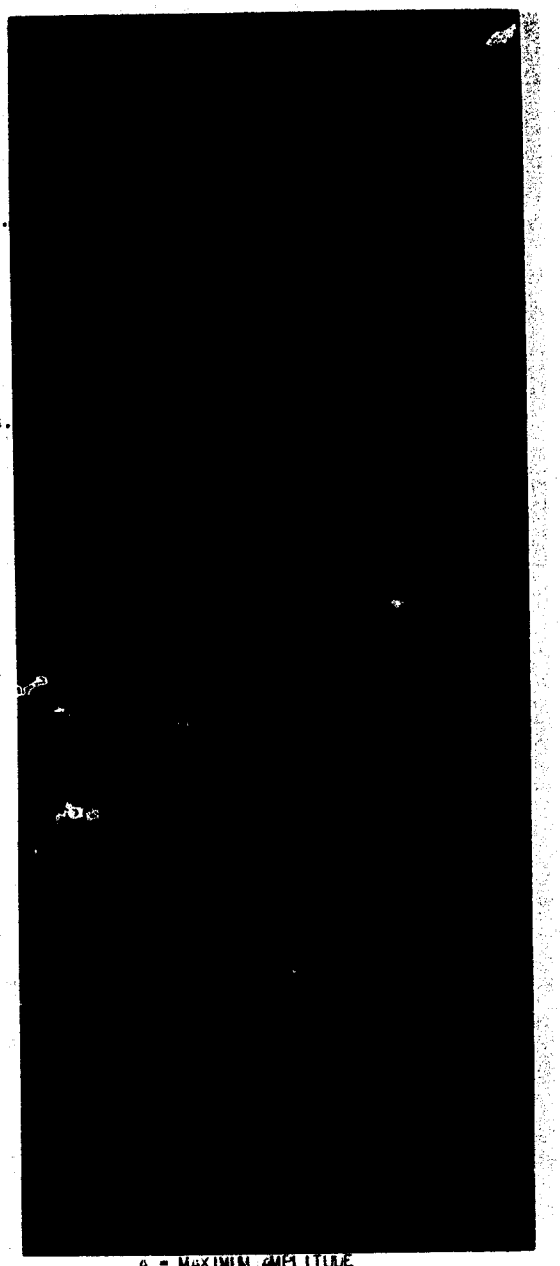
[illegible]	LOCATION	CAL. VALUE
[illegible]		
FIRE FUZE		
[illegible]	[illegible]	1000 PSIG/IN.
[illegible]	[illegible]	1000 PSIG/IN.
VELOCITY #1	FIRST FOUR FEET FROM GUN MUZZLE	
VELOCITY #2	SECOND FOUR FEET FROM GUN MUZZLE	
1000 [illegible]		



1 INCH SCALE

A = MAXIMUM AMPLITUDE
B = MAXIMUM FAIRED AMPLITUDE
C = RISE TIME
D = PULSE DURATION
E = 0.01 SECOND

FIGURE 10 - OSCILLOGRAPH RECORD FROM TEST NO. 3 -- PARACHUTE CHARACTERISTIC STUDY OF THE 155 mm GUN

1613/258
PROJECT NO. T-16718

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TRACE	LOCATION	CAL. VALUE
1000 CPS TIME BASE		
FIRE FUSE		
PRESSURE TRANSDUCER #1	TOP OF GUN BREECH	12000 PSIG/IN.
PRESSURE TRANSDUCER #2	SIDE OF GUN BREECH	10800 PSIG/IN.
VELOCITY #1	FIRST FOUR FEET FROM GUN MUZZLE	
VELOCITY #2	SECOND FOUR FEET FROM GUN MUZZLE	
1000 CPS TIME BASE		

[redacted]

1 INCH SCALE

A = MAXIMUM AMPLITUDE
B = MAXIMUM FAIRED AMPLITUDE
C = RISE TIME
D = PULSE DURATION
E = 0.01 SECOND

FIGURE 11 - OSCILLOGRAPH RECORD FROM TEST NO. 4 -- PARACHUTE CHARACTERISTIC STUDY OF THE 155 MM GUN

PROJECT NO. T-16718
REF. SYM: 1613/258

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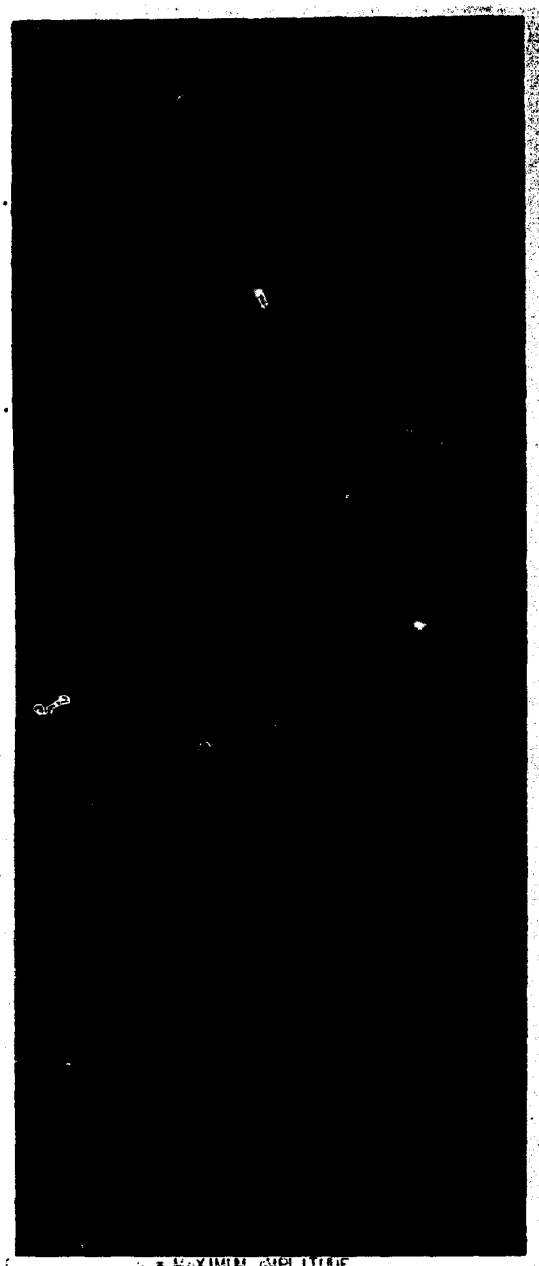
[illegible]	LOCATION	CAL. VALUE
1000 CPS TIME BASE		
FIRE PULSE		
PRESSURE TRANSDUCER #1	TOP OF GUN SPEECH	10400 PSIG/IN.
PRESSURE TRANSDUCER #2	SIDE OF GUN SPEECH	10800 PSIG/IN.
VELOCITY #2	SECOND FIVE FEET FROM GUN MUZZLE	
1000 CPS TIME BASE		



1 INCH SCALE

A = MAXIMUM AMPLITUDE
B = MAXIMUM FAIRED AMPLITUDE
C = RISE TIME
D = PULSE DURATION
E = 0.01 SECOND

FIGURE 12 - OSCILLOGRAPH RECORD FROM TEST NO. 5 -- PRESSURE CHARACTERISTIC STUDY OF THE 155 mm GUN

PROJECT NO. T-16718
REF. SYM: 1613/258

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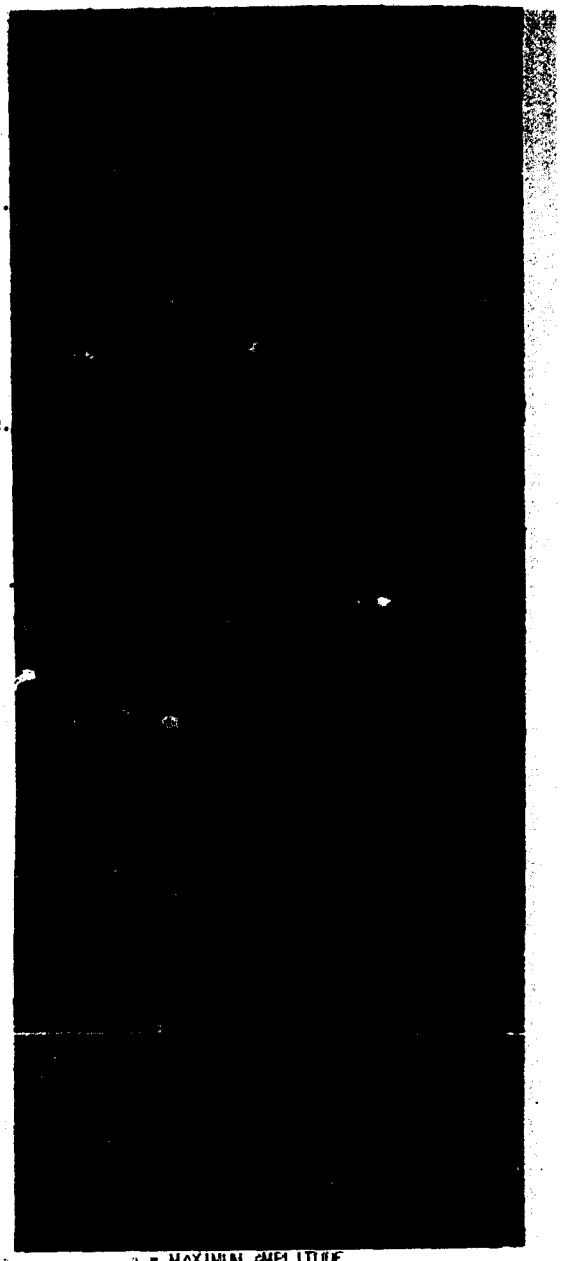
PICKUP	LOCATION	CAL. VALUE
1000 CPS TIME BASE		
FIRE PULSE		
PRESSURE TRANSDUCER #1	TOP OF GUN BREECH	11600 PSIG/IN.
PRESSURE TRANSDUCER #2	SIDE OF GUN BREECH	6200 PSIG/IN.
VELOCITY #2	SECOND FOUR FEET FROM GUN MUZZLE	
VELOCITY #1	FIRST FOUR FEET FROM GUN MUZZLE	
1000 CPS TIME BASE		



1 INCH SCALE

A = MAXIMUM AMPLITUDE
B = MAXIMUM FAIRED AMPLITUDE
C = RISE TIME
D = PULSE DURATION
E = 0.01 SECOND

FIGURE 13 - OSCILLOGRAPH RECORD FROM TEST NO. 6 -- PARACHUTE CHARACTERISTIC STUDY OF THE 155 MM GUN

PROJECT NO. T-16718
REF. SYM: 1613/258

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[illegible]	LOCATION	CAL. VALUE
[illegible]		
FIRE PULSE		
[illegible] #1	[illegible]	[illegible] PSIG/IN.
[illegible] #2	[illegible]	10400 PSIG/IN.
VELOCITY #2	SECOND FOUR FEET FROM [illegible]	
VELOCITY #1	FIRST FOUR FEET FROM [illegible]	
[illegible]		

[redacted]

1 INCH SCALE

A = MAXIMUM AMPLITUDE
B = MAXIMUM FAIRED AMPLITUDE
C = RISE TIME
D = PULSE DURATION
E = 0.01 SECOND

FIGURE 14 - OSCILLOGRAPH RESULT FROM TEST NO. 7 -- PARACHUTE CHARACTERISTIC STUDY OF THE 155 [illegible] GUN

PROJECT NO. T-16718
REF. SYM: 1613/258

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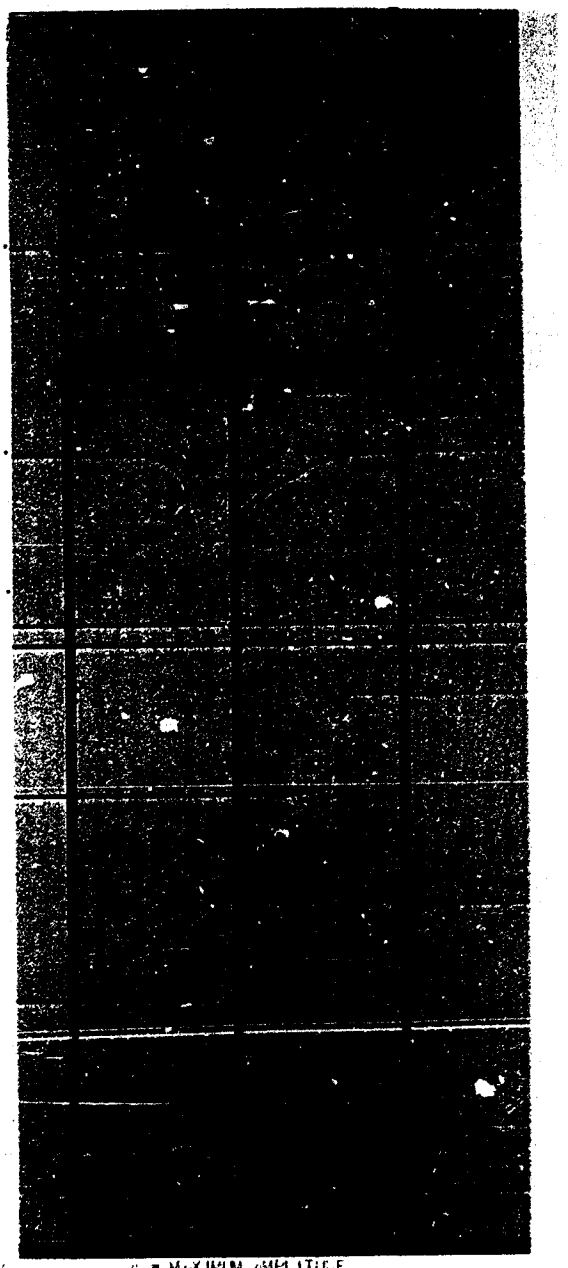
TRACE	LOCATION	CAL. VALUE
1000 CPS TIME BASE		
FIRE PULSE		
PRESSURE TRANSDUCER #1	TOP OF [illegible] BREECH	11500 PSIG/IN.
PRESSURE TRANSDUCER #2	SIDE OF [illegible] BREECH	5400 PSIG/IN.
VELOCITY #2	[illegible] SECOND FOUR FEET FROM [illegible] NOZZLE	
VELOCITY #1	FIRST FOUR FEET FROM [illegible] NOZZLE	
1000 CPS TIME BASE		



1 INCH SCALE

A = MAXIMUM AMPLITUDE
B = MAXIMUM FAIRED AMPLITUDE
C = RISE TIME
D = PULSE DURATION
E = 0.01 SECOND

FIGURE 15 - OSCILLOGRAPH RECORD FROM TEST NO. 8 -- PARACHUTE CHARACTERISTIC STUDY OF THE 155 MM GUN

PROJECT NO. T-16718
REF. SYM: 1613/258

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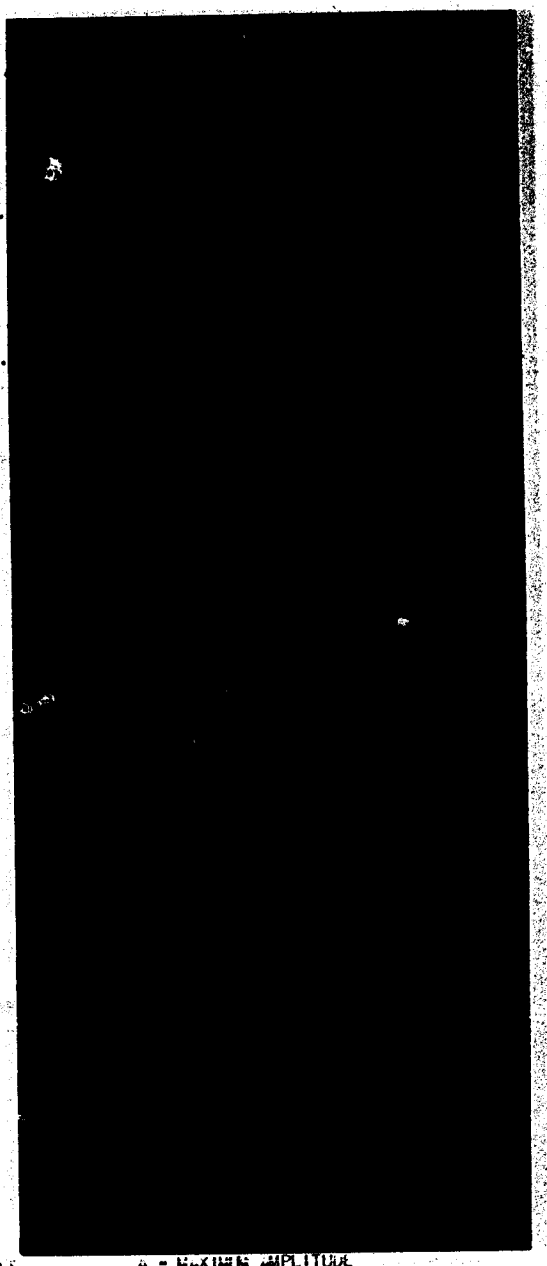
TRACE	LOCATION	CAL. VALUE
1000 CPS TIME BASE		
FIRE RESET		
PRESSURE TRANSDUCER #1	TOP OF GUN MUZZLE	6200 PSIG/IN.
PRESSURE TRANSDUCER #2	SIDE OF GUN MUZZLE	6800 PSIG/IN.
VELOCITY #1	FIFTY FOUR FEET FROM GUN MUZZLE	
VELOCITY #2	SEVENTY FOUR FEET FROM GUN MUZZLE	
1000 CPS TIME BASE		



1 INCH SCALE

A = MAXIMUM AMPLITUDE
B = MAXIMUM FAIRED AMPLITUDE
C = RISE TIME
D = PULSE DURATION
E = 0.01 SECOND

FIGURE 16 - OSCILLOGRAPH RECORD FROM TEST NO. 9 -- PARACHUTE CHARACTERISTIC STUDY OF THE 155 MM GUN

PROJECT NO. T-16718
REF. SYM: 1613/258

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[illegible]	LOCATION	CAL. VALUE
1000 CPS TIME BASE		
[illegible]		
[illegible]	[illegible]	10[illegible] PSIG/IN.
VELOCITY #1	FIRST FOUR FEET FROM [illegible]	
VELOCITY #2	SECOND FOUR FEET FROM [illegible]	
1000 CPS TIME BASE		

[redacted]

[illegible] INCH SCALE

A = MAXIMUM AMPLITUDE
B = MAXIMUM FAIRED AMPLITUDE
C = RISE TIME
D = PULSE DURATION
E = 0.01 SECOND

FIGURE 17 - OSCILLOGRAPH RECORD FROM TEST NO. 10 -- PARACHUTE CHARACTERISTIC STUDY OF THE 155 MM GUN

PROJECT NO. T-16718
REF. SYM: 1613/258

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TABLE I

Instrumentation Used During the

Parachute-Characteristic Study on the 155-mm Gun

Pressure Transducers

No.	Location	Type	S/N	Test Used	Fig. Ref.
1	Top of gun breech	Statham PG10TCa-10m-350	8660	1, 2, 3, 4	3
1	Top of gun breech	Norwood Controls 112-1-11-34-61	4376	5, 6, 7, 8, 9	4
2	Side of gun breech	Statham PG10TCa-10m-350	8662	1, 2, 3, 4, 5, 6, 7	3
2	Side of gun breech	Norwood Controls 112-1-11-34-61	4378	8, 9, 10	-

Velocity - Measuring System

Frangible glass conductor rods, placed 1 foot apart for the first 8 feet from the gun muzzle, measured the projectile velocity during all tests (see Figure 2).

T-16718
RS 1613/258

TABLE II

Summary of Test Conditions for the

Parachute-Characteristic Study on the 155-mm Gun

Test No.	Date	Charge Wt. (lbs)	Angle of Fire (degrees)	Total Push Weight (lbs)
1	12/24/59	12.0	45	39
2	1/4/60	13.0	45	39
3	1/14/60	12.0	45	39
4	2/4/60	13.0	45	35.5
5	3/30/60	12.0	20	51
6	4/5/60	13.0	20	51
7	4/7/60	14.5	20	51
8	4/19/60	15.0	20	51
9	4/28/60	12.0	20	51
10	5/3/60	13.0	20	51

TABLE III

Summary of Recorded Test Data from the

Parachute-Characteristic Study on the 155-mm Gun

	Pressure Transducer 1				Pressure Transducer 2				
Test No.	Maximum Peak Pressure (psig)	Maximum Faired Pressure (psig)	Rise Time (sec)	Pulse Duration (sec)	Maximum Peak Pressure (psig)	Maximum Faired Pressure (psig)	Rise Time (sec)	Pulse Dur (sec)	Maximum Velocity (fps)
1	No record								
2	No record								
3	5200	4000	0.0041	0.0155	4800	4350	0.0041	0.0121	910
4	6700	5700	0.0023	0.0099	7500	6300	0.0022	0.0096	1000
5	5700	5700	0.0023	0.0108	5600	4500	0.0030	0.0105	715
6	8250	8250	0.0022	0.0106	6700	6100	0.0018	0.0098	880
7	10000	10000	0.0023	0.0103	10900	9500	0.0019	0.0085	910
8	9900	9900	0.0022	0.0100	9600	9600	0.0023	0.0089	1000
9	6800	6800	0.0028	0.0115	5500	5500	0.0024	0.0125	715
10	-	-	-	-	8200	8200	0.0018	0.0110	880